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Endless Traveling or Railway Sidewalk.

The inventor of this novel mode of rapid transit for large cities is Mr. Alfred Speer, known as "The Wine Man," of Passaic, N. J., who obtained letters patent thereon, through the Scientific American Patent Agency, October 10, 1871. He feels very confident that, in this invention, he has reached the ultimatum of combined rapidity, comfort, and safety, and that, although generally adapted to use in all large cities, it is especially so for New York, Broadway being named as the route deemed most favorable for its erection, and most likely to accommodate the public.

Our readers are well aware that scheme after scheme has been projected to solve the knotty problem of transit in this city, so long in proportion to its width. So far, conflicting interests, added to the obvious defects of many projects, have defeated the adoption of any. Should this plan of Mr. Speer's be destined to a better fate, its unique character, as well as the magnitude of the work, will certainly render it the most remarkable feature among the other remarkable objects which interest visitors to the metropolis.

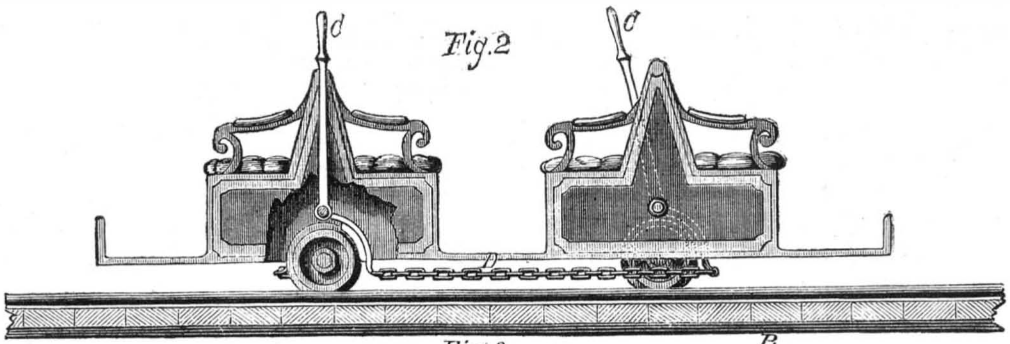
The nature of the proposed improvement may be described as consisting in the construction of an endless, perpetually and rapidly moving elevated sidewalk, with means to facilitate the getting on and off of passengers, without risk of injury to life or limb, or loss of time to others who are already traveling on it.

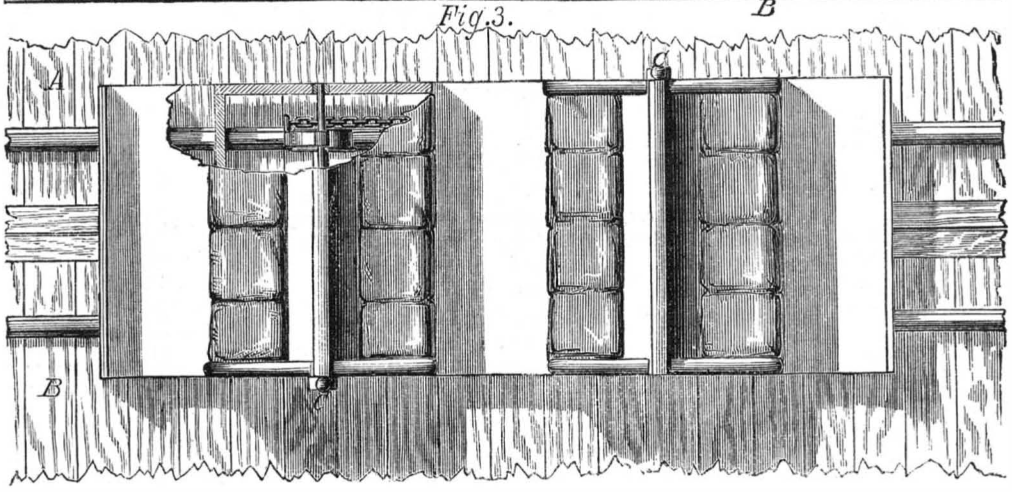
Fig. 1 is a perspective view of the proposed structure, and Figs. 2 and 3 represent details.

From an exhaustive description of this invention, published in the *Paterson Guardian* of December 7, 1871, which has been furnished us as embodying some of the inventor's views of the project, we clip some paragraphs, which explain the principal features.

"In the first place, iron pillars of a pleasing design and ornamentation are erected adjacent to the curbstone on the edge of the sidewalk. These are placed at the necessary distances apart to support the structure, say five or six pillars in each block. These iron posts reach up to the second story, and upon their tops are fastened the rails for the sidewalk to move upon. The pillars will be pleasing to the sight, and the objection of frightening horses by passing cars will be obviated, as the motion will be continual and nothing unusual will come along to frighten the horses below. Neither will there be the danger of a fearful accident from the cars running off the track, as in the case of railways. On the top of these posts is a continuous sidewalk, sixteen or eighteen feet wide; the center of which is over the pillars at the curb line. The walk will then project eight or nine feet over the street, and eight or nine feet over the sidewalk, leaving a space from that to the buildings of about twelve feet, which may remain open; or at the option of the landowners of a block, they may build a permanent plank or glass walk from that to their buildings. As the walk will be even with the second story of the buildings, it will at once make that story as good for stores as the ground floor; or, in the case of large establishments, the second story could be used as a retail department, while the ground floor below, which could be reached by wagons and trucks, could be used as the wholesale department.

"This elevated sidewalk, even with the second story, is reached from the ground by stairways from every corner (or further apart, perhaps). People coming along the street below, and all who desire, can go up to that second





SPEER'S ENDLESS TRAVELING OR RAILWAY SIDEWALK.

story and get upon the elevated sidewalk, which itself travels along at the rate of ten miles an hour or faster, and never stops. On one side of the street it goes up and the other down. Pedestrians usually walk along at the rate of about four miles an hour, consequently, if one walks thus fast on this sidewalk, he goes four miles an hour faster than the walk goes. That is, he walks four miles and the sidewalk carries him ten or more. If you come across a friend, you do not lose any time in stopping to talk with him, for you are going along all the while with the sidewalk, whether walking, standing or sitting on one of the chairs or settees spread along the edge of the walk."

The sidewalk may be described as a train of low platform cars or a sidewalk in sections, the ends of which meet and form a continuous platform the whole distance, up one side of the street and down the other. This train of platform or sidewalk is to be moved by underground engines, which act upon the walk through any approved mechanism. The platforms are to be provided with awnings to shelter the passengers from sun and rain. The space between the exterior movable walk and the buildings will be some twelve feet, more or less, about one foot of which space, immediately adjoining the movable walk, will be occupied by a stationary plank way, upon which will be laid one of the rails for the use of a transfer seat. The balance of the space may remain open or be closed up with a lattice or glass platform reaching to the buildings at the option of the land owners on any block, thus turning this space into a stationary sidewalk from one corner to the next. On the edge of this fixed way, B, Figs. 2 and 3, is laid a continuous rail. On the inner edge, A, of the movable walk is also laid a corresponding rail, which of course moves at the same speed as the movable walk.

Transfer seats or settees, with four wheels, are placed so that two wheels rest on the fixed rail and two on the movable rail. It is evident that should the wheels on the fixed rail be kept from moving, while the others are left free to rotate, the transfer seats will stand still. When so standing, passengers may step with perfect safety from the fixed platform into the transfer seat. Now, if the wheels on the fixed rail be released, and those on the moving rail be kept from turning, the friction of the moving rail, on the wheels so held, will soon impart an advancing motion to the car or seat equal to that of the moving walk, at which time the passengers may step from the seat to the moving walk as safely as they stepped upon the platform of the seat. The alternate brakeing of the transfer car wheels is accomplished by the brake handles, C, the shoes of the brakes on each side being connected by the chain, D.

This then, is, in brief, the simple arrangement by which Mr. Speer proposes to remove the present disabilities of transit in New York. A conductor, who will also be collector, will be placed upon each transfer car, whose duty it will be to collect the fares of passengers, attend to the brakes, and have the charge of the seat or car.

Suitable arrangements of telegraph wires will inform every engineer on the road in case of an accident that will require the stoppage of the walk; but it will be seen that such a thing as a collision cannot possibly occur, and there can scarcely be a possibility of accidents to passengers.

Although such a gigantic affair, Mr. Speer says the cost will not be one fiftieth that of the underground tunnel nor of the arcade railway proposed, and about both of which so much has already been said and written.

Mr. Speer intends putting up a full sized working section during the coming summer, either in Passaic or New York, and to operate it to demonstrate the simplicity and advantages of his plan.

Mr. Speer claims for his invention that it has many valuable advantages, both to the traveling public and to the owners of property along its route. No person will lose time by standing at street corners waiting the approach of a car or or stage; but he can, at any corner, get on without any delay by means of the transfer chair or settee, one being always in waiting or approaching within a few yards. A passenger loses no time by delays or stoppages, as with cars, to take on or let off new passengers. The getting on and off of persons will be accomplished while the other passengers will be continuously moving at the same rate of speed, unconscious of the stoppage or starting of the transfer seats.

As the walk will be wide and continuous in length, there will be ample room and no crowding for seats or packing up the standing passenger room, as in railway cars. By the outer railing may be the place for those who choose to stand; along the middle may be placed seats for those who choose to sit, and on the inner part, a wide space or passage, kept for those who desire to walk or run.

If adopted on Broadway, the street will be relieved from the omnibuses, and give more room for private carriages and cartage of merchandise. The ground floors could then be used for wholesale purposes, as there will then be room on the street for trucks, thus facilitating the receiving and shipping of goods from the same on a level with the street.

The Crystallization of Metals.

Dr. John Hall Gladstone, F.R.S., recently lectured at the Royal Institution on "The Crystallization of Metals," but he confined his attention chiefly to silver. By the aid of the electric microscope, he showed how crystals of silver vary in shape, when deposited upon slips of copper, from solutions of nitrate of silver varying in strength. He exhibited a piece of silver found in a tomb in the island of Cyprus; the piece of metal was probably 1,500 years old; it contained a little copper and a trace of gold, and had become as crystalline as cast iron. It was not a unique specimen, he said, for dealers in old silver knew that the metal very often became crystalline with age. There was a change in bulk as well as in the structure; the bulk of the silver was one tenth less than at first. This change in bulk of certain metals showed that it was a very serious question of what metals national standards of measurement should be made. Probably pure metals are less liable than others to change of form and volume. In decomposing nitrate of silver with strips of copper, when the strength of the solution is doubled the rapidity of the chemical action is trebled, perhaps in consequence of the increased electrical conductivity of the liquid; polarization alone will not account for it. When a piece of zinc, coated with particles of platinum by chemical decomposition, was placed in pure water, it would go on decomposing the water, and at elevated temperatures would decompose it with considerable rapidity; he proved this by experiment.

Cupro Ammonium.

Take a bottle about half full of ammonia solution, of gravity ·880, immerse some shreds of copper and notice the result. Almost immediately the solution acquires a tinge of blue, which tinge can be referred to the solution of a portion of the copper, the question being, by what is the metal dissolved?

Air, or rather the oxygen of air, is necessary to the result, as may be demonstrated by absolutely filling a bottle with solution of ammonia *plus* the copper shreds, instead of partially filling it, when no solution of the metal will issue.

It will be proper here to remark that, although ammonia will first precipitate hydrated oxide of copper from any ordinary copper salt, and an excess of ammonia will dissolve the oxide, yielding a blue solution, yet the latter is not the cupro ammonium to which our remarks will refer, having none of the properties of that fluid save identity of color.

Although the incidence of chemical action is made evident to the eye at once, yet the maximum degree of chemical action will only be arrived at after the lapse of about six weeks, and not even then except care has been taken to remove the stopper of the bottle, from time to time shaking the contents —still better, pouring the contents from one bottle to another —the general result arrived at being to give air. In practice on the large scale, the same result is more speedily attained by means of an air force pump. After the lapse of the requisite time, the solution will be found to have acquired a a deep blue color and also certain very curious properties, amongst others that of dissolving a number of things usually regarded as insoluble. For example, cupro ammonium so rapidly dissolves silk that, when in good condition, a yard length of white Persian or sarsanet, if plunged into the solvent, disappears as readily as a lump of sugar in a tumbler of hot water. Lignin or cellulose dissolves also with great facility, but with a facility not quite equal to silk. Of all forms of lignin, perhaps, white blotting paper dissolves most readily, but there is no form or variety of lignin which it will not dissolve under the condition of adequate time.

Taking advantage of this solvent property of the agent, a curious series of operations becomes possible. Paper, linen, wood, any sorts or varieties of lignin may easily be agglutinized together, without the intervention of any other cement than its own substance brought to the state of solution by cupro ammonium. A curious fact, too, is that, when surfaces of paper or other ligneous material have been thus agglutinated, the copper which they hold may be extracted by a weak acid, leaving the paper or other lignin pure and white, but not in any way interfering with the adhesion of one layer of lignin material to another.

The chemical inquirer need not be told that the designation cupro ammonium is only empirical. What the exact formularization of the substance may be, the name does not express and is not intended to express. That the copper exists in a peculiar electro-chemical state not participated by ordinary copper salts is well demonstrated by difference of the action of the two on iron. For example, whereas sulphate of copper (blue vitriol), if dissolved and iron immersed in the solution, deposits copper on the iron at expense of iron dissolved, the cupro ammonium does nothing of the sort, but actually guards the very brightest of iron and steel against all chemical action so long as immersion is continued. This reminds us of a reply to a naval surgeon who has sent us a letter in which he asks whether cupro ammonium would protect his instruments against rust, to which they are subject between decks. The answer is yes, cupro ammonium will infallibly do that; but, we are sorry to say, it will also dissolve all such parts of surgical instruments (*e.g.*, knife handles) as have ivory, wood, or bone entering into their composition.—*Engineer.*

Electricity at Niagara Falls.

Professor S. H. Lockett relates the following observation in a letter from Niagara Falls: "While crossing the new suspension bridge I had occasion, while conversing with a friend, to point towards the falls with my walking cane; as I did so I heard distinctly at the end of my cane a buzzing noise. Repeating the experiment, the same noise was heard. I stopped several passers and tried their canes with the same result; except in the case of one which lacked a ferule. I immediately supposed this might be an electrical phenomenon, and set to work to test the correctness of this supposition. I took a key and held it at arm's length toward the falls, and heard the same sound. Finally, at dark, I returned to the bridge, and, pointing my cane, had the satisfaction of seeing a clear beautiful electric brush on its end. The best point to observe this interesting phenomenon is in the middle of the bridge, and the cane must be held at arm's length, so that its end may be at some distance from any part of the bridge. The success of the experiment depends a good deal on the direction of the wind, and the amount of vapor blown over the bridge."

Muck.

The term *muck*, as used by farmers and agricultural writers, has a somewhat ambiguous meaning. It is often applied to cow dung and stable manure; but usually the term is employed to designate the black, unctuous deposits found in meadows and low basins, and upon the margins of ponds. As these deposits differ most essentially in composition, the significancy of the word is not well defined. To obviate the confusion or perplexity which exists, we think there should be a distinction made between *peat* and other low land deposits, and they should have different names. Peat is the proper term to apply to the vegetable matter found in meadows in different stages of decay, and which is unlike the heavy, dark deposits, consisting of sand, clay, and vegetable *débris*, found in slough holes, ponds, etc. The difference between peat and this wash is very great, and the advantage in maintaining a distinction is obvious, as farmers will be better able to understand what deposits have some value and what have none. Peat, or pure vegetable deposits, may under some circumstances be worthy of attention, but wash or *mud* seldom is.

