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Improved Balanced Slide Valve.

It would be entirely superfluous to dwell upon the subject of valve friction in connection with this description. The great pressure to which unbalanced valves are subjected in steam engines, their consequent waste of power, and the wear resulting from their great friction, are familiar to all engineers. Engineers are also aware that many attempts at counteracting the pressure, or balancing valves, have been made, some of which have resulted in large saving of power.

Our engravings illustrate a new method of accomplishing the desired result, patented through the Scientific American Patent Agency, Sept. 7, 1870, by Owen Collier and W. H. Masterman, of Sacramento, Cal. The improvement is simple, its parts are few, and it is capable of general application on locomotives, and marine and stationary engines. The working bearings are made of steel, and have but a slight movement, so that wear takes place slowly, and the principle of the device is such that, whatever the wear may be, the adjustment takes place automatically, so that the wear will not affect the perfect operation of the invention in balancing the valve.

Fig. 1 is a perspective view of the device attached to to the steam chest of a locomotive cylinder. Fig. 2 is a vertical section, showing the interior construction.

In Fig. 2, A is the slide valve, having pivoted to the center of its upper surface, the rod, B, of a piston, D. The piston, D, runs in a cylinder which oscillates on the trunnions, E, one of which has an opening, F, through its entire length, communicating freely with the external atmosphere.

The piston rod, B, plays in a slot, C, through which steam passes into the cylinder, G, and completely surrounds the oscillating cylinder. It is evident now, that the same pressure per square inch as is sustained by the steam chest is also felt by the piston, D, and that if the area of D be made greater than the surface of the valve, A, the piston would lift the valve entirely from the seat. By proper observance of proportion between the area of the piston, D, and that of the valve, the pressure on the valve may be balanced with the utmost nicety, and the loss of power through friction, as well as the wear upon the faces of the valve and seat, may be almost entirely obviated.

An ingenious method of accurately centering the piston, B, so as to make it come in exact line with its point of connection with the valve, forms part of the details of the piston, but is not shown in the engraving. By its use the adustment is easily and accurately made.

We are informed that this device has been tested for two months on the California Pacific Railroad, and that its use effects a saving of at least five per cent fuel over the unbalanced valves previously employed,

Address, for further information, Orrin Collier, Box 773, New York city, or W. H. Masterman, Sacramento, Cal.

THE iron product of the United States for the year 1869 was 1,961,641 tuns.

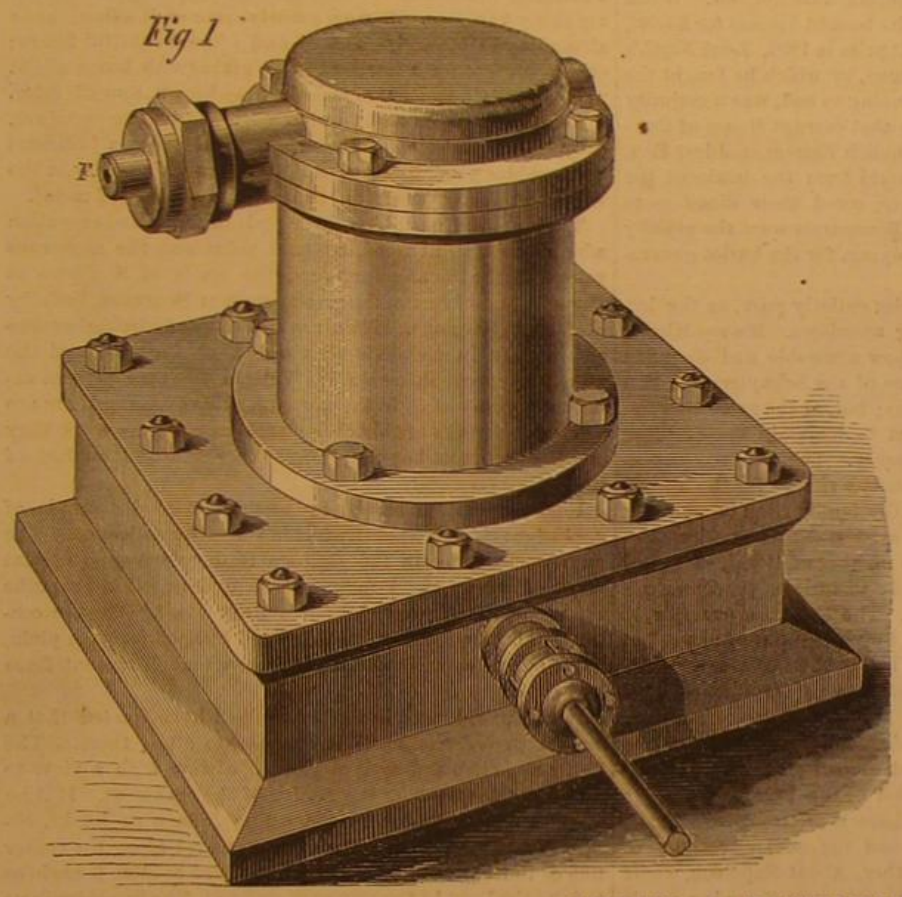
Curious Case of Asymmetry.