During the present winter we have observed, in our rides and walks in the country, farmers busily engaged in removing the heavy deposits from ponds left dry from the absence of rains. This labor, from the worthless character of the substance sought, was wholly unremunerative. An examination of one of these deposits in process of removal showed that sand and clay formed nearly fifty per cent of the bulk of the material; water and a small amount of partially decomposed leaves and rushes made up the remainder. The black fragments of vegetable material gave to the mass a dark appearance, and hence it was supposed to have manurial value. Most fields would be positively injured by applying to them this heavy silt or mud, and the loss of time and labor to the farmer in removing it was a serious one. Before carting away such deposits, he should have taken a handful of the mixture and thoroughly diffused it in a quart of clear water. The sand and clay fall to the bottom of the vessel, and the lighter particles of vegetable material settle above; and by decanting or turning off the water after standing a few hours, a clear idea of the nature of the muck could have been obtained.

We are certain that the value of peat or muck, as a source of plant food, has been greatly exaggerated. From a considerable number of analyses of peat, taken from different localities, we will select two made the present winter, as fairly representing both extremes, one a very good, the other a very poor article. The first and best gave of—

Water	84·95
Ash	4·83
Organic matter	10·22
	100·00

The second gave of—

Water	63·73
Ash	28·56
Organic matter	7·71
	100·00

A tun of the first specimen held seventeen hundred pounds of water, the second, twelve hundred pounds. The best contained about two hundred pounds of vegetable matter, the worst one hundred and sixty. What fertilizing value the specimens possessed is to be found in the ash and organic matter. The ash of the first was composed of sand, sulphate and carbonate of lime, oxide of iron, with traces of magnesia and soda; the second was largely made up of clay and sand with small quantities of lime. These mineral constituents are insignificant in value, although, in one of the specimens, large in amount. It may be said that the ash constituents of the last specimen are, practically, of little account, and the first holds but traces of the costly materials of plant food.—*Boston Journal of Chemistry.*

A MOST EXCELLENT DOMESTIC CONFECTION.—This is the season for oranges. The peel of this fruit, preserved in sugar, is one of the most delightful confections which a family can use, far superior to the extracts sold in the shops. The peel should of course be perfectly clean, and should be cut in long thin strips. Stew in water till all the bitterness is extracted. Throw away the water and stew again for half an hour in a thick sirup made of a pound of sugar to one of peel, with just water enough. Put away, in a cool place, for flavoring puddings, pies, etc. For this purpose, it should be chopped very fine. No better or cheaper flavoring can be furnished to a household.

THE thirteen new Woolwich infants, guns of 35 tuns, now completed, are the most powerful pieces of ordnance in existence in England or any other country. The guns are specially intended for the navy, and are to be first used in the three large ironclads now in course of completion. Two of these ships, the *Thunderer* and the *Devastation*, are of 4,400 tuns burden, and the other, the *Fury*, is of 5,000 tuns. Each of these vessels will be provided with four of the 35 tun guns, which they will carry in two turrets, two guns being placed in each turret side by side.

ETHER GLUE.—An excellent liquid glue is made by dissolving glue in nitric ether. The ether will only dissolve a certain amount of glue, consequently the solution cannot be made too thick. The glue thus made is about the consistency of molasses, and is doubly as tenacious as that made with hot water. If a few bits of india rubber, cut into scraps the size of buck shot, be added, and the solution be allowed to stand a few days, being stirred frequently, it will be all the better, and will resist the dampness twice as well as glue made with water.

THE ELECTRO-MAGNETIC TELEGRAPH.

The two following extracts, from well known scientific journals, give a very concise history of the development of the electro-magnetic telegraph, and require no note or comment:

Extract from the *Edinburgh Philosophical Journal* for 1825, Vol. XII, page 105: On the laws of electro-magnetic action as depending on the length and dimensions of the conducting wire. By Peter Barlow, F. R. S. (Published January 1, 1825.)

"In a very early stage of electro-magnetic experiments, it had been suggested that an instantaneous telegraph might be established by means of conducting wires and compasses. The details of this contrivance are so obvious, and the principles on which it is founded so well understood, that there was only one question which could render the result doubtful, and this was: Is there any diminution of effect by lengthening the conducting wire?

It had been said that the electric fluid, from a common electrical battery, had been transmitted through a wire four miles in length, without any sensible diminution of effect, and, to every appearance, instantaneously; and if this should be found to be the case with the galvanic circuit, then no question could be entertained of the practicability and utility of the suggestion above adverted to. I was, therefore, induced to make the trial, but I found such a considerable diminution with only 200 feet of wire as at once to convince me of the impracticability of the scheme."

Extract from Silliman's *American Journal of Science and Arts*, for 1831, Vol. XIX. pages 400—404: On the application of the principle of the galvanic multiplier to electro-magnetic apparatus, and also to the development of great magnetic power in soft iron, with a small galvanic element. By Professor Joseph Henry.

* * * * "The idea afterwards occurred to me that a sufficient quantity of galvanism was furnished, by the two small plates, to develop, by means of the coil, a much greater magnetic power in a larger piece of iron. * * * At the same time, a very material improvement in the formation of the coil suggested itself to me on reading a more detailed account of Professor Schweiger's galvanometer, and which was also tested with complete success upon the same horse shoe; it consisted in using several strands of wire, each covered with silk, instead of one. * * * With a pair of plates four inches by six, it lifted thirty-nine pounds, or more than fifty times its own weight.

These experiments conclusively proved that a great development of magnetism could be effected by a very small galvanic element, and also that the power of the coil was materially increased by multiplying the number of wires, without increasing the length of each.

The multiplication of the wires increases the power in two ways: first, by conducting a greater quantity of galvanism, and secondly, by giving it a more proper direction, for since the action of a galvanic current is directly at right angles to the axis of a magnetic needle, by using several shorter wires we can wind one on each inch of the length of the bar to be magnetized, so that the magnetism of each inch will be developed by a separate wire; in this way the action of each particular coil becomes very nearly at right angles to the axis of the bar, and consequently, the effect is the greatest possible. * * *

In order to determine to what extent the coil could be applied in developing magnetism in soft iron, and also to ascertain, if possible, the most proper length of the wires to be used, a series of experiments was instituted jointly by Dr. Philip Ten Eyck and myself. For this purpose, 1,060 feet (a little more than one fifth of a mile) of copper wire of the kind called bell-wire, ·045 ($\frac{45}{1000}$) of an inch in diameter, were stretched several times across the large room of the Academy. * * * *

In one experiment, the whole length of wire was attached to a small trough on Mr. Cruickshank's plan, containing twenty-five double plates, and presenting exactly the same extent of zinc surface to the action of the acid as the battery used in the last experiment. The weight lifted in this case was eight ounces; when the intervening wire was removed and the trough attached directly to the ends of the wires surrounding the horse shoe, it lifted only seven ounces. From this experiment, it appears that the current from a galvanic trough is capable of producing greater magnetic effect on soft iron, after traversing more than one fifth of a mile of intervening wire, than when it passes only through the wire surrounding the magnet. It is possible that the different states of the trough, with respect to dryness, may have exerted some influence on this remarkable result; but that the effect of a current from a trough, if not increased, is but slightly diminished in passing through a long wire is certain.

On a little consideration, however, the above result does not appear as extraordinary as at the first sight, since a current from a trough possesses more projectile force, to use Professor Hare's expression, and approximates somewhat in intensity to the electricity from the common machine. May it not also be a fact that the galvanic fluid, in order to produce the greatest magnetic effect, should move with a small velocity, and that, in passing through one fifth of a mile, its velocity is so retarded as to produce a greater magnetic action?

But be this as it may, the fact, that the magnetic action of a current from a trough is, at least, not sensibly diminished by passing through a long wire, is directly applicable to Mr. Barlow's project of forming an electro-magnetic telegraph, and also of material consequence in the construction of the galvanic coil."

Photo-engraving on Metals.

William A. McGill and Robert G. Pine, of Memphis, Tenn., have invented a new process for photographic engraving on metals and other substances, which they describe as follows:

"We take, as a base of operation, a pure silver surface or an alloy; and, after finely polishing or frosting it, it is subjected to the action of iodine, and a film of the iodide of silver is formed on the plate. We then expose the plate to the action of light in the *camera obscura*, or under a photographic negative, until a faint image of the object is formed. The plate is then submitted to the action of an electrotype battery (copper solution), when a well defined image of the object in copper is formed, the cupreous deposit attaching itself only to those parts of the plate which were rendered conductors of electricity by the action of light, while the unexposed parts will remain non-conductors of electricity. The plate is now dried and etching solution poured on it, composed of sulphuric acid saturated with nitrate of potash, or their equivalents. This solution immediately attacks the shadows or exposed portions of silver surface, while the cupreous deposit from the electrotype bath is not affected. After etching the required depth, the copper deposit on the plate may be readily removed by *aqua regia*, which will not act on the silver plate, leaving a finely etched image in the silver plate.

To engrave or etch on steel, gold, copper, and other substances, the surfaces are first coated with pure silver. We then proceed substantially as above explained, with the exception that different acids or combinations of acids are used on the various metals or other substances after the silver plating or surface is etched through, according to the nature of the base to be operated upon; for instance, in etching on gold, after the silver is etched through with the saturated solution of sulphuric acid and nitrate of potash, we use *aqua regia* or nitro-muriatic acid, which acts on the gold, but leaves the silver intact.

The invention is specially applicable to the ornamentation of silver plate and jewelry."

Recurrent Vision.

In the course of some experiments with a new double plate Holtz machine, belonging to the college, I have come upon a very curious phenomenon, which I do not remember ever to have seen noticed. The machine gives easily intense Leyden jar sparks, from seven to nine inches in length and of most dazzling brilliance. When, in a darkened room, the eye is screened from the direct light of the spark, the illumination produced is sufficient to render everything in the apartment perfectly visible; and what is remarkable, every conspicuous object is seen twice at least, with an interval of a trifle less than one quarter of a second—the first time vividly, the second time faintly; often it is seen a third and sometimes, but only with great difficulty, even a fourth time. The appearance is precisely as if the object had been suddenly illuminated by a light at first bright, but rapidly fading to extinction, and as if, while the illumination lasted, the observer were winking as fast as possible.

I see it best by setting up, in front of the machine at a distance of eight or ten feet, a white screen having upon it a black cross, with arms about three feet long and one foot wide, made of strips of cambric. That the phenomenon is really subjective, and not due to a succession of sparks, is easily shown by swinging the screen from side to side. The black cross, at all the periods of visibility, occupies the same place, and is apparently stationary. The same is true of a stroboscopic disk in rapid revolution; it is seen several times by each spark, but each time in the same position. There is no apparent multiplication of a moving object of any sort.

The interval between the successive instants of visibility was measured roughly as follows: A tuning fork, making 92½ vibrations per second, was adjusted so as to record its motion upon the smoked surface of a revolving cylinder, and an electromagnet was so arranged as to record any motion of its armature upon the trace of the fork; a key connected with this magnet was in the hands of the observer. An assistant turned the machine slowly, so as to produce a spark once in two or three seconds, while the observer manipulated the key.

In my own case, the mean of a dozen experiments gave 0″·22 as the interval between the first and second seeing of the cross upon the screen, separates results varying from 0″·17 to 0″·39. Another observer found 0″·24 as the result of a similar series.

Whatever the true explanation may turn out to be, the phenomenon at least suggests the idea of a reflection of the the nervous impulse at the nerve extremities, as if the intense impression upon the retina, after being the first time propagated to the brain, was there reflected, returned to the retina, and from the retina, traveling again to the brain, renewed the sensation. I have ventured to call the phenomenon "recurrent vision."—*Professor C. A. Young, in the American Journal of Science.*

Poisoned Collars.

Some of the brands of paper collars are glazed with a mixture containing white lead, which is a dangerous poison when brought into contact with the skin. An exchange mentions the case of a clergyman who became troubled with numbness of the limbs, which, with other symptoms, led his physician to suspect poison. On combustion of the paper collars worn by the clergyman—the "Dickens" brand—the ash was found to contain white lead.

THE tunnel under the city of Genoa, connecting the other railways with that going to Nice, is to be opened during the present month.

IMPORTANT TRADE MARK DECISION.

Before the Supreme Court of the United States.

The President, Managers, and Company of the Delaware and Hudson Canal Company, appellants, *versus* Henry C. Clark. Appeal from the Circuit Court of the United States for the Southern District of New York.

The complainants commenced mining on their lands in Lackawanna valley about the year 1828, and they have ever since been engaged in taking out coal and carrying it to the Hudson river and to the markets of the country. The averment of their bill is that about the time they commenced their operations they sought out, devised, and adopted the name "Lackawanna coal" as a special, particular, and distinctive name or trade mark by which their coal might be introduced to dealers as the product of their mines in distinction from the coal of other producers, and that prior to their adoption of the word "Lackawanna" it had never been adopted or used in combination with the word "coal" as a name or trade mark for any kind of coal. Their bill also avers that ever since their adoption of the name their coal has been called and known in the market as "Lackawanna coal" and by no other name. These averments of the bill are supported by no inconsiderable evidence. The complainants were undoubtedly, if not the first, among the first producers of coal from the Lackawanna valley, and the coal sent to market by them has been generally known and designated as Lackawanna coal. Whether the name "Lackawanna coal" was devised or adopted by them as a trade mark before it came into common use is not so clearly established. On the contrary, the evidence shows that long before the complainants commenced their operations, and long before they had any existence as a corporation, the region of country in which their mines were situated was called "the Lackawanna valley;" that it is a region of large dimensions, extending along the Lackawanna river to its junction with the Susquehanna, embracing within its limits great bodies of coal lands, upon a portion of which are the mines of the complainants, and upon other portions of which are the mines of the Pennsylvania Coal Company, those of the Delaware, Lackawanna, and Western Railroad Company, and those of other smaller operators. The word "Lackawanna," then, was not devised by the complainants. They found it a settled and known appellative of the district in which their coal deposits and those of others were situated. At the time when they began to use it, it was a recognized description of the region, and of course of the earths and minerals in the region.

It may be observed there is no averment that the other coal of the Lackawanna valley differs at all in character or quality from that mined on the complainants' lands. On the contrary, the bill alleges that it cannot easily be distinguished therefrom by inspection. The bill is therefore an attempt to secure to the complainants the exclusive use of the name "Lackawanna coal," as applied, not to any manufacture of theirs, but to that portion of the coal of the Lackawanna valley which they mine and send to market, differing neither in nature or quality from all other coal of the same region.

Undoubtedly words or devices may be adopted as trade marks which are not original inventions of him who adopts them, and courts of equity will protect him against any fraudulent appropriation or imitation of them by others. Property in a trade mark, or rather in the use of a trade mark or name, has very little analogy to that which exists in copyrights or in patents for inventions. Words in common use, with some exceptions, may be adopted if at the time of their adoption they were not employed to designate the same or like articles of production. The office of a trade mark is to point out distinctively the origin or ownership of the article to which it is affixed, or, in other words, to give notice who was the producer. This may in many cases be done by a name, a mark, or a device well known, but not previously applied to the same article.

But though it is not necessary that the word adopted as a trade name should be a new creation, never before known or used, there are some limits to the right of selection. This will be manifest when it is considered that, in all cases where rights to the exclusive use of a trade mark are invaded, it is invariably held that the essence of the wrong consists in the sale of the goods of one manufacturer or vendor as those of another, and that it is only when this false representation is directly or indirectly made that the party who appeals to a court of equity can have relief. This is the doctrine of all the authorities.

No one can apply the name of a district or country to a well known article of commerce, and obtain thereby such an exclusive right to the application as to prevent others inhabiting the district, or dealing in similar articles coming from the district, from truthfully using the same designation. It is only when the adoption or imitation of what is claimed to be a trade mark amounts to a false representation, express or implied, designed or incidental, that there is any title to relief against it.