Instances of abnormal development of parts of the body at birth are not infrequent, but the peculiar malformation known as asymmetry is very rare, and we have only heard of two cases previous to the one we now have under consideration. Professor Humphrey has recently had a female patient, the right side of whose body is much larger than the left, the increase in size affecting all the organs, the bones, and the length of the limbs. In the skull, the right side of the crown is higher; of the jaw, lower; the right sides of the tongue, the lips, and the chin, are respectively larger than the left. The right tonsil even has a similar peculiarity. The patient is right-handed, and much stronger in her right limbs than in her left; she is free from any disease, and consulted Dr. Humphrey for a trifling local complaint. She is now twenty years old.

Speaking and Singing without a Tongue.

In the Transactions of the Philosophical Society, published between 1742 and 1744, there is an account of Margaret Cutter, who, when four years old, lost her entire tongue from a cancerous affection; but who, nevertheless, afterward retained the power of taste, swallowing and speech, without any imperfection whatever. She not only spoke as fluently and with as much correctness as other people, but also sang to admiration, articulating with distinction all her words while singing. What is not less singular, she could form no idea of the use of a tongue in other persons. This remarkable case was brought before the Royal Society, under certificates of attestation from the minister of the parish, a medical practitioner and another respectable citizen, well-known in Suffolk, where she resided. On account of the extraordinary character of the case, the Society requested an additional report upon the subject, and from another set of witnesses, named by the Society for the purpose, and for whom they drew up the necessary questions and marked out the proper course of examination. The second report coincided with the first in all particulars, and shortly afterward the young woman was brought to London, where she confirmed the account, by personally appearing, and speaking and singing in the presence of the members of the Royal Society and many other persons.

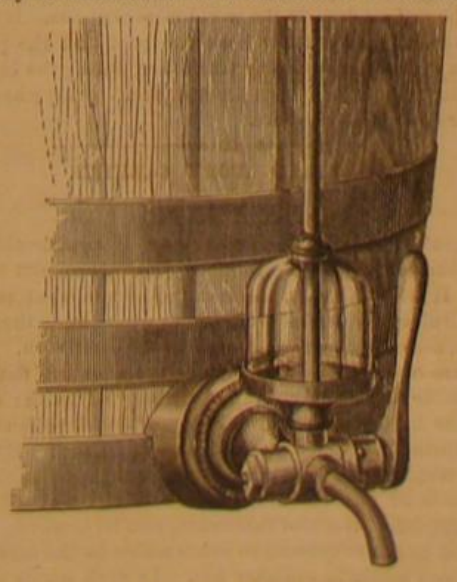
Two or three years since we gave an account of a case wherein the power of articulate speech was retained after the larynx had become entirely closed, the patient breathing for years through a tracheatomy tube. The facts in the latter case were taken from the Transactions of the New York State Medical Society.



COLLIER & MASTERMAN'S BALANCED SLIDE VALVE.

MEASURING FAUCET.

An English inventor has patented the device shown in the accompanying engraving. It is, in the form shown, intended to exactly measure the quantity of liquid transferred from barrels to bottles; but, with graduated glasses, the principle may be extended to the measurement of different quantities of liquids, in the sale of petroleum, oils, syrups, etc. The turning of the plug first admits the liquid to the glass receptacle, and when the receptacle is filled, the plug of the tap being of the form known as "two-way," turning it further on allows the fluid to escape into the bottle or other vessel designed to receive it. Air is admitted to the measuring glass through a vertical tube. This is a useful device, worthy of adoption in this country, but one which, we think, our inventors might easily improve



Kitchen Boilers.