These principles, founded alike on reason and authority, are decisive of the present case, and they relieve us from the consideration of much that was pressed upon us in the argument. The defendant has advertised for sale and he is selling coal not obtained from the plaintiffs, not mined or brought to market by them, but coal which he purchased from the Pennsylvania Coal Company, or from the Delaware, Lackawanna and Western Railroad Company. He has advertised and sold it as Lackawanna coal. It is in fact coal from the Lackawanna region. It is of the same quality and of the same general appearance as that mined by the complainants. It is taken from the same veins or strata. It is truly described by the term Lackawanna coal, as is the coal of plaintiffs. The description does not point to its origin or ownership, nor indicate in the slightest degree who mined the coal or brought it to market. All the coal taken from that region is known and has been known for years by the trade, and rated in public statistics, as Lackawanna coal.

We are, therefore, of opinion that the defendant has invaded no right to which the plaintiffs can maintain a claim. By advertising and selling coal brought from the Lackawanna valley as Lackawanna coal he has made no false representation, and we see no evidence that he has attempted to sell his coal as and for the coal of the plaintiffs. If the public are led into mistake it is by the truth, not by any false pretence. If the complainants' sales are diminished it is because they are not the only producers of Lackawanna coal, and not because of any fraud of the defendant. The decree of the circuit court dismissing the bill must, therefore, be affirmed.

THE electric light has been introduced into the lighthouse at the South Foreland. This is now the third lighthouse station in England at which the electric light is established, and the French have established one at Cape Grisnez.

PROFESSOR MORSE.

Our engraving is an excellent portrait of the late Professor Morse, of telegraphic fame. Once in a while, for the gratification of his friends, he would produce the various decorative honors that were bestowed upon him by the crowned heads of Europe, and some of these are represented in our picture.

All the principal nations of Europe gave him tokens of distinction. So early as 1848 the Sultan presented him a decoration set in diamonds. Gold medals were awarded him by Prussia, Austria and Würtemberg. France made him a Chevalier of the Legion of Honor. Denmark gave him the cross of Knight of the Danneborg; Spain, the cross of Knight Commander of the Order of Isabella the Catholic. At the instance of the Emperor of the French, representatives of the European States—France, Russia, Sweden, Belgium, Holland, Austria, Sardinia, Tuscany, the Holy See, and Turkey—met at Paris to decide upon a collective testimonial to him, and the result of their deliberations was a vote of 400,000 francs. Scores of learned societies, all over the world, admitted him to membership. In 1856, the telegraph companies of Great Britain gave him a banquet in London. In 1858, the American Colony in France entertained him at a grand dinner in Paris. On the 29th of December, 1868, the citizens of New York gave him a dinner at Delmonico's. In June, 1871, a bronze statue of Professor Morse, erected in the Central Park by the voluntary contributions of telegraph employés throughout the country, was formally unvailed, with an address by William Cullen Bryant; and in the evening a reception was held at the Academy of Music, where one of the first instruments used on the original line between New York and Washington was placed upon the stage and connected with the wires, that Professor Morse might send, with his own hand, a word of greeting to all the cities of the United States and Canada.

Stenographic Machine.

The *Chronique de l'Industrie* gives an account of a new machine for printing speeches, lectures, and sermons during their delivery, in place of the more tiresome and less exact method of manual stenography. The apparatus is described as containing a series of keyboards similar to a piano, each key representing a letter or character to be printed, and connecting with a corresponding type. Whenever a key is depressed, its type will be pressed against a travelling strip of paper to impress its image thereon. The operator, using both hands like a pianist, can depress several keys at once, thus forming whole syllables and words at single motions of the hand. It is stated that a few months' practice will enable a person to follow a speaker without difficulty and to reproduce an immediate and perfect print of the speech with all words properly spelt. The delay of rewriting, always necessary where short hand writing is employed, is thus avoided. M. Gensoul is named as the inventor.

The machine above described is of American origin, and examples of it are or were recently in operation at the Automatic Telegraph Company's offices, 66 Broadway, New York. By its use, words may be printed nearly as fast as they can ordinarily be written, but by no means as rapidly as the utterances of a speaker. To accomplish the latter purpose, the words must be abridged into signs, capable of execution by slight movement of the fingers. Any extensive movement of the fingers or hands, such as key playing, would be fatal to stenography, and the use of the above machine, for such a purpose, we therefore consider to be impracticable.

SCIENTIFIC AND PRACTICAL INFORMATION.

FIREPROOF BUILDINGS.

An English architect proposes the building of floors of sheet iron and fire clay tubes, using these as a skeleton construction, and agglomerating the whole into a mass with concrete. This floor, he claims, is a non-conductor of heat and is entirely fireproof, and the hollow tubes can be employed for ventilation or for distributing the heat of a furnace, all over the floor of each room. Experiments on the strength of this flooring are said to have given satisfactory results.

DEXTRIN.

The *Polytechnisches Journal* recommends the preparation of dextrin by mixing 500 parts potato starch, 1,500 parts cold distilled water, and 8 parts pure oxalic acid in a vessel on a water bath, and heating till the mixture does not show the starch reaction when tested with iodine. When this point is reached, the vessel is removed from the water bath, and the liquid neutralized with pure carbonate of lime. Having stood for two days, the liquid should be filtered, and the filtrate evaporated on a water bath till it becomes of a pasty consistency. It can then be removed with a knife and dried into a cake in a warm place. Two hundred and twenty parts of pure dextrin are thus obtained.

STEEL HEADED RAILS.

The steel headed rails have been found, on trial by the engineer of the Reading railroad, Pa., to separate at the welds to an extent of 25 per cent of the rails laid down. It may be predicted that the use of the compound article is likely to be discontinued, especially as the price of steel has been brought so near to that of iron.

Ramie.

At the Exhibition of the Mechanics' Institute in San Francisco last year, the Pacific Ramie Company exhibited a single plant of this new textile. Like all the nettle family, to which it belongs, it makes a very vigorous growth in California soils.

From experiences with the plants now in growth, producers can count on two crops a year, making one tun of clear raw fiber to the acre, worth $350 in England. The plant is perennial and is propagated from roots, one planting lasting for years.

After the first year, the cost of cultivation is small, for the vigorous plant outgrows all weeds—from twenty-five to one hundred stalks springing up from a single root. The bark yields the fiber, which is of great strength, and from which a fine and durable quality of drsss goods, usually interwoven with wool or silk, are manufactured. It takes a permanent dye.

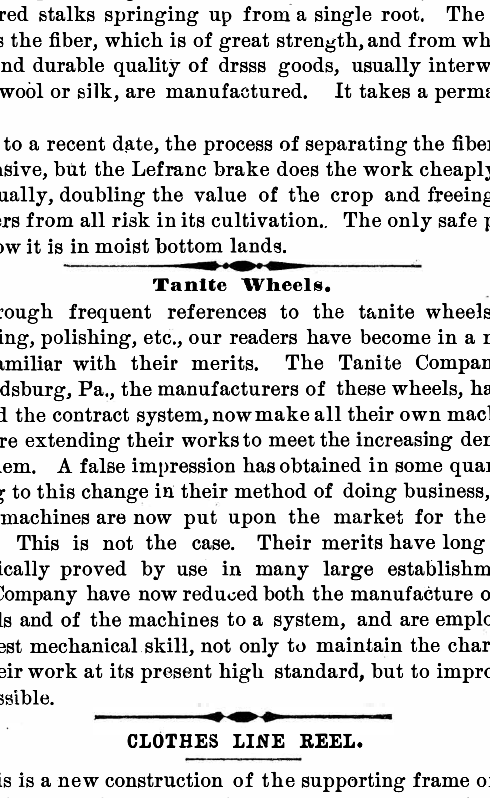
Up to a recent date, the process of separating the fiber was expensive, but the Lefranc brake does the work cheaply and effectually, doubling the value of the crop and freeing our farmers from all risk in its cultivation. The only safe place to grow it is in moist bottom lands.

Tanite Wheels.

Through frequent references to the tanite wheels, for grinding, polishing, etc., our readers have become in a measure familiar with their merits. The Tanite Company, of Stroudsburg, Pa., the manufacturers of these wheels, having ceased the contract system, now make all their own machines and are extending their works to meet the increasing demand for them. A false impression has obtained in some quarters, owing to this change in their method of doing business, that their machines are now put upon the market for the first time. This is not the case. Their merits have long been practically proved by use in many large establishments. The Company have now reduced both the manufacture of the wheels and of the machines to a system, and are employing the best mechanical skill, not only to maintain the character of their work at its present high standard, but to improve it if possible.

CLOTHES LINE REEL.

This is a new construction of the supporting frame of the reel, the frame having attached at one of its ends a dovetail tenon, A, for the purpose of connecting it to a corresponding dovetail mortise made on or attached to the post or building. The opposite end of the frame is provided with a guide, B, for the line as it passes on to or off from the reel. With the reel and frame are combined a friction plate to arrest the motion of the reel, so that, when the line is being drawn out, sufficient resistance will be offered to prevent any portion of it from dragging on the ground and thus becoming soiled. In ordinary reels, this precaution has been overlooked, and it is difficult to draw out the line without having it sag so as to touch the ground.



This invention was patented Nov. 21, 1871, by Mr. Charles H. Staffin, of Boston, Mass.

[For the Scientific American.]

FRICTIONAL GEARING.

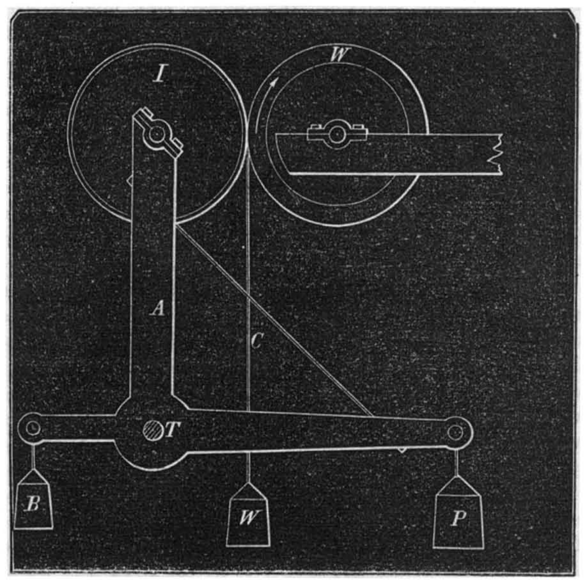
BY E. S. WICKLIN.

NUMBER III.

In the practice of mechanics, we are generally satisfied with an old and familiar principle, without giving ourselves any great trouble to inquire into the comparative degree of its efficiency. But this does not satisfy the requirements of science; nor is it sufficient for the practical mechanic when applied to principles less familiar.

When new modes are introduced as rivals of the old, the question of comparative efficiency is at once raised, and should be met by crucial experiment. But unfortunately for both science and practice, these questions are not generally so met. Too few experiments are made, and those without sufficient care and accuracy to establish principles or remove doubts. No experiment is, however, without some degree of interest, and when all the conditions of a test are known it is not difficult to estimate approximately the value of results. With this view, the conditions and results of a few experiments, made to test the tractive power of smooth-faced friction pulleys, are here given. These experiments, when made, were not meant for publication or for the benefit of science, but to establish rules for private practice. They should be repeated by others before being taken as conclusive.

For the experiments, two pulleys were made in the usual way, one being of wood—soft maple—and the other of iron. Both were accurately and smoothly finished. These pulleys were each seventeen inches in diameter and of six inches face, and were put up as shown in the annexed diagram.



A, in the diagram, is a double bell crank frame, with arms two feet long. The ends of the upright arms receive the bearings for the iron pulley, I. The journals of this pulley are one and a half inches in diameter and three inches long, and run in Babbitt boxes. The frame is hung upon journals or trunnions, *t*, and balanced by the weight, B. W and P are strong packing boxes, which are filled with scrap iron to the extent required. The face of the pulley, I, is extended beyond the six inches to receive the cord, C, for which purpose a shallow groove is cut in the pulley so as to bring the center of the cord just to the periphery. The driving pulley, W, is put upon a shaft where it may be made to revolve slowly in the direction of the arrow.

It will be seen that the weight in the box, P, upon the horizontal arm will bring the pulleys together with a pressure just equal to the weight. The wooden pulley being in motion, the pressure, when sufficient, will roll the other pulley and raise the weight, W.

The manner of experimenting was to put a given weight upon the cord, C, and, while the driving pulley was moving, to load the box, P, until the weight, W, was carried up. The machinery was then stopped, when the weight would slowly descend, slipping the iron pulley backwards upon the wood. The weight in the pressure box was now noted; the weight was again raised, and the pressure increased sufficiently to hold the weight from slipping down, and the pressure again noted.

In the following table, the figures on the left show the weights raised. The second column gives the pressure just sufficient to bring the weight up; and the third column shows the weight necessary to raise and hold the weight, without slip.

After these experiments were made and twice repeated with the pulleys, the frame, A, was reversed, so that the weight in the pressure box would tend to separate the pulleys. They were then connected by a six inch leather belt, and the experiments repeated with the results given in the fourth and fifth columns of figures.

FRICTION PULLEYS.			BELTED PULLEYS.	
Weight raised	Pressure required to just raise the weight.	Pressure required to raise the weight without slip.	Pressure required to raise the weight.	Pressure required to raise the weight without slip.
Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
10	29	33	30	34
20	58	65	60	69
30	87	96	91	120
40	115	125	121	159
50	143	154	153	199
60	171	185	183	242
70	199	214	213	247
80	225	244	239	332
90	264	289	278	375
100	295	312	310	419
120	354	387	372	487
140	416	433	442	563
160	477	499	524	652
180	538	561	592	731

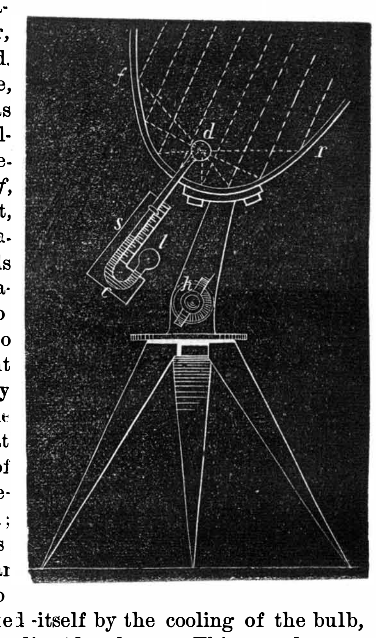
It will be seen that, in this test, the traction of the friction wheels was greater than that of the belted pulleys, and considerably more than is usually supposed to be obtained from belts upon pulleys of either wood or iron; and that, while there is a marked falling off in the adhesion of the belt as the work increases, that of the friction increases as the labor becomes greater. Also, that the difference in the pressure required to just do the work, and that necessary to do it without loss or slip, advances in an increasing ratio with the work of the belt; but in the friction it is almost constant throughout the whole range of experiments. The figures applied to the friction wheels are the mean results of repeated experiments; those applied to the belted pulleys are each of a single test. It is not thought that these experiments were sufficient to fully establish all that the figures show; but they were enough to prove that smooth faced wheels possess a much higher tractive power than has been generally supposed. They are given without further deduction or comment.

And now a word as to some of the advantages of friction gearing. Being always arranged with a movable shaft, so that the wheels may be thrown together or apart with the greatest ease, the machine driven by it is started and stopped at any moment while the driving wheel remains in motion. And when stopped, the separation is complete, and may so remain for any number of minutes or months without attention, and may be again started at any moment without the least inconvenience or injury. So slight is the separation required that it is done almost without an effort. And by it, we entirely dispense with the nuisance of loose pulleys, belt shifters, and idle running belts; and with the risk of throwing off and putting on belts. It obviates the delay and labor of shipping and unshipping pinions, and the rattle and bang and frequent breaking of clutches. It is durable, and requires no repairs; it is compact, and economizes room. It does not increase the pressure on journals when the speed is quickened, as is the case with belts running with great velocity, but remains constant at all speeds. And it will transmit any amount of power, from a hundredth part of a horse power to one hundred horse power, with no greater per centage of loss, and with less pressure on journals than can be done by belts.