An English cotemporary, the *Ironmonger*, speaks deprecatingly of the small amount of ingenuity devoted to the construction of kitchen boilers, and this in an age which has improved almost every article of use in the household. Selecting from a list of boiler accidents, more or less disastrous in result, we find a case of fatal explosion of a boiler, the bursting taking place in consequence of the pipes being frozen. A simple and intelligible occurrence, certainly, and, consequently, easy to be prevented. The blame is due to the builder who put up, and the maker who constructed, the infernal machine. No boiler should be made without a safety valve. A pressure of steam is always useful, especially where hot water is forced over a house; and those who have eaten potatoes boiled in a pressure of ten pounds on the square inch, will admit that it has value for culinary purposes. The valve should be fitted with an immovable weight, and then tampering with it, and all accidents to the boiler from bursting, will be prevented.

A DESIDERATUM: Lamp wicks about twice or thrice the length of the common wicks of kerosene lamps. It is well known that about one half of each wick, as at present used, is lost. Longer wicks are greatly needed.

ONE HUNDRED YEARS AGO.

A Lecture by James Parton.

The speaker began his lecture by the assertion that to-day is the best of all the days the world has seen, which he illustrated by contrasting the habitations of the olden time with those of the present day. He described the noted old mansion of Major Ben Perley Poore, at Newburyport, which three generations of antiquarians have filled with ancient utensils and furniture, and where there are whole suites of rooms furnished in the style of 1700. The speaker fully appreciated the taste and liberality which have created so interesting a museum, in which the whole life of old New England lives again. But, as the residence of a family, how inferior is this old house to the country villa of the present time, with apartments lofty and spacious, and all its implements happy hits of inventive talent—the whole house warmed by one invisible fire, and lighted at night by a turn of the hand! In these two houses we behold the interesting and musty past—the bright and better present.

The lecturer proceed to descant upon the simple, contracted, provincial life lived in the old houses, illustrating every point by some fact, unimportant in itself, but indicating more than it told. He described the way in which a country clergyman, seventy years ago, had a chaise built—taking into his family a carriage-maker, under whose direction trees were felled in the forest, and the best timber selected. It was all this artist, assisted by the village blacksmith, could do, to get the carriage done in five months; and when it was driven out, the whole population of the village came out into the streets to see it go by, and remained gazing at it as long as it could be seen.

He gave some curious particulars of the incredible ignorance that prevailed in Christendom, especially on scientific subjects, in the last century. In 1770, Louis XVI., of France, touched 2,400 persons for the king's evil, and in 1787 a poor old woman was stoned in Philadelphia as a witch. John Wesley and Dr. Johnson both believed in witchcraft, apparitions, and haunted houses; and Dr. Johnson himself was touched for the king's evil by Queen Anne. The German Goethe, the most gifted young man then living, was seeking the "virgin earth"; and many men in German universities were passing sleepless nights in trying to make gold.

When Prof. Silliman was appointed Professor of Chemistry in Yale College, neither he nor any other man in New England knew anything about chemistry, and he was obliged to go to Philadelphia to learn the merest rudiments of the science. When at last he began to lecture, in that famous old vault sixteen feet under ground, he wanted some glass retorts, and sent to the glassworks, as a pattern, the only retort the college could boast, the bulb of which was broken off from the neck. The glassmaker copied the model with Chinese fidelity, and sent all the new retorts home with the bulbs and necks nicely separated.

The state of medical science, the lecturer thought, was pretty fairly shown by a remark of Figaro, in the "Barber of Seville": "All the garrison take physic to-morrow morning, and I have had interest enough to get the contract for giving them their dose." In the olden time, doctors bled for almost every disease, drawing blood sometimes from the arm, sometimes from the foot, according to their fancy. Mr. Crawford, a candidate for the Presidency in 1824, was stricken with paralysis in the midst of the campaign, and was bled twenty-three times in three weeks, very profusely each time, and then people wondered that it took him three years to get well.

Along with this gross ignorance, there existed a certain dread of the advance of knowledge, as if it were impious for man to pry into Nature's secrets. When Dr. Franklin invented the lightning rod, a Harvard professor had to come forward in a pamphlet and defend Franklin against the charge of presumption. The speaker quoted from an article of 1759, in which the actors of Drury Lane theater were severely reprehended for imitating thunder and lightning in the tragedy of Macbeth. A similar feeling exists to this day, where a dealer in lightning rods is often obliged to discuss theology before he can drive a bargain.