It is not contended that this style of gearing should supersede the belt. There are hundreds of situations in which nothing can take the place of belts. The ease with which they can be carried in almost in any direction, and to any reasonable distance, will perhaps always place them foremost as a means of transmitting power. But where several machines, that must be run independently of each other and be stopped and started without interference, are driven by the same motor, one connection, at least, should be frictional; and that, if practicable, should be the connection nearest the motor. Where the motions are slow and the occasions for stopping few, this is of less importance; but where the speed is considerable, and the stoppages are frequent, it will be found a very great convenience.

MEASURING THE CLEARNESS OF THE SKY.

John Leslie invented, in the beginning of this century, an apparatus intended to measure the amount of clearness of the sky, and he called it therefore an aethrioscope. It consisted of a differential thermometer, *d t*, which operated as usual by the difference of expansion of the air in two glass globes, thus moving the liquid column, *c*, in the tube connecting them; and this motion is observed on the scale, *s*. One of the globes, *d*, of this thermometer is placed in the focus of a parabolic reflector, *r f*; the other globe, *t*, outside the reflector, has a silvered surface and is highly polished. By those means, Leslie expected to withdraw the globe, *d*, totally from terrestrial radiation, which keeps the globe, *t*, at the constant temperature of the surrounding bodies; and, as he had found that clouds reflect heat and radiate heat, he anticipated that the descent of temperature of the globe, *d*, and the consequent rise of the liquid column on the scale, *s*, would be a direct measure of the clearness of the atmosphere. His anticipations were, however, only partially fulfilled. He found, for instance, that when the sky was cloudy, the liquid column did not move, whether the reflector, *r f*, was covered or not, proving that the radiation from the clouds counterbalanced the radiation of the mirror towards them; but he also found that the amount of cloudiness had very little influence on the instrument, and that even a total absence of clouds showed sometimes little radiation; while at other times with an equally clear sky, very powerful upward radiation manifested itself by the cooling of the bulb, *d*, and the rise of the liquid column. This utterly perplexed him, and he publicly expressed his inability to interpret the indications of his instrument, which, he said, "sometimes under a fine blue sky will indicate a cold of 50°, while, on other days when the sky is equally bright, the effect is scarcely 30°." The instrument was thus useless, for more than half a century; but recently, by investigation concern



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 tun 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.

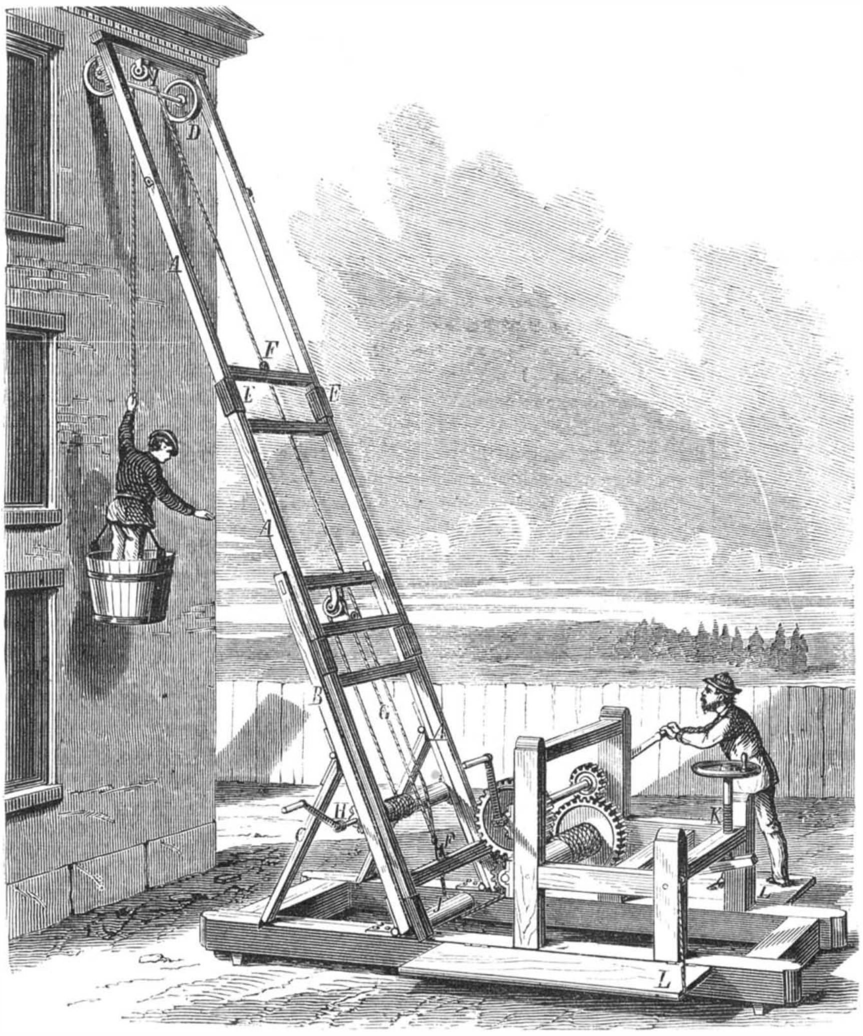
Our engraving illustrates a fireman's and builder's elevator, which can either be placed upon the ground, as shown, or attached to a truck to be drawn about by horses, and by which an elevation of any hight can be easily, rapidly, and safely attained.

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.

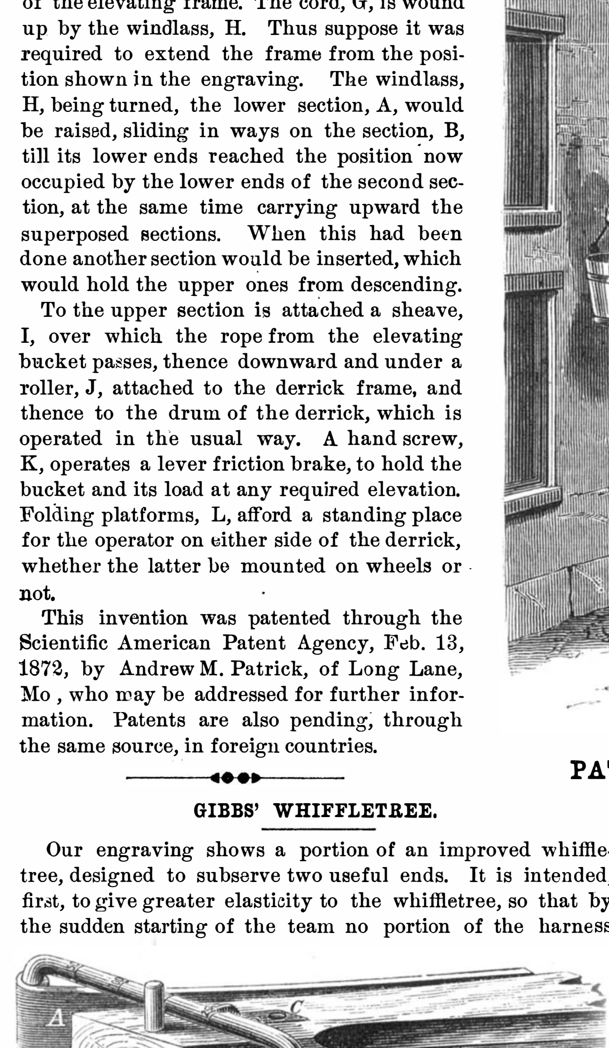
This invention was patented through the Scientific American Patent Agency, Feb. 13, 1872, by Andrew M. Patrick, of Long Lane, Mo, who may be addressed for further information. Patents are also pending, through the same source, in foreign countries.



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.

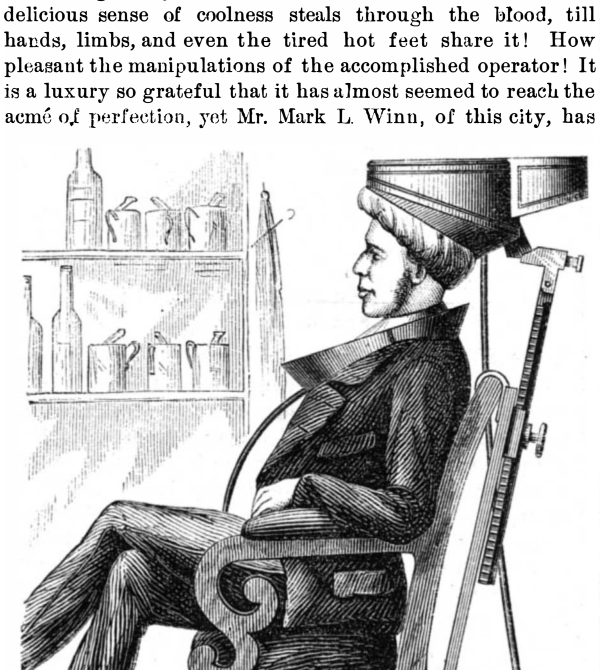
The Dandelion or Taraxacum.

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.

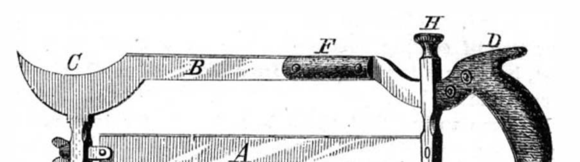
The arrangement of parts is such that any of these appliances may be attached or detached at will, as the circumstances of the case require. Thus, totally bald headed individuals will not require the dryer, which, of course, will not be used in their case. Young ladies (all ladies are young, we believe) 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.

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.

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.

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.

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Contents:

(Illustrated articles are marked with an asterisk.)

DRYING BY THE DIRECT APPLICATION OF HEAT-DISTILLATION.

The drying of substances by the direct action of heat, the separation of solid substances from the water they contain, and the separation of fluids by virtue of the different temperatures at which they are converted into vapor, comprise some of the most important operations in the industrial arts. The manufacture of alcohol, turpentine, the separation of petroleum oils, and many chemical processes depend more or less upon the principle of distillation.

Solid substances that are uninjured by the action of heat may have their moisture expelled by heating them directly, or without the intervention of conveyers of heat like air or steam. The heat required in this process is, in surface drying and exclusive of waste, just that required to convert the adhering fluid into vapor. In distillation, unless the apparatus be properly constructed, a very large portion of the heat employed will be wasted. This may be illustrated by the attempt to distil off water from a long necked glass flask, the heat being applied at the bottom. The water will be converted into steam and, rising, will condense in the neck of the flask and trickle down the sides, only a small percentage of the steam passing out from the mouth of the flask.

Now if in trickling down the sides, the fluid should arrive at a ledge or trough, so to speak, which would arrest its flow downward and conduct it to a pipe or tube leading out of the flask, the water would be conveyed away, and would not require the repeated addition of heat to expel it. This redistillation is, however, useful in some processes, and so some stills are constructed with a view to encourage the action described rather than retard it.

The process of distillation may be applied to remove useless fluids from substances which are valuable, or to extract from a worthless substance a valuable fluid, as brandy from fermented grape pomace, etc. It is often employed to separate substances from each other, none of which are worthless. This is the case in the manufacture of petroleum oils.

Crude petroleum is a mixture of a great number of fluids of widely different specific gravities and boiling points. If the mixture be exposed, in a still, to the constant temperature at which the most volatile of its constituents distils over, this lightest hydrocarbon will be separated from the others. Then if the heat be raised and maintained steadily at another temperature, another hydrocarbon distils over, and so on, the successive operations constituting what is called fractional distillation.

The proof of alcohol is raised by repeated distillation, the alcohol boiling at 180° and water at 212°; a portion of the latter distils over with the alcohol, a less percentage remaining at the end of each distillation: till a certain limit is reached, at which the attraction of the alcohol for the remainder of the water is so great that heat will not separate them.

Both chemical and mechanical action may be employed in connection with the direct action of heat for the drying of single, or the separation of mixed, substances, but as we propose to discuss these methods in future articles, we will not touch upon them further at present.

It is as proper to speak of drying a liquid or a gas as a solid. The chemist sees no distinction between these operations, except that of detail. Yet it is obvious that when a liquid does not unite or mingle with water, it can be wet only on one surface. It will float like oil, in which case only its lower surface is moistened, or sink like mercury, the water stratum rising to the surface. In such cases the application of heat is not the best way to perform the separation, decantation being much quicker and more economical.

There is also a very wide difference in the attraction of substances for water. Thus solutions of potash, which yield a portion of their water under the action of heat, finally reach a point of concentration beyond which no further loss of water will take place, no matter how high the heat may be carried. In such cases, the remaining water generally chemically combines with the substances under consideration, forming what chemists style hydrates. Sulphuric acid is another example of this class of substances. It can be concentrated to a given point by heat, but beyond this no further evaporation of the water takes place without a proportional evaporation of the acid.

There are also certain substances which, having the same or very nearly the same boiling points, cannot be separated by distillation.

The construction of stills for different purposes greatly varies, and we cannot well discuss it in this place. Those interested in pursuing the subject can find information in Morfitt's Chemical Manipulations, Ure's Dictionary of Arts and Manufactures, Dussauce's Treatise on the Manufacture of Vinegar, and Duplais on Alcoholic Liquors, in one or other of which works the processes of distillation, as conducted in different industries, may be found.

THE RELATION OF SCIENCE TO RELIGION.

In America, where the law of primogeniture does not exist, and the office of President is open to the aspiration of any adult citizen who may be politically shrewd or militarily lucky enough to obtain it, we do not esteem birth and ancestry as much as do people who reside in Europe. We judge men more on what they are than upon what their ancestors were. We would not care much if it should be proved that, some million of ages ago, our ancestors were apes, as Professor Rudolf Virchow* and others would have us believe. Those distant relatives are no doubt entitled to our respect, but it is not to be supposed that the account of them, given to us by Darwin, Wallace, and others of that school, should inspire us with rapturous affection. Neither are we thereby induced to own the members of the simian race, who occupy sumptuous apartments in Central Park, as men and brethren. To have sprung from this apparently ancient line does not seem to humiliate Professor Virchow. On the contrary, he prides himself on it.

"Morally speaking," he says, "it assuredly affords a higher satisfaction to think that man has raised himself, out of that state of rudeness, ignorance, and bondage, to one of morality, knowledge, and freedom, than to imagine that by his own fault he has fallen from a condition of Godlike perfection into one of meanness, pollution, and sin, to redeem him out of which his own strength is insufficient."

This passage, which occurs near the close of Professor Virchow's essay, gives a clear insight into the theological attitude of the author's mind, which is far from orthodox. In this age, however, heterodoxy is not as horrifying as it was once, when to doubt a religious dogma was to be doomed to social ostracism, if not to active persecution. Besides, at present many eminent scientific men are advocating similar views to those of Professor Virchow, and share his heterodox opinions. It is quite impossible, therefore, to disregard, if we were so inclined, this modern scientific skepticism, which meets us almost everywhere in scientific discussions.

Müller teaches us that the mythology or religion of the ancients was an attempt to express ideas and conceptions of things which were to them mysterious and inexplicable in the state of knowledge which then prevailed. Geologists affirm that the Mosaic account of the creation of the world must be either taken in an allegorical sense, or rejected. Huxley holds views decidedly antagonistic to what is generally called revealed religion. Darwin and his school endeavor to explain existence by the development theory, and so on to the end of the chapter. We repeat that it is impossible to avoid meeting this phase of scientific discussion, and as the essay of Professor Virchow affords an excellent sample of the reasoning which gives such skepticism birth, we propose to base upon it some general remarks.

All scientists have agreed that what can neither be demonstrated as a fact, nor logically inferred from facts, has no place in science. Reasoning by analogy can therefore have a comparatively limited sphere in science. For although well determined analogies are facts, the chances are ten to one that a supposed analogy will, when critically examined, turn out to be only a *pseudo* resemblance.

What we charge against the teachers of this school is that, while their development theory is purely a system of analogical reasoning, they do not declare that this or that conclusion is *probably* correct, but assert it as fact, and as dogmatically as the most ultra and fanatical religionists, whose bigotry they denounce. Thus Huxley, in his address on protoplasm, asserts as positively that in this substance we have the ultimate physical basis of life, and that protoplasm has its origin in the chemical combination of carbon, hydrogen, oxygen, and nitrogen in the presence of living protoplasm. The whole tone of his address, though he did not say as much in words, was a sort of triumphant self congratulation that there was no need of supposing a special creator, since chemical affinity was the general cause of animated existence. Is then chemical affinity the cause uncaused? Have we yet, or shall we ever arrive at the cause uncaused? Does the development theory, the knowledge of protoplasm, help us in recognizing the first of all causes? Would even spontaneous generation, if proved to take place, as many have sought to prove, reveal a cause behind which we can affirm no other cause can stand? From the very nature of the case, we can answer these questions in the negative.

So long, then, as mysteries exist, and this will always be the case, man will by faith stretch out his hands toward the hidden realm, and hope that in that realm there may be something, to satisfy the aspirations of his soul, brighter and better than what he has found through all his gropings. And this faith will form the basis of some kind of religion. The majority of men may perhaps be taught to believe that the human race sprang from apes, but so believing, and seeing the enormous distance they have progressed from the condition of those animals, they will hardly set limits to progress, and will be little convinced that all opportunity for individual advance is limited to the few toilsome years which form the average term of human life.

The skepticism of the present day is based upon as blind a faith as the belief of the orthodox. But we do not care to quarrel with this faith, or with conclusions derived from pure speculation, any more than we would quarrel with faith in revealed religion. The question of religious belief is one which has no place in scientific discussion. All scientists admit this, yet there are many who omit no opportunity to give sly and sarcastic thrusts at the belief held by many wise and good men, which, forming the very character of the men who entertain it, is deserving of respect rather than ridicule, not to speak of its intrinsic claims to the acceptance of intelligent minds. Professor Huxley has been particularly obnoxious in this way, and has thereby greatly limited his influence as a public teacher.

It may be replied that as the religionists attack the scientists, the latter must make some reply in self defence. We do not see the necessity. It is the business of science to discover, record, and classify facts. Whether these facts conflict with or confirm the religious faith of any, does not concern in the least the scientific investigator. If he discovers that the ancestors of mankind were apes, it is his duty to announce his real or supposed discovery; it is not his province to turn upon those who have held a different view and hold them up to scorn or ridicule because they believe they sprang from a higher source, and repudiate their anthropoid ape ancestors. If religion be false, it needs no direct attacks to kill it. If the discoveries of science be facts, they will outlive all false notions and superstitions. Science and religion should not be directly antagonized, for, besides that this is needless, neither one nor the other is benefited by such controversies.

All this we can say, while we own to a decided leaning toward the evolution theory. It seems more consistent with the way in which an All-wise Being would work, that through eternal and immutable laws He should evolve the varied complex structures which people the universe, than that each should be the result of a special act of creation. In this we see nothing that conflicts with such an interpretation of the Mosaic account as would harmonize with the now very generally conceded allegorical and poetical character of that portion of the Bible.

*Half-Hour Recreations in Popular Science, No. 2. The Cranial Affinities of Man and the Ape. By Professor Rudolf Virchow. Author of Cellular Pathology, etc. Boston: Lee & Shepard. New York: Lee, Shepard & Dillingham.

PISTON ROD PACKING.

It is probable that, on the whole, with engines of plain construction, no part is more frequently out of order and gives more annoyance than the packing of the piston rod. The hemp gasket, when properly made, serves a good purpose, but its usefulness is limited. The gland requires frequent tightening; and, after a time, a peculiar change in the character of the material takes place, where high pressure steam is used, resulting in loss of elasticity and final worthlessness.

A vast deal of study and ingenuity have been applied to the removal of this annoyance, and the production of an unobjectionable piston rod packing. Wire packing has been patented. Copper wire gauze has been employed to pretty good purpose, though with not wholly satisfactory results. Combinations of various materials such as cotton, rubber, etc. have been tried without much success. There is still a general want of a permanent and reliable piston rod packing. The latest substance successfully employed in this country for this purpose is, we believe, asbestos, sometimes called mineral flax. Asbestos consists of silicates of magnesia and lime, generally with protoxide of iron and manganese. This substance is pliable when massed together, and is absorbent of oil, unchangeable under the action of even very high temperatures, can be wrought into gaskets like flax or hemp, and seems well adapted to supply the want named. It exists in large quantities, and can be cheaply put in market, in quantity and quality suited to the purpose.

Mr. St. John Vincent Day, C. E., recently read a very instructive and suggestive paper* on packing piston rods with asbestos, before the Institution of Engineers and Shipbuilders in Scotland, in which he states that asbestos has now been employed in that country with results justifying its further trial. He exhibited examples of asbestos packing, one of which had been used three months on an American locomotive with steam at 130 lbs., the locomotive making an average run of 150 miles per day, the packing being apparently as flexible and tenacious as when first employed.

Another example was shown, taken from the locomotive employed to draw the fastest train on the Caledonian line; and it was stated that the best ordinary packing lasted, with constant screwing up, only two months at most, rarely so long. The packing shown had been in use three weeks, during which the engine had run 2,000 miles, while the gland screws had never been once touched. The packing was as good as when put in.

An asbestos packing put into the stuffing box of a passenger

*See page 113 of the current volume of the SCIENTIFIC AMERICAN.

engine was stated to have lasted during a service of 14,070 miles. This was a coiled packing, and, at the end of the service named, the gland had been screwed so nearly home as to require the addition of another coil.

These facts, in connection with what we personally know of this packing, lead us to believe that a much more extensive use of asbestos packing might profitably be made. But there are other substances that might, we think, prove adapted to this purpose.

Common hard soap forms an impervious durable packing for stems and spindles in gas meters, gaslight machines employing light hydrocarbon, etc. It is possible that some of the insoluble soaps, the bases of which are the oxides of lead, calcium, magnesium, aluminum, etc., might be found sufficiently indestructible under the action of lead to afford a good packing, at least for low pressure engines. Some or all of these soaps might easily be made the subject of experiment for this purpose, and we think there is at least a probability that one or more of them would prove available either singly or as the basis of a mixture or compound. Neither steam nor oil would dissolve some of these soaps, and the only destructive action that could take place would be their possible fusion or decomposition at high temperatures.

THE ADVANCE IN THE PRICE OF IRON.

An advance of ten dollars per tun on manufactured iron, and fifteen dollars per tun on pigs, during the short space of three months, at a time when no special event has occurred to which such a rise can be directly attributed, is a noteworthy fact calculated to cause the manufacturing and commercial public to do for themselves a little hard thinking. In such an emergency, when large enterprises are retarded through the increased cost of an indispensable material, the elaborate essays of theorists and the harangues of partisan speech makers will do little to allay the anxiety caused by the check, in many kinds of business, this advance has made and is yet likely to make. The old wordy warfare between protectionists and free traders will rage with renewed vigor, but the people are at present in want of something besides words; they want cheap iron.

It has been the avowed purpose of protectionists to keep American labor from being reduced, in the respect of wages, to the level of European labor. A large share of those called protectionists have, like ourselves, conceded the justice and wisdom of this policy, limiting its action to those industries in which our natural advantages are equal to those possessed by other countries. No legislation can place coal and iron closely in proximity, so as to render possible cheap iron. Legislation may, however, place American manufactures on a par with foreign producers so far as the item of labor is concerned. To step beyond this limit is to create monopolies and to enrich manufacturers at the expense of the public.

It would seem, through the combined effect of their own efforts and the logic of events, that foreign labor is fast appreciating in value. This, together with the increased general demand for iron in Europe, has affected the iron market throughout the world. Importations have fallen off, and home manufacturers, doubtless in anticipation of further advance, are refusing to make contracts at fixed prices for further fulfilment. It is stated that most manufacturers are running their establishments chiefly on orders as received.

Another equalizing effect upon labor is produced by the unusually high price of pig iron as compared with that of manufactured iron; the skilled labor requisite to produce the latter is therefore correspondingly at a discount.

It has been truly said the great want of the age is cheap iron. This being the case, the general reader will at once comprehend how disastrously this upward tendency of the iron market affects most manufacturing interests, how it specially retards the progress of railroad building, and thus affects the entire business of the country, to a greater or less extent according to the relation various industries bear to the development of the new resources which the roads now in progress and those projected are intended to open up.

Happily, this state of things cannot long continue. With our inexhaustible stores of ore and coal, we can produce our own iron in any quantity required to meet the home demand; and capitalists will not be slow to see the opportunities, for profitable investment, the iron manufacture is likely to offer. We may therefore expect active competition, and a final return to former prices, with a large and permanent increase of home manufacture.

STEAM ON THE ERIE CANAL.

The reward of one hundred thousand dollars offered last year by the State of New York for the best plan for a motor for canal boats still remains open, no person having as yet brought forward a boat that satisfies the Commissioners. In a recent report to the Legislature, these officials state that the almost universal impression among inventors is that the important point to be overcome is the prevention of the wash of the banks of the canal. But this impression is wrong. There is no danger to the canal banks, as the boats are only required to run three miles an hour. What is wanted is a plan by which the boats may be towed or propelled more cheaply than by animal power.

In order to set the matter straight, the Commissioners have adopted the following resolution:—

Resolved, That the experiments, heretofore made in navigating the canals by freight boats propelled by steam, have not been failures by reason of injury done the banks of the canals by the swell caused either by the motion of the boat or the wheels through the water; and that, in the judgment of this Commission, there is no practical difficulty, in navigating the canals by boats carrying 200 tuns of cargo at the rate of three miles per hour, that arises from "injury to the canals or their structures." The main difficulty to be overcome is to establish the economy of steam or other motor as compared with animal power.

The Commissioners state that inventors in nearly all the States of the Union, in the Canadas, in England, Scotland, Wales, Holland, South America, southern Africa, and in short nearly every part of the world, have written letters of inquiry to various members of the Commission and to its engineer and secretary. About 700 communications in all have been received and been replied to, giving, as far as practicable, the information sought. Various models and drawings have been sent to the Commission, and among them several the productions of women.

Among the plans presented are many ingenious and elaborate devices accompanied with carefully prepared drawings, while very many of them are evidently the result of immature or inexperienced study, and in some instances the propositions are, to all but the inventors, absurd. A vast number of methods of applying motive power have been presented, from plans that were decided useless years ago, to the introduction of the modern narrow gage railway on the banks of the canals.

As evincing the general character of a large proportion of the plans presented, the following may be mentioned: Plans to propel the boats by large screws or wheels, placed on deck and designed to act upon the air. The use of automatic poles attached to the sides or stern of the boat, or a wheel with long arms placed in a well in the center of the boat, to act on the bottom of the canal. A variety of tracks laid on the bottom of the canal, on which the boats are to be moved. Elevated and submerged cables and cables attached to the banks. A plan called by the inventor the "Siphonic system." The power to be derived from water supplied by a trough to be elevated above the canal and to extend its entire length, which is passed through a syphon, the short leg of which to be inserted in the trough, and the long leg to pass through the stern of the boat. A fly wheel passed over the stern of the boat and designed to receive and store up power, to be exerted by the crew during their leisure from other duties, and to deliver it again through the medium of a screw propeller connected with it by proper gears, and many others of a like character.

The anxiety of the inventors to secure the money offered by the State is such that a large number of devices, we are informed, are now in the course of construction, and there is every reason to expect that, during the coming season, many more boats will attempt the trial trips required by the Commission. Some of the inventors express great confidence in success, while others insist that the law should be amended in such a way as to be more favorable to their particular schemes.

The Commission does not advise any change in the law ot the kind desired by such persons as think its objects cannot be secured as it now stands and is construed by the Attorney General; on the contrary, they think all the things now required by the law should be insisted upon being complied with before the money should be awarded.

All the time allowed by the law will be given to the competitors, but the Commission will adhere to the determination, expressed at its first meeting, that boats in actual service, and not drawings or models, will be considered as competing for the money offered by the State.

We last week published illustrations of Goodwin's method of canal propulsion, which we understand is to be tried practically during the present season. It is one of the most promising of any of the plans that have been devised.

BEET SUGAR IN THE UNITED STATES.

Believing as we do that the production of beet sugar is destined to become one of the important industries of this continent, we regard any facts which tend to hasten this result as of importance. Through much ignorance, timidity, and consequent failure, we are, by the efforts of persevering and hopeful m n, gradually groping to the light in this matter. The conditions, for the successful growth of good beet crops on the different varieties of soil contained within our borders, are gradually becoming understood; and, after all, this is perhaps the greatest essential of success. Given good crops of beets rich in sugar, and the profitable extraction of the sugar will certainly follow in time.

We have perused, with much interest, the report of Professor Charles A. Goessman, Ph.D., on sugar beets raised upon the farm of the Massachusetts Agricultural College, published in the ninth general report, of the trustees of that institution, to the Governor and Council of Massachusetts, in January of the present year, which contains facts which we propose to make the basis of a few remarks.

An experiment was made on the college farm with 4 7 acres of land, prepared in the best manner possible for the reception of beet seed. Owing to the want of a suitable drill for sowing the seed, the rows were made two and one half feet apart, instead of from eighteen to twenty inches apart, as should have been the case, thus leaving considerable waste land. The seed drill also worked imperfectly, leaving blank spaces in some of the rows. Still, under these unfavorable circumstances, the root crop averaged 22,200 pounds to the acre.

Seeds of the following varieties of beets were planted, namely: Vilmorin of 1869, Imperial of 1869, ditto of 1870, Electoral of 1870, Vienna Globe of 1869, varieties of mangold of 1870. The Imperial sugar beet crop—seed of 1870—gave 12·59 per cent of sugar; Vilmorin, 12·95 per cent; Electoral, 12·30 per cent; Vienna red, white, and yellow globe beets, 8·004 per cent; ordinary mangolds, 5·035. These results were obtained by analysis, and not in the regular process of manufacture.

A computation, made with these results as a basis, shows a handsome margin of clear profit obtainable on the assumption that the extracting process would be economically and skillfully conducted.

In concluding his report, Professor Goessman touches upon a vital point relative to the profitable extension of the beet sugar manufacture in the United States. It has been argued, against the introduction of this manufacture, that the difference in the price of American and European labor forbids the hope of our competing with foreign producers. This argument is so ably met by Professor Goessman, that we quote a portion of his remarks upon it:

"Although duly recognizing the great weight of this point for with the farmer rests the success of the enterprise in the end, I believe that its influence as an obstacle is frequently overrated and based on somewhat obsolete assumptions. The government tax of from $40 to $50 per acre of sugar beets, in Germany and France, as well as our higher prices of sugar, will go far towards covering our most expensive labor. The interests of the Louisiana sugar planters and the sugar beet cultivators of more northern sections of the country are the same, as far as a proper protection of their industry is concerned; and the public opinion, in view of the requirements of the government, is apparently prepared to accord to them, for some time at least, this advantage. Great improvements in agricultural implements and in modes of securing the juice have reduced labor by hand to a considerable extent. A short enumeration of the most conspicuous instances may place this statement in its proper light. Various seeding machines, improvements more or less on Garrett's famous seed drill, are used in planting the seed, in four or more rows at once, and at any desired distances from twelve to twenty inches apart. According to the size of the machine, one or two men, with one or two horses or oxen, may seed from eight to sixteen acres per day; the same implement can also be modified by replacing the seed boxes with suitable knives to be used as cultivators, to clean the space between the rows of plants, and to cover the roots. Ploughs with two knives are used to break up the soil on both sides of the rows of beets, to loosen the latter in such a manner, without lacerating them, that children may do the harvesting of the roots. In fact, the whole work in the field, after the soil is once properly broken up, calls for no extraordinary labor. A good deal of the work can be done by boys. Machines do the washing, the grinding or cutting, and general handling of the roots to the centrifugal apparatus. The task of handling the pulp of beet roots for the press requires, comparatively speaking, a large supply of hands to do the business connected with that process, but Roberts' diffusion method dispenses with a large number of the hands formerly required in the press room—nearly one half."