In point of humanity and benevolence, the progress of man has been so signal that even the cynical and despairing Carlyle could scarcely deny it. It is only ninety-eight years since Howard found the jails of Europe to be filthy dungeons, the keepers of which had the privilege of selling liquor and tobacco to the inmates; so that the jail was only an infernal tap-room, wherein men and women, old and young, festered and rioted together. The very year in which Howard began his work, a woman was burned at the stake in Spain on a charge of having made a compact with the devil. The lecturer drew a hideous picture of the torture and execution of poor Damiens, a crazy fanatic, who grazed the skin of Louis XV., of Europe, with a penknife, and was torn limb from limb by four horses, after undergoing unspeakable torments of various kinds. The awful fact of this case was that all France applauded the punishment, and Europe was not shocked at it. No one protested or interceded; and, if we may judge from the memoirs of the time, all Christendom seemed to regard the penalty as just and proper.

Mr. Parton alluded, also, to the criminal system of England at that time, when, after each assize, whole cartloads of malefactors, men and boys, were taken to Tyburn, and executed—sometimes five or six carts, full of criminals, going to the place of execution, one behind the other, the criminals themselves laughing and singing.

Turning from these graver aspects of the subject, the lecturer commented, in a ludicrous vein, upon the manner in which children were treated in the good old times, and gave an amusing account of his own experience, in a New York school of ancient pattern. Washington Irving, he said, who went to school in New York soon after the Revolutionary war, was so affected by the sight of the punishments inflicted, that the teacher had to let him go home with the girls before whipping time came. Gibbon also records that his knowledge of the Latin syntax cost him a good many tears and some blood. The first President of Harvard College was a great whipper of the students, and at last he pummeled one of them so severely with a cudgel that even the old Boston Puritans could not stand it, and turned him out. At the same time, the speaker contended, weak parents were just as foolishly indulgent toward their children as they are now. He gave, in illustration, that curious scene from the memoirs of the Countess de Genlis, where a spoiled child insists on having the flowery head-dress of the Countess to play with, and sticks to the point until the Countess is obliged to take it off.

The speaker remarked upon the tendency we all have to regard the great evils of the day as things new or very recent. He used to suppose that the contentions of the bulls and bears in Wall street was peculiar to the present time. But when Blennerhassett arrived in New York, toward the close of the last century, he found plenty of bulls and bears here, although the objects of the strife then were lands and lots. There were cornering and rings, and selling short, and all the other devices now practiced, though not called by their present names. Corrupt politics were not new. When Palmerston entered Parliament, he bought his seat for £5,000, which he tells us was the market price in 1804. Lord North's majority in the House of Commons, by which he fought the American Revolution from beginning to end, was a majority bought and paid for; and it was that corrupt House of Commons which dismembered the English Empire, and lost England her chance of ruling the world from the banks of the Hudson. Ireland, Poland, France, owed their disasters to corrupt politics, and the bandit Bonapartes were the penalty which France has paid, and is paying, for the harlot governments of the Bourbons.

Nor were politics in the Colonies entirely pure, as the lecturer showed by some amusing anecdotes. Bishop Kip, of New York, has lately told us how agreeable and dignified New York society was in the time of the Schuylers, the Van Rensselaers, and the Livingstons; but, at the same time, he has given us to understand that to maintain one of those fine families required half a county. This was too expensive; for nothing must be accepted as victory for the human race until every honest and worthy family shall be as truly refined and dignified as the best aristocrat that ever lived.

The lecturer concluded with a number of items, short and sharp, in which the progress made in various provinces was indicated rather than expressed. The *Press*, for example, in London, paid two pence a dozen for paragraphs of news; but recently the New York *Tribune* had paid $3,000 for a simple cable dispatch. From pack-horses to palace cars—what a step was there!

After continuing in this strain for several minutes, the speaker remarked upon the great difficulty of getting a genuine knowledge either of the past or the present, owing to the fact that crimes, wars, and disasters are recorded at great length, while virtuous actions and the nobler triumphs of peace often escape record altogether. About Napoleon, whom the speaker seemed to regard with contempt, there is a whole library; but of the illustrious Newton we have not a tolerable biography. In illustration of this point, Mr. Parton gave a passage from his own experience, when he held the post of paragraph-maker to a New York weekly. Thinking it unjust that the press should report men's evil deeds at so much length, while passing over good actions, he determined to found a new department, which should record good deeds only. But, after ransacking all the world of journalism, and even keeping a bright lookout in the streets for acts of benevolence and heroism, he was obliged to give up the idea from the impossibility of procuring sufficient material. And yet, during that very time, as at all times, the vast majority of all the actions done in the world were virtuous. It is only those who familiarly know both the past and the present that can realize the consoling truth that, during the last hundred years, there has been improvement everywhere, and real retrogradation nowhere.

WOOD AND IVORY CARVING.

BY J. D. CHAGE.

The grain and texture of wood vary so considerably that comprehensive rules of general application cannot be laid down. It is not difficult, however, to show in what respects general rules may be observed, and at what points they must diverge, according to the material to be dealt with. Some woods are of so fine a grain and so close a texture that they are capable of almost unlimited delicacy of finish; and of these, the harder sorts will take a soft-hand polish which places them almost on a par with ivory. I need only refer to that wonderful specimen of wood carving, the cabinet by Fourdinois, of Paris, from the Paris Exhibition of 1867, now at Kensington. Work of this description is, however, so exceptional as not to demand so much notice as the carving of the various woods in ordinary use. In such woods as oak, walnut, or mahogany, we have materials with a more or less pronounced grain or texture, in color not quite even, readily cut with a sharp edge, and of a tenacity altogether different from the brittle nature of stone, enabling it to bear considerable undercutting or perforation without risk. These are all qualities admitting of or requiring special treatment.

To commence with the first-named condition—the visible grain or texture. It is obvious that the workman will select for his carving that wood which is most *even* in texture, grain, and color, since all strongly marked grain or figure tends to confuse and destroy the effect of his work. Still, even when he has done this, he has in *oak* a very apparent grain, and here and there some amount of "figure." The carver in oak, therefore, must seek carefully to execute his work in such a way as to overcome the opposition which these qualities present. His lights must be preserved broad, clear, and in high relief; the leading intention of all foliage distinctly marked, the finer lines or stems preserving a sharp outline. The shadows must be bold enough to explain the forms, intensity being given by bold undercutting. Much assistance to the expression may be given by the actual tool marks. Nothing is so fatal to the spirit of wood carving as glass paper. Yet, bold though the execution of the work be, it need not appear coarse; the strength and tenacity of the material allow of thin edges and considerable freedom as to detached and perforated work. But, above all things, let the wood carver avoid a thick, square edge—an edge at right angles with the face of the work. This at once gives his work a *stony* character, which no mere finish will obviate.

I know no examples better illustrating the exact capacities of oak than the exquisite stalls of Amiens (1528), and the beautiful paneled door inclosure by Paul van Schelden, in the Town Hall of Oudenarde. There is an excellent model of the latter in the Crystal Palace. In walnut wood we have a material extremely suitable for the carver's art. There are many varieties, differing greatly from each other; some abounding in strongly marked and often beautiful figure; others presenting a mellow, even grain (with but a slight "streakiness"), and an agreeable gray-brown tone of color. When this latter class of wood is used (and its fine pores are, upon the completion of the work, filled up by a judicious wax rubbing), results may be obtained as satisfactory in the way of wood as those from bronze are in the way of metal.

To those who would learn the style of finish and execution adapted to walnut wood, I would point out the numerous works of the Siennese carvers, the stalls of S. Pietro at Perugia, and of Santa Maria Maggiore at Bergamo, both by Stefano de Bergamo. There are also some admirable benches and a desk in the Sala di Cambio, at Perugia, and the numerous grand doors in the Vatican likewise present excellent specimens. In the museum at Kensington there are a few good works of this class; modern Siennese work they are, but the artist has well caught the style and method of the old carvers.

I do not call to mind any prominent good example of *ancient* carving in walnut wood in the latter collection. The numerous coffers in the Cartoon Gallery have no special merit of execution. I must not be understood to proscribe the use of the figured class of walnut wood. On the contrary, this, beautiful in itself, should be used for such plain, flat surfaces as will exhibit and derive embellishment from its beauty.

It will be observed in the examples I have quoted that a certain *precision of touch* is common to all of them. The lights are crisp and well preserved, always with a view to carrying the eye along the motive of the ornament. If it be a scroll with a fine stem connecting foliage or husks, observe that the eye is always made to travel along the center line of the curve. The section of foliage or stem is such as to take the light in the proper direction. The fine stem is so sharply cut (though sometimes a mere thread) as never to fail in expression, either by means of its fine high light or sharp little shadow. In this way even the finest lines are not allowed to be lost in the dark color of the wood. It will be found also that excellent use is made of the tool marks, which greatly assist the expression of the work.