In further support of his position, the author cites the introduction of the Roberts diffusion process, which though it reduced the expenses for labor in the press room one half; but this reduction only made one sixth of the extra earnings of the manufacturer. It is thus seen to what an extent the success of this industry depends upon the skillful culture of the roots; and though skill is undoubtedly requisite in all the subsequent processes of extraction and manufacture of the sugar, it appears plain that, with increasing knowledge, we shall be able ultimately to establish this department of agriculture and manufacture on a sound and permanent basis.

Death of Erastus Corning.

Mr. Erastus Corning, who for more than sixty years has been one of the most active business men of New York State, died on the evening of Monday, April 8th, at his house in Albany. He was born at Norwich, Conn., on December 14, 1794, and was therefore in the seventy-eighth year of his age. His commercial life commenced in a hardware store, and being shrewd and persevering, he soon became the proprietor of the concern. After some years of continued prosperity, he bought 250 acres of land near Albany, and became one of the most advanced agriculturists of his day. He was, moreover, an active politician, and was rewarded therefor by the confidence of his fellow citizens, he having held several important offices. The railroads of New York State owe much to his enterprise and ability, he having been a director of many of them, and, for some time, president of the leading one, the New York Central.

Of late years, Mr. Corning was chiefly known in connection with the iron manufacture, his fortune being largely invested in iron and steel works at Albany and Troy. He lived to see the growth from the beginning of this important industry in America, and had the satisfaction of knowing that he contributed much to its development. He leaves for his heirs a fortune of some five million dollars of his own acquiring.

Don't Use Galvanized Iron Pipes.

We have, on several occasions, called the attention of our readers to the danger which arises from the use of galvanized or zinc covered iron pipes for conducting water for household purposes. Such pipes render the water poisonous, sickness and death being the result. In a recent case at Portsmouth, N. H., where a family of four persons were made ill by the drinking of water supplied through galvanized iron pipes, Dr. Jackson examined the water, and found it to contain six grains of oxide of zinc to the gallon.

THE Goodyear hard rubber patent expires May 6, 1872. The Goodyear soft rubber patent expired sometime ago.

Grass Cloth.

Grass cloth is manufactured from the fibers of a plant called by the Chinese *Ma;* it is a generic term, under which several varieties of that species are included. It is a *canna bis*, or hemp.

It has an irregular cellular root of a yellowish white color, which sends up annually ten, fifteen or more stems, to the hight of from 7 to 10 feet. The stems are upright, slightly fluted, pilous and herbaceous; its leaves are on long petioles, alternate, ovate, roundish, serrate, simple. The upper surface pilous and dark green, the lower of a silver gray. The flowers are described as minute, numerous, of a light green color, on a catskin-like receptacle or spike. It is found at the base of hills and on dry soils, from Cochin-China to the Yellow river, and from Chusan to the farthest west that researches for the present can extend, and abounds chiefly in Kiang-su, Kiang-nau, Chih-kiang, Fuh-kiang, and the Canton provinces.

The plant is mentioned in the Chinese classics, and was undoubtedly cultivated and employed by them a thousand years prior to our era.

The plant yields three crops every year. The first cutting takes place in June. On being cut, the leaves are carefully taken off with a bamboo knife by women and children, generally on the spot. It is then taken to the house and soaked in water for an hour, unless it is already wet by recent showers. In cold weather, the water should be tepid. After this the plant is broken in the middle, by which the fibrous portion is loosened and raised from the stalk; into the interstice thus made, the operator, generally a woman or child, thrusts the finger nails and separates the fibers from the center to one extremity and then to the other. The stripping process is very easy.

A partial bleaching is effected on the fibers before they undergo further division, sometimes by boiling and at other times by pounding on a plank with a mallet. These operations are in some places repeated. After being dried in the sun, an important operation then proceeds by women and children, to whom is entrusted the tedious process of splitting the fibers, which they do with their finger nails. Expert hands are able to carry this division very far. When this process has been preceded by hatcheling, the threads are finer and softer. The threads are formed into balls and subjected to frequent soakings and washings. The ashes of the mulberry leaf are recommended to be put in the water with the hemp (some use lime) for a whole night. Others simply expose it to dew and sun. In rainy and cloudy weather, it should be exposed to a current of air in the house; moisture darkens it. The threads are now ready for splicing—the work of women and children, the labor of the agriculturist being concluded—when the threads are rolled into balls after being sized or stiffened with congee. Before the thread is ready for the weaver, the balls are steamed over boiling water in a closed oven. They are then spread out to dry.

Grass cloth is superior to linen for garments in hot climates; the latter, being a rapid conductor of caloric, is often unsafe; the former is not so good a conductor and is therefore more suitable. This may be owing to the fact that the latter is hotpressed, by which it is rendered compact and smooth, while the process to which the other is subjected for the same purpose but partially affects it, or there are original differences in the fibers of European and Chinese linen.

Convulsions of Nature.

A tornado on its windy way struck the earth at St. Louis recently, demolished one large building, demoralized several others, caused the loss of one life and the serious personal hurt of several persons, and then bounded up into the air and has been heard of no more, though the St. Louis people surmised that Illinois might be struck by the same hurricane. This was a strange storm, and was organized on novel principles. It is one of a class not uncommon in the West, though rare in the cold season. But the whole winter has been prolific in meteorological wonders. Snowstorms of intense severity in the Rocky Mountains, winds of fierce and cruel coldness in Iowa and Minnesota, steady cold in the East, little rain and snow over large portions of the North, and frequent snow falls in the States below the Potomac—these are some of the peculiarities of a season which will be long remembered for its eccentricity.

Now, too, we have an account of a terrible earthquake in Southern California. Three hundred shocks were felt in the space of three or four hours. The first shock destroyed the small town of Lone Pine, and buried its inhabitants in the ruins of their low adobe huts. Thirty persons were killed and three hundred wounded. The earth was cracked and torn up, and a volcano is reported. The water in Owen's Lake was raised four feet, and Owen's river overran its banks. The district visited is volcanic, and so far removed from the more populous and better known portions of the State that no fear is apprehended of seismic commotions at San Francisco.—*Commercial Advertiser.*

WEBSTER'S spelling book has been on sale for the past ninety years, and more than fifty millions of copies have been sold. During a period of twenty years, the author received a royalty of less than one cent per copy; but his nett income from the sales was sufficient to support his family while he prepared his greater work, "Webster's Dictionary."

COMMODORE BROWN, Chief of the Virginia Oyster Police force, expresses the opinion that the whole Chesapeake may be made an oyster bed by a judicious policy. The water is nowhere too deep for the oyster to live and flourish.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—REVOLVING SHAFT.—Is there a point in a revolving shaft that does not move?—C. C. H.

2.—BATTERY POWER FOR SUBMARINE CABLES.—What battery power is used on the Atlantic cables, and how little will work them?—S. B. P.

3.—DURABLE WHITEWASH.—What will render whitewash as durable as paint? Will sugar of lead do it? White zinc and barytes cause it to wash off.—E. C. W.

4.—POLISHING SHELL.—Will some one be kind enough to inform me the best way to obtain a fine polish on shell combs and eyeglasses?—H. E. R.

5.—CONDUCTING POWER OF SILVER WIRE.—Can you inform me which is the best conductor of electricity, hard drawn or annealed silver wire?—G. F. G.

6.—FINISHING FURNITURE.—Will some of your correspondents inform us of the cheapest and best method of staining and finishing common bedsteads?—A. & M.

7.—LAMP CEMENT.—I would like to know if there is anything that I can use to soften the material used to fasten on the tops of kerosene lamps, so that the tops can be easily removed?—T. S.

8.—ASBESTOS PACKING.—Will some one, of the host of engineers who read your journal, inform me of the method of using asbestos packing on piston and valve rods? Can the powdered asbestos be used for packing?—D. A. N.

9.—PACKING RINGS.—Should cylinder packing rings have the recess for Babbitt's metal turned out, or should a place be left solid through which to cut them? Also what is the proper thickness of rings for a 14 inch cylinder?—S. S. I.

10.—DOMESTIC EMPLOYMENT.—E. S., of Canada wants to know a branch of industry which will enable him and his children to find constant home employment without necessitating the separation of the family.

11.—POLISHING PICTURE FRAMES.—I wish to know in what manner moldings for picture frames are polished. They are of black walnut. I wish to know the process and the materials. I wish also to know the process of varnishing chromo pictures, and the necessary material.—E. B.

12.—CANVAS BOAT.—How can I make a canvas sporting boat, composed of two sections, to be handy for transportation? What should be the length and breadth, and of what should the framework be? How can I shrink the canvas on the frame and make it water tight? The boat is to be large enough for two persons.—W. V. J.

13.—MORTAR FOR DRYING OVENS.—I use four inch brick walls, in drying ovens exposed near the furnaces to a temperature of 250° Fahr.; and I find that lime mortar crumbles and soon loses its adhesive properties. What can I use that will be free from the above objections, and that will give a strong and durable bond?—J. K. C.

14.—DOUBLE BASS.—Will some one give me the size and proportions for a double bass, and the best material and varnish for the purpose?—M.

15.—PRESERVING BIRD SKINS.—I wish to cure some bird skins. Can any of your numerous readers give me the desired information?—W. J. L.

16.—TEMPERING BARREL SAW.—How can I best temper a barrel saw to saw staves? Is there any way to temper it after it is rolled?—J. E. R.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal.

ALL reference to back numbers must be by volume and page.

FROZEN WATER MAIN.—Query 6, March 16.—C. H. J. asks which is the quickest and cheapest way to thaw out 150 feet of frozen water main, etc.; and as he has taken the liberty to use my initials in asking the question, I will use his in answering it. Put a jet of steam (under a moderate pressure) into the top of the waste cock of your frozen pipe, and allow the water to escape from the bottom of the pipe, and you will very soon remove the ice.—C. H. J., of N. Y.

CONCRETE BUILDING.—To B. L. V. A., January 27. Molding the concrete into blocks, and laying with lime, mortar, or cement will answer; but it takes one half to one fourth more time and expense, and is not as good as when done by the following method: The basement or cellar walls should be 18 inches thick, the first story, 14, and the second, 12 inches. If granite or other good rock cannot be had in a quarried state for the underground wall, I should substitute a concrete of hydraulic cement, sand, and rock, till I got above the ground, dumping it into a trench when it was convenient to do so. The fireplace, if any, should be of iron, brick, or rock; and after the flue is started, it may be carried up in the concrete, by means of a coffin shaped box, or elongated hexagon, separated into two parts by a long wedge, which, being drawn out after the concrete has hardened, will allow the box to collapse; and it can then be raised and set for another course. The flues above the wall should be carried up with brick. There is no appreciable shrinkage about such walls. To J. P., January 27, 1872.—One fifth part of good lime, with clean sharp sand will make a substantial house wall. Such walls should be well anchored at the corners by long pieces of wood, stone, or iron. One thirteenth part of lime will answer equally well, by using eight parts of broken rock, brick, or other imperishable material, rammed into the mortar, as it is poured up. Masons require more lime, because it renders the mortar more plastic.—Z. L. H., of S. C.

CRACKED FLUTE.—Query 13, March 16. The experience of nearly forty years warrants me in offering the following advice: Anoint the flute thoroughly and repeatedly with pure raw linseed oil prepared by letting it remain unshaken for several weeks, when the clear oil should be poured off for use. It should be applied, inside and out, every time the flute is put away, it having been carefully cleaned from moisture for the first year, after which an application once a month will be sufficient. Pure olive oil will do better, but it must be oil of olives. On taking the flute from its case for use, the oil should be wiped out with an old silk handkerchief (cotton will do for the outside) wrapped tightly around a stick, using as much friction as possible. This will produce a burnished surface, which, besides aiding in filling the pores, adds to the mellowness of the tone. Care must be had to prevent the metal or anything other than the silk from touching the flute, and to apply the pressure equally on all sides, otherwise the bore will become distorted. To stop cracks that have already appeared, pack them full with good beeswax which has been mixed, by melting and stirring, with a small portion (say one sixth) of rosin, sufficient to stiffen but still leave it viscid; apply when cooled, and cram it in with the finger. Do not be tempted to use shellac or any rigid cement, as it will fail on account of the distention and contraction of the wood by change of temperature. It is well to pass your thumb over the cracks, filled as above, before commencing to play, the object being to smooth them down and insure their being tight, which rigid cement will not admit of.—ART.

MADSTONE.—R. A., of North Carolina, sends us a stone discovered by a neighbor which he states "has been compared with the famous madstone (owned by the Pointer family of Halifax county, Va. for the past half century, and which extracts the poison of mad dogs, snakes, spiders, etc.), and found to be exactly alike in every respect, adhering to the flesh like a leech, and extracting the poison by absorption. The specimen I send you has been, to my own knowledge, applied in a case of bite by a copperhead snake and effected a complete cure in twelve hours. The patient was very sick and delirious. The flesh is moistened before application. Are there any other stones in the country of a similar character? I am arranging to advertise it for sale, and therefore wish your opinion before offering it to the public."—Answer: The stone which our correspondent sends is half an inch square and one eighth thick, black in color. In it we have determined the presence of alumina, which we suspected, and are now quite confident, is the "charm" of the madstone. We do not think there is anything in the stone which acts as an antidote; its virtue is its property of absorption, and any other aluminous mineral, as Websterite, pure clay, etc., would undoubtedly serve as well. Another correspondent, writing from Purdy, Tenn., describes the rampages of a mad dog in his vicinity, several children having been bitten, and great alarm among the residents having been occasioned. The parents of some of the suffering children immediately went to procure the use of madstones. Our correspondent says: "There are many fabulous stories told about the virtues of the madstone. I have seen one sold to Mr. David Riding, four miles south of this place, for $5, and have heard of several more sold by an old man who passed through the country shortly after the war with his pockets full. Will some one learned in the arts and sciences give your readers a short comment on the mad stone, its physical structure and appearance, its virtues and *modus operandi*, how long after the infliction of the bite may its wondrous virtues be depended upon, and above all, its origin? The specimen in Mr. Riding's possession is about ½x1 inch, and looks very much like a dark species of slate."—W. C. K. Answer: The "madstone" of the Southern States is an aluminous mineral, and its charm lies in its power of absorption. It is not an antidote. But we would have more faith in ten drops of ammonia than in ten pounds of this "madstone." It is not to be denied, however, that "snake stones" have been used in several countries with wonderful success. Sir Emerson Tennent, in his "Sketches of the Natural History of Ceylon," calls attention to the "pamboo-kaloo" as a remedy in cases of wounds by venomous serpents, and gives more than one well authenticated instance of its virtue when the patient was bitten by the deadly cobra di capello. The stone is intensely black and highly polished, and, being porous, rapidly imbibes the blood and with it the poison. The stone adheres for a few minutes, like the "madstone," and then drops off. The celebrated Faraday, after an analysis, declared his belief that it is a piece of charred bone, evidence of which is afforded both by the apertures of cells or tubes on its surface and by the fact that it exhibits an organic structure within. When heated, water and ammonia escape, and finally the carbon burns away, leaving a white ash which is phosphate of lime. The snake charmers from the coast also visit Ceylon proper to prepare the snake stones themselves, and to preserve the composition a secret. Dr. Davy says the manufacture of them is a lucrative trade carried on by the monks of Manilla, who supply the merchants of India. The Mexicans also have a snake stone, *piedraponsona*, which is nothing more than charred hart's horn. This adheres firmly and is very absorbent, and when speedily applied, has been found efficacious in the case of a bite from a rattlesnake. We would caution our readers against putting too much faith in these stones; they certainly are of no avail unless used immediately after the wound has been made.