Holding a place superior, but closely allied to the finer woods, is ivory. This beautiful material has been very highly prized for the purposes of art from the earliest times. Its close, homogeneous texture peculiarly fit it for the finer kinds of carving, and the beautiful surface of which it is capable, together with its soft, even tone of color, have frequently induced artists to adopt it for works of a size considerably beyond what we need consider now. The form and size of its natural growth may, in a general way, be taken to limit the size of its use, which is therefore ordinarily confined to a surface of a few inches. There is hardly any limit to the finish and elaboration of detail which may be given to a few inches of ivory. High relief or low relief appear to equal advantage, and the conditions attached to it appear most simple. The work must never be rough or coarse, and must always exhibit the exquisitely delicate texture of surface which is natural to it. Its strength admits of its being undercut to almost any extent, and of being worked to almost any degree of tenuity, whilst the remarkably soft gloss of its surface exhibits to advantage either the boldest or most delicate roundings.

THE engineering establishments of the Clyde, Scotland have been well employed. The demand for sugar mill machinery for all parts of the world, has exceeded all previous experience. The value of the general exports of machinery for the past year, were some hundreds of thousands of pounds in excess of those of 1869. The value of the vessels built and supplied with machinery, for 1869, in the Clyde, was estimated at $25,000,000, and the business in ship building and marine engineering for 1870 was fully equal to that of the previous year. The opening of the Suez Canal has, for the time being, given a direction to the construction of screw steamers, to the displacement of sailing vessels. There are probably not more than four sailing vessels at present being built on the Clyde.

A VEIN of copper has been found in Lycoming county, Pa.

Mr. Lockyer on the Eclipse.—American Observers.

Mr. Lockyer, the English astronomer, in speaking of the eclipse, says:

Cloud in Sicily, cloud in Spain, cloud in Africa. Such, at first sight, might seem to be the only result of all the observations made on the eclipsed sun of 1870; such the reception given by Nature to those who wooed her as she had never been wooed before; who approached her full of the rarest gifts which science has placed at man's disposal. But, after all, has the oracle been silent? I think not. Dare we, however, say that the great problem of the corona, that one among the many still outstanding difficulties which the eclipse was invoked to settle, is settled? This, perhaps, would be saying too much; but still, I think, a step in advance has been made. The oracle has spoken darkly, perhaps, but it has spoken.

The system of sketching, introduced for this eclipse, is at once so simple and final, that the only wonder is, it has not been introduced before. The corona must be either solar, atmospheric, or subjective; that is, more or less built up in the observer's eye, while this more or less depends, *cæteris paribus*, upon the brilliancy of the undoubted solar portion. If at all stations, the stations being as wide apart as they have been this time, the drawings be similar, the corona would be undoubtedly cosmical; if dissimilar, then it would either be terrestrial or subjective; and this point could and would have been settled this time, if the weather had permitted, by arranging the observers *in pairs*—that is, dealing with two observers instead of a single one, and so obtaining the eye-variation.

This being premised, what is the result of the very few observations, comparatively speaking, which have been made? In the first place, I submit that the fact that the corona is a compound phenomena comes out in an unmistakable way. We have, first of all, a ring some 5 min. or 6 min. high round the moon, which almost all observers alike have seen; and then we have light beyond, which some observers have seen of one shape, and some of another, now stellate with many rays, now stellate with few, now absolutely at rest, now revolving rapidly.

This, I think, is the keynote of all the observations with which I have become acquainted. I need scarcely say that it is exactly what has been predicted.

First among the fortunate ones who observed the corona, with the telescope, was Professor Watson, of Ann Arbor, who took up his station at Carlentini, and appears to have been the best favored among the Sicilian observers. From his account I gather that there was an almost perfect shell around the sun, 5 min. high, and that outside this shell were less definite rays.

Next I must mention Professor Pierce, the head of one of the American parties, who observed two miles north of Catania, at a private casino of the Marchese Sangiuliano. I believe that he also saw the shell, but of this I am not absolutely certain; but he distinctly observed that the outer corona over the prominences was rosy red, although he did not see the prominences himself. A more beautiful proof of the terrestrial nature of this portion of the corona it would be difficult to imagine; for, of course, at the sun, the hydrogen, which thus tinged it, is incapable of coloring anything, as its own light is absorbed by the transcendent brilliancy of the photosphere; while nothing would be more natural than to suppose that the light, which, in its own atmosphere