CHLORO-ACETIC ACID.—No. 21, March 30.—Place a quantity of glacial acetic acid in a white glass bottle, which fill with chlorine gas. Place this in the direct sunlight for some hours; and eventually you will have a crystallization of the acid around the sides. There will also be oxalic acid formed, and some free acetic acid will remain. Mix all together, and place in shallow vessels under the receiver of an air pump, together with dishes containing fused potash and strong sulphuric acid. Oxalic acid will first crystallize out, and then the chloro-acetic, in rhombic crystals which may be dried on blotting paper.—E. H. H., of Mass.

RANCID BUTTER.—To J. B. B., No. 24, March 30.—Melt the butter at a tolerably high temperature, in fact, till nearly boiling. Strain clear through cloth, and thoroughly wash with water, to which has been added a little solution of chlorinated soda, or, as it is commonly called, Labarraque's solution. Finally wash with clean water, and I think you will find the butter sweet, though it will not have the flavor of the fresh made article.—E. H. H., of Mass.

BROWNING GUN BARRELS.—To W. H. R., query 10, page 154. —Your recipe is very good, and if you will have your barrel bright and free from grease, you can get a pretty glossy appearance by the following mode: Apply the fluid with a sponge, being particular not to touch it with your hands. Let it remain for from six to ten hours, or until it gets a brown coat of rust. Then scrape it off with a steel brush, give it another coat and scratch as before until the desired color is obtained, which you will readily see when you wet it with the fluid. Now take half a pound of carbonate of soda to one gallon of water and boil; scald the barrel with it after it is scratched off the last time, and, while it is warm, apply grease and it is finished with a beautiful glossy appearance. Five or six coats are enough to bring the desired color.—M. M., of Texas.

TO TAN SMALL SKINS.—When taken from the animal, let the skins be nailed in the shape of an oblong square on a board to dry, fur side down. Before taking them from the board, clean off all the fat or oily matter with a dull knife. Be careful not to cut the skins. When you wish to tan them, soak thoroughly in cold water until soft; then squeeze out the water, and take of soft water three quarts, salt, half a pint, and best oil vitriol, one ounce. Stir well with a stick, and put in the skins quickly, and leave them in thirty minutes. Then take them in your hands and squeeze (not wring) them out, and hang in the shade, fur side down, to dry. If you get the quantity of liquor proportioned to the skins, they will need no rubbing to make them soft; and, tanned in this way, the moths will never disturb them.—F.

BUFFALO ROBES.—These are not, strictly speaking, leather, as they are prepared without the use of bark or tannin in any form. They are simply a raw hide made soft and pliable by manipulation and the use of grease or oil. The Indian process, in principle, is the same we use in making our soft leathers, chamois, buckskin, lash or string leather, etc. The Indian women, in making buffalo robes, first "flesh" and pare down the green hide with a bone, toothed something like a saw, and knives. They then cover it on the flesh side with the brains, blood, liver, grease, and the contents of the gall bladder of the buffalo or elk. This is thoroughly worked in near a fire or in the sun. They then, after the hide is partially dried, work it over a cord and beam till the rope becomes soft and flexible. They sometimes make a species of leather by taking off the wool by the use of lime, and then preparing it as above, smoking it thoroughly. The hide of the buffalo is covered, not with hair, but with a true wool, which has the property of felting or fulling, and out of which cloth can be manufactured.—P. W.

BATTERY FOR PLATING.—To W. B. J., query 12, March 16. I have obtained excellent results in plating with a battery made as follows: Take a gallon jar, and get a shoemaker to make a leather cup, of the same hight as the jar, and about 2½ inches in diameter, and water tight. Solder a connecting wire to a strip of scrap zinc as wide as the length of the leather cup; roll it up and put it into the cup. Get a strip of sheet copper, no matter how old or thin, clean it, solder a wire to it, and bend and insert in the gallon jar. Set in the leather cup with the zinc inside and fill with a solution of common salt. Fill the gallon jar outside the leather cup with a concentrated solution of blue vitriol, and the battery is complete.—D. G. P., of Ill.

"Several new subscribers," of Three Rivers, Michigan, will find C. F.'s rule for screw cutting on page 58 of the current volume.

FLUIDS AND LIQUIDS.—To H. W. H., query 2, page 185.—Fluids are of two kinds, liquids and gases. In the first, the attractive force of the atoms equals the repulsive, as in water and in alcohol. In the second, the repulsive force exceeds the attractive, as in air, oxygen, illuminating gas. A quart of a liquid will fill two pint measures; a quart of gas will fill two gallon measures.—B. G., of N. J.

HYDROGEN GAS.—To E. X., query 4, page 185.—The metallic base of hydrogen has not been discovered, though a supposed amalgam of that element with platinum excited some interest a few years ago.—R. G., of N. J.

MICROSCOPY.—To A. M., query 20, page 185.—Use a condensing lens or mirror for viewing opaque objects; and view them on a black background.—R. G., of N. J.

IRON IN WATER.—To M. M., query 13, page 200.—The iron in your water should benefit you.—R. G., of N. J.

FUSIBLE METAL.—To O. E., query 14, page 200.—Cadmium makes the most fusible alloys. One alloy of cadmium, tin, lead, and bismuth melts at 63° to 65° Fah.—R. G., of N. J.

J. H., of N. J.—The shock experienced by you in approaching your hand to water in wash basins, gas jets, etc., is owing to the electricity in your system. It is not due to any galvanic action in the tin lined water pipe. By turning on the gas and shuffling your feet across the floor, then holding your knuckle to the jet at the point of emission from the burner, you may light the gas.

E. C. W., of Mo.—Your idea is erroneous; do not waste money on it.

T. C. B.—To make emery cloth belts use strong glue; put it on evenly with a brush, and then sift on the emery from a box with a perforated cover like a pepper box.

T. F. G., of Ga.—We believe gas made from gasolene and furnished through pipes is as safe as ordinary illuminating gas.

H. P. R., of O.—We never yet saw the foundation of a stationary engine too solid, and don't believe it can be made so. The idea that timber is necessary between the bed and the masonry is erroneous.

E. P. J., of Mass.—It would be difficult to contrive a more uneconomical way of using steam than the one you propose. To let the piston move a short distance before the full admission, and to exhaust at the end of the stroke with a full cylinder of high pressure steam, would be to exactly reverse the effect of expansion.

WET COAL DUST.—To G. W. F., query 3, March 30.—Coal dust burns better when moistened. The moisture helps it to coke, and if the back part of the fire is a bright red, the steam, being decomposed, acts as so much additional fuel, the oxygen promoting the combustion, and the hydrogen inflaming.—E. H. H., of Mass.

TESTING BARK FOR TANNIN.—To J. F. A., query 4, March 30. —Make a decoction of the bark or wood, from a definite quantity of the material, and filter. Make a solution of gelatin of a determined strength. Add of this to the liquor until no further precipitate is formed. Separate this precipitate, dry, and weigh. Knowing the quantity of gelatin added, it is easy to calculate now the quantity of tannin. This will be found accurate enough for practical purposes.—E. H. H., of Mass.

CLEANSING STOVEPIPE.—To N. C., query 15, March 30.—I presume you burn wood in your stove and that your pipe is horizontal. During the burning of the wood a vast quantity of water is formed, and the intense cold has condensed it, and, the pipe being horizontal, it has accumulated, and the soot mixed with it, forming a paste and thus the obstruction. A perpendicular pipe would not act so, as the condensed water would run back on to the heated surface and become again converted into vapor, until the pipe would become hot enough to allow the whole to pass off without condensation.—E. H. H., of Mass.

FUSIBLE PLUGS.—To W. H. W., query 1, March 30.—These are made of bismuth 8, lead 5, tin 3 parts. Increase proportions of lead and tin according to the temperature it is desired for the alloy to melt at. E. H. H., of Mass.

HYDROGEN.—To E. X., query 4, page 185.—Gas has been passed through many processes to produce hydrogen, but none, so far as I know, has been considered practical. Hydrogen is a base of itself.—E. H., of Mass.

BATTERY FOR PLATING.—To W. B. J., query 12, page 185.—I would advise you to purchase a Bunsen battery, as I have found that no other is as cheap in the long run.—E. H., of Mass.

MATCHES FOR MOLDING.—Query 21, March 16.—Take new sand and dry thoroughly, then mix, with boiled linseed oil and a small quantity of litharge, to the proper consistency. Care must be taken not to use too much oil. Ground pumice stone is sometimes used mixed with the above, and is generally approved.—K., of Conn.

ELECTROMAGNET.—In answer to F. L. T., query 5, page 154, I will state that the wire should be insulated, by first winding with best cotton or silk, and then coated with shellac dissolved in alcohol.—E. H., of Mass.

P., of Pa.—Ultramarine is doubtless the substance referred to in the recipe as refiner's blue.

MELTING POINTS OF PLATINUM AND STEEL.—To J. A. H., query 5, page 200.—Platinum melts at 3,080° Fah., and steel at 2,500° Fah.—L. V. B., of N. C.

DEMAGNETIZING STEEL.—For the information of J. B. W., query 17, March 23, I send the following: When the iron cores in telegraph relays become permanently magnetized by heavy currents of electricity, they are relieved of all residuary magnetism by pounding them on the ends with lead.—J. C. H., of Kan.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

COLORING SEED.—O.
ENGINE PHENOMENON.—F. M. C.
ROTARY ENGINE.—D. B. K.
THE U. S. NAVY.—B. T.
TURBINE WHEELS.—G. C. P.
VITAL OR PSYCHIC FORCE.—B. T.
WHAT IS A MACHINE?—G. L. B.
ANSWERS TO CORRESPONDENTS.—C. O. I.—G. R. M.—J. P. W. —W. A. McH.—F. C.—A. M.—S.—J. C. H.—K.—H. J. H. —S. B. H.—G. A.
QUERIES.—H. J. R.—W. A. H.—R. F. D.—F. K.—Y.—R. D. P. —W. B.—W. M. G.—S. R. B.— C. D. W.—W. R. B.— J. P. H.—A. N.—O. S —J. C. S.—C. A. H.—A. S.—L. E. S. —A. L.—W. P. B.—E. K. D.—F. E. K.—M. E.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

WATER WHEEL.—William G. C. Mastersun, Proctorsville, Vt.—This is a wheel of the turbine class, but so strikingly different in many ways from those familiar to most of our readers that it will be very difficult to give any idea of its construction in a verbal description. The entire wheel, the rotary part as well as the chute, although independent of each other, may be raised by the water, receptacles being formed, beyond the outlet slots of the rim for water, which acts as a cushion and also as a regulator to steady the motion like a balance wheel. The gate is self acting. The mechanism by which these results are attained is very unique and ingenious, showing that the inventor is fertile in mechanical resources.

HARROW.—Oradon J. Leabo, Forest Grove, Oregon.—Two or more pairs of bars, pivoted in the middle under the frame, are provided with teeth at each end, and connected through rods with bars attached to a reciprocating pitman, so that the teeth are moved by the mechanism in such a way as to constantly cross their own furrows in a single passage over the ground, thereby, it is claimed, giving the ground a more thorough harrowing than can be done in the old way by twice harrowing. The harrow runs on wheels, and has a seat for the driver.

WHEEL FOR VEHICLE.—George R. Duval, Salem, Oregon.—The hub is made of cast iron or other metal, and provided with a projecting flange. Around the flange is shrunk a wrought iron band, which projects beyond both sides of the flange. The band is perforated with holes, which alternate from side to side of the flange, they being thus arranged in a zigzag row to receive the inner ends of the spokes on alternate sides of the flange. The rim of the wheel is made of wood or metal, semi-cylindrical in cross section so that its convex side forms the inner circumference. Each spoke is made in form of a bolt with a head at the outer ends—a screw thread on the inner end. The spokes are fitted through apertures of the tire and rim, so that their heads are countersunk into the outside of the tire, and their inner end, are then passed through the band, shrunk in the flange of the hub, receiving the nuts on the inner side of the same. A plate is then slipped over each end of the hub to fit within the band and rest against the nuts. The plates serve, therefore, to prevent the nuts from working loose, and also to protect them from mud and dust. Bolts hold these plates in place.

FIREPROOF ROOF.—Samuel Smith, of Mattoon, Ill.—This improvement in the construction of roofs of buildings has been made with a view of rendering them not only durable and fireproof, but a support to the side walls of the building. An arch, composed of tiles which lock into each other, laid so as to break joints with each other, is supported by bars of angle iron laid into the wall, which form the abutments of the arch. The bed plate of each of these bars extends from the wall over the joists, and where wooden joists are used the bars may be spiked or bolted to them, which would serve to support the walls and prevent them from spreading. Rods of iron pass through the flanges of the abutment bars and form chords to the arch at suitable distances from each other. These chords are protected from the action of heat in case of fire, and prevented from expanding, and consequently damaging the arch, by means of cylindrical fireproof tiles or composition placed on the chords, and secured thereto in any permanent manner. The water gutters of the roof are formed by gutter tiles, the latter of which are laid into the walls. Orifices in the end walls permit the discharge of the water from the gutters into the conductor pipes. The tiles are all laid in good cement, and the arch is formed on a temporary skeleton arch of wood, the same as in laying a brick or stone arch. When completed the arch is covered with a coating of mastic or other cement, so as to render the entire roof (with the gutters) perfectly waterproof. The side walls may be anchored to the angle iron abutments, or to the chords, in any manner, if necessary, but as described they would, in ordinary cases, be held together and supported in case of fire. It is claimed that a building provided with this roof cannot be destroyed, as everything combustible inside may burn, but the roof and walls will remain. The arch may be built on a circle of any radius, the arc simply diminishing or increasing according to the width of the building, so that tiles of the same pattern may be used for all roofs.

SELF ADJUSTING THREAD TENSION FOR SEWING MACHINES.—John Bromley, Macon, Ga.—The invention consists in a delicate tension device for sewing machines which automatically adjusts itself to any size of thread, and yet allows any thread to be readily inserted by persons who are unexpert in machine sewing. It is simple, applicable to any sewing machine, and not liable to get out of order.

POTATO DIGGER.—Robert G. Dayton, North Granville, N. Y.—In this invention a patent has been allowed on the following parts, namely: Gear wheels, crank shaft, connecting rod, rods, and pivot rods, arranged in connection with the frame and shaker in a peculiar manner, whereby the shaker is operated. Also a combination of spring bars and guide bars with the frame and shaker. The potatoes are scooped up with the soil by a sort of scraper or plow which rises in a peculiar curve, slightly descending at the rear. The potatoes fall some distance upon the shaker, with sufficient force to jar the soil and break lumps. The shaker, which is of the grid variety, being violently agitated by the mechanism above referred to, separates the earth, while the potatoes, passing from the edge of the shaker, lie upon the top of the separated soil, in convenient position for drying and gathering.

FIRE EXTINGUISHER.—Jacob B. Van Dyne, Louisville, Ky.—This fire extinguisher has the distinguishing feature of not being liable to mix the chemicals unless completely inverted. Then it acts with unerring certainty and with great efficiency.

DETACHABLE LAMP COLLAR AND SAFETY TUBE.—Chas. B. Mann, Baltimore, Md.—This invention consists in forming a lamp collar in two parts, one of which is secured on the neck of the lamp in the usual way, while the other is a permanent attachment of the long wick and safety tube and has vent holes for escape of gas. The device is to be attached to glass lamps by the manufacturer, and thus they will be put upon the market ready provided with a perfect safety attachment, and can be sold at a trifling cost above that of the ordinary kind, or those having the ordinary burner.

RIGGING FOR VESSELS.—George Taylor, of Harwich, Mass.—The main object had in view in the present invention is to save life by rendering it unnecessary for sailors to go on to the bowsprit of the vessel in rough weather. On the great number of schooners which comprise the fishing squadron of the eastern coast, as well as on most sailing vessels, the bowsprit is the point of danger to the sailors. Connected with the lower end of the jib is what is known as the "bonnet," which is, when in use, a prolongation of the jib. This bonnet reaches out over the bowsprit, and has to be furled or removed in rough or stormy weather. To do this the sailor must go out on to the bowsprit, which is almost always wet, and frequently covered with ice, and many a poor sailor, in the line of his duty, goes on to it who is never seen again. The present invention consists in so attaching the bonnet to the jib and supporting it by the bowsprit as to render it unnecessary for the sailor to leave the deck in furling or removing it. The method of removing or furling the "bonnet" of a schooner or other vessel without the necessity of causing the sailor to go out on the bowsprit, by attaching the said bonnet, by loops and line to the jib, and operating said line in a peculiar manner, constitutes the claim allowed.

CONICAL STOP COCK.—J. Evans Jones, of Tidioute, Pa.—This invention has for its object to permit the removal of truncated conical plugs or stopcocks from their shells for inspection or repair without endangering the fastening devices. The invention consists in causing the small end of the plug to protrude through the shell, and in providing it with a projecting button that may be struck by a hammer or mallet whenever it is necessary to loosen the plug for removal. The ordinary stop cocks also protrude through the shell, but are held in place by nuts applied to their small ends. When, after removal of the nut, a plug is to be loosened in its seat, it must be hammered at the small end. Thereby the plug is frequently very much injured, and often entirely ruined, the screw threads being destroyed or battered. This injury is prevented by the projecting plug, which has no screw thread at the small end, but is held to its place by a cap and screw applied to the larger end, and fastened to the shell by screws. Whenever the plug is to be loosened for removal, it can, after the screws are taken off, be struck on the button at the bottom without injury.

DEVICE FOR FORMING LETTERS ON THE CIRCUMFERENCE OF METAL DISKS.—Stephen M. Ott, of Newark, N. J.—This invention furnishes an improvement in forming raised letters and other devices upon the edges or circumferences of metallic disks, which will, it is claimed, enable said devices to be formed more accurately and at much less expense than when engraved upon said edges in the ordinary manner. In forming the letters or devices, the disk or blank to be operated upon is placed in the circular cavity formed by dies, and is operated upon by a press, drop, or other suitable device to force the metal of the said wheel or disk into the sunken letters or devices of the dies, and thus form the raised letters or devices upon the circumference of the disk or wheel. If desired the dies may be used as a mold, and the wheel or disk cast into the circular cavity. This device is designed especially to form the letters upon the wheels of printing telegraph instruments, hand stamps, etc., but may be used with equal advantage for various other purposes.

DRESS GOODS HOLDER.—Albert S. Grant, of Rochester, Minn.—This new and improved dress goods holder, for use in stores upon counters or tables or in windows, for holding the goods as they are commonly held by hand for exhibiting them to customers, consists in a hook, or other equivalent holder, adapted for holding the piece of dress goods when gathered as they are customarily held in the hand, supported above the counter by metal socketed holders, for the support of rods, having on the tops the yoke or hook, or any equivalent, for holding the goods. The rods are fitted into the metal sockets by a tapered point, so that while always fitting snugly to prevent swinging or rattling, they will admit of being taken out readily. It is proposed to employ these hooks in show windows also, in place of the frames, boxes, cords, or other devices used therein; but they are intended more particularly for use over the counter. The present mode of holding the goods by hand is very laborious for the attendant and highly desirable to avoid. By this invention the work can be done equally as well as, if not better than, by hand. Among other advantages of the invention, to salesmen as well as to buyers, is that a salesman can arrange a pattern or patterns of dress goods in these holders for the inspection of the purchaser, and then attend to other customers; for by the above arrangement he would not have to hold the goods by hand, and thus keep other customers waiting, while the first at his counter were inspecting his goods at their leisure.

BRAKE FOR RAILWAY CARS.—Anton Tatzel, Sr., and Friedrich Kinn, of New York city.—Frames pivoted to or hung upon the axles are connected rigidly with the brake shoes and guards by arms. The frame cannot ordinarily swing on the axle to drop the brake on the track, as rods, above the axle, connect it with levers at both ends of the car, which levers are locked in suitable manner. In case of an emergency, when the car approaches a place of danger or a person falls in front of the wheels, the front lever is quickly dropped by the attendant, which allows the brake in front of the wheel, by its own weight and the friction of the wheel, to drop upon the track right in front of the wheel. The wheel in its further motion runs upon the concave part of the brake, and is thereby lifted from the track, spending its power against the brake, while, it is claimed, the motion of the car is speedily but gently arrested by the excessive friction of the brake shoe on the track. The shoe is flanged to prevent it from running off the track. The rods connecting the shoes with the levers are jointed, to permit lateral bending, which is necessary when the car runs on a curve. By the introduction of this invention, the inventors believe, many accidents will be prevented to the cars in motion and to persons falling upon the track.

BLACKING AND BRUSH HOLDER.—Ephraim H. Sweetser, of Salem, Mass.—This invention consists of a large flat bottomed metal cup with a set screw and stud, adapted for receiving and holding blacking boxes of different sizes upon the bottom, with a long, partly cylindrical and partly conical case fitting on it in the place of a cover, and being open at the top to receive the daubing brush, which is made round with a knob at the top for a handle, to adapt it to fit into the top of said case for being kept in said case, and so that the top of the brush forms the cover of the case. This apparatus makes a neat and simple device for holding the blacking and the daubing brush, and preventing the smearing of the shelf wherever the articles are kept.

KNITTING MACHINE.—Hugo Guenther, of New York city.—This invention relates to the Lamb or other knitting machines, and consists in providing the needles with detachable shanks. The shank is provided with a hook, and is used in combination with a needle having a short upturned ear, by which means certain ends are accomplished not easy to explain in a mere verbal description. The invention is ingenious and applicable to many knitting machines now in use.

RECIPROCATING STEAM ENGINE.—John Shepherd and Carlos A. Clark, of Bloomfield, Iowa.—The steam cylinder has a piston rod working through a stuffing box in the cylinder head in the ordinary manner. The rod has two pistons. The steam chest is an open cylinder, piston valves working therein over the steam ports. The exhaust port is in the middle of the cylinder and the steam pipe is at the middle of the steam chest. The water of condensation, as well as the steam, is claimed to be discharged twice at every stroke or revolution of the engine. By this arrangement, the inventor claims that there is no place for waste steam, and that the piston cannot be retarded by the water of condensation, as the latter finds its way to the exhaust port by its own gravity. If desired, the steam chest and cut off valves or pistons and the induction ports might be applied to engines in common use.

ANIMAL TRAP.—John Rollins, of Kingston, Tenn.—The animal, say a rat, is induced by suitable bait to enter upon a peculiarly safe looking floor or trap door in the end of a box. Reaching the bait, he nibbles. Nibbling he is lost, for the slightest motion of the bait unlatches the trap door, precipitating him into a chamber and closing the entrance. Seeking to escape from this predicament, he finds a promising looking wire grating which yields readily to the pressure of his insinuating nose, and he passes into another chamber, the fatal grating closing behind him. The motion of the grating operates a device whereby the trap door is again set in position to admit a second prowler, while it shuts off all communication with the first. Second prowler, being arrested in his work of theft, travels the same road as the first, setting the trap for a third and so on. The whole arrangement is ingenious and cheap, and forms an undoubtedly good and efficient trap.

MACHINE FOR SOLDERING CAN CAPS.—William B. Bishop, of Brooklyn, N. Y.—This invention has for its object to improve the construction of an improved machine for soldering the caps upon sheet metal cans, for which Letters Patent were granted November 29, 1870, to make it more convenient and effective. This machine was in its original form a most ingenious combination of devices. Five claims have been allowed for improvements which now render it, we think, a first class machine for the purpose.

WATER WHEEL.—William G. C. Mastersun, of Proctorsville, Vt.—This is a wheel of the turbine class, but so strikingly different in many ways from those familiar to most of our readers, that it will be very difficult to give any idea of its construction in a verbal description. The entire wheel, the rotary part as well as the chute, although independent of each other, may be raised by the water, receptacles being formed beyond the outlet slots of the rim for water which acts as a cushion and also as a regulator to steady the motion like a balance wheel. The gate is self acting. The mechanism by which these results are attained is very unique and ingenious, showing that the inventor is fertile in mechanical resources.

BRAKE LOCK FOR WAGONS.—Lawrance and Henry Egeberg, Columbus City, Iowa.—This is an improved lock for wagon brakes, which holds the brake securely locked when applied, and prevents rattling when the brake is not applied. A bar of wrought iron is bent into V shape and secured to the wagon box. The ends of the bar are bent outward, and to them are bolted the ends of a curved or arched bar, the forward edge of which has ratchet teeth formed upon it. The brake lever is made with a band or offset, so that it may cross the outer edge of the bar. By suitable devices a spring locking arrangement is caused to engage teeth in the arched ratchet bar, with sufficient force to hold the brake when applied, and to prevent it from rattling when not applied.

COMPOSITION FOR COLORING LEATHER.—Lewis C. May, Cochituate, Mass.—This invention relates to a compound to be applied to leather in the manufacture of boots and shoes, and for leather used for other purposes, for changing the color or complexion of the leather, designed more especially for changing the color of the soles or bottoms of boots and shoes, but not confined thereto. It consists in a compound which fills the pores and makes the leather bright and hard. By the use of a revolving brush, or friction applied otherwise, after the application of the composition, the complexion or color of the leather may be changed, as desired. The bottom of a boot or shoe, or other leather, may be made of a very light color, or of a dark red or other complexion or shade. This color, it is claimed, will not fade, but improves the wear or durability of the leather.

SCROLL SAWING MACHINE.—Samuel Ide, Medina, N. Y.—This is a device for straining scroll saws, and causing the upper belt on which the saw is held to draw exactly in line with the saw, whatever may be the rake or horizontal sweep of the same. The invention consists, first, in connecting the said belt with a segment mounted upon a shaft in an adjustable frame, which is acted upon by springs to draw the belt straight. Secondly, in making the bearings of said shaft laterally adjustable, and also in the arrangement of a vibrating and adjustable belt guide. By this means the belt is at liberty to be lengthened or shortened at will. The frame, shaft, and segment can be thrown more or less far forward to adjust the belt exactly in position with the saw and with the degree of rake or sweep to be given the same.

NEW BOOKS AND PUBLICATIONS.

SHAKSPEARE: His Life, Art, and Characters. With a Historical Sketch of the Origin and Growth of the Drama in England. Two Volumes. By Rev. H. N. Hudson. Boston: Ginn Brothers.

The Rev. Mr. Hudson has long been known as an able critic, and as a devoted student of Shakspeare. In these volumes he gives us the accumulated information and opinions derived from years of attentive research into the historical and other facts pertaining to the career and writings of the great poet. The biography of Shakspeare which Mr. Hudson presents is very clear and interesting, while it is supported by many collateral evidences which assure its correctness. The histories of the various works of the immortal bard, the analyses of the various plays and their several characters, are all written in masterly style. No one can rise from the reading of these volumes without experiencing a renewed interest in the works of Shakspeare, and having his attention directed to many new features of beauty and attraction that might ever have passed unnoticed but for the rare and striking suggestions of the author.

GATEWAYS TO THE POLE: An Address Delivered before the St. Louis Mercantile Library Association, January 6th, 1872, Upon the Thermal Paths to the Pole, the Currents of the Ocean, and the Influence of the latter upon the Climates of the World. By Silas Bent. Saint Louis: The R. P. Studley Co., Printers.

The author makes an able argument to support the proposition that only by following the warm waters of the Gulf Stream and the Kuro Siwo, can the North Pole be reached.

We are in receipt of the THIRD ANNUAL REPORT OF THE BOARD OF RAILROAD COMMISSIONERS OF MASSACHUSETTS, an elaborately prepared document, containing voluminous statistics. The Legislative Reports of Massachusetts, on various matters pertaining to the commonwealth, prepared under special commissioners, contain a great deal of valuable statistical information of importance and interest, and are creditable to the intelligence of her people.

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Sewing machines, cloth gathering attachment for, Willcox and Carleton.... 125,424
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Smut machines, composition stone for, Elliott and Wood.... 125,385
Soap and other materials, machine for mixing, C. Elling (reissue).... 4,854
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Steam trap, W. Robinson.... 125,487
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Stone, tool for turning, J. E. Mitchell.... 125,403
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Vehicles, adjustable metallic dash for, G. M. Peters (reissue).... 4,861
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Ventilator, car, S. E. Kirkpatrick.... 125,461
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Vise, pipe, Barwick and Farre.... 125,433
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Water elevator, steam, E. Reese.... 125,408
Windmill, S. W. May.... 125,593
Yeast for brewers and others, J. Wolff.... 125,646

DESIGNS PATENTED.

5,752 to 5,756.—CARPETS.—J. Barrett, New York city.
5,757.—WATCH KEY OR CHARM.—J. Goldsborough, Philadelphia, Pa.
5,758.—STOVE.—J. Hackett, Louisville, Ky.
5,759.—TYPE.—C. E. Heyer, West Roxbury, Mass.
5,760 and 5,761.—OIL CLOTHS.—H. Kagy, Philadelphia, Pa.
5,762.—DRAWER PULL.—J. M. Maris, Philadelphia, Pa.
5,763.—HAND STAMP.—W. E. Osborn, Brooklyn, N. Y.
5,764 and 5,765.—CARPETS.—W. R. Parks, Palmer, Mass.
5,766.—DOOR LATCH.—A. Wunder, New Haven, Conn.

TRADE MARKS REGISTERED.

737.—PLUMBAGO LUBRICANT.—American Graphite Co., New York city.
738.—SEWING SILK, ETC.—Calhoun, Robbins & Co., New York city.
739.—LIQUORS.—Cazade & Crooks, New York city.
740.—MULEY SAW HANGINGS.—W. S. Colwell, Allegheny, Pa.
741 to 743.—WHISKY.—M. R. Cook & Co., New York city.
744.—SUSPENDERS.—Fisk, Clark & Flagg, New York city.
745.—MEDICINE.—Hall & Alger, Taunton, Mass.
746.—MEDICINE.—N. Jenkins, New Orleans, La.
747.—FLOUR.—McCutcheon, Gordon & Co., Sparta, Ill.
748.—SNUFF.—A. Ralph, Philadelphia, Pa.
749 to 754.—MOWING, REAPING, AND HARVESTING TOOLS.—The Greenwoods Scythe Company, New Hartford, Conn.
755.—CUTLERY.—E. Ward & Co., Sheffield, England.
756 to 758.—MEDICINES.—C. Fleming, Sewickley, Pa.
759 to 762.—CORSETS.—Ottenheimer, Rothschild and Co., New York city.
763.—DRY GOODS.—A. T. Stewart & Company, New York city.
764.—PREPARATION OF COD LIVER OIL.—E. H. Truex, New York city.

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

20,815.—SAUSAGE FILLER.—J. G. Perry. June 19, 1872.
20,841.—RAILWAY SIGNAL.—A. Burnham. June 19, 1872.
21,275.—ICE STAND.—H. A. Roberts. August 7, 1872.
21,311.—SECURING PLANE IRON.—L. Bailey. August 14, 1872.
20,824.—DEVICE FOR PLANING.—H. B. Smith. June 19, 1872.
20,840.—BOILER FURNACE.—H. Yates, June 19, 1872.
15,995.—FIRE ARM.—G. W. Morse. May 22, 1872.
15,996.—CARTRIDGE.—G. W. Morse. May 22, 1872.

EXTENSIONS GRANTED.

19,819.—LIGHTNING CONDUCTOR.—O. White.
19,787.—WINDLASS.—J. P. Manton.
19,747.—WIRE STAPLE.—B. Boardman.
19,786.—LATHE CHUCK.—J. L. Mason.
19,806.—ROTARY CUTTER.—J. A. Woodbury.

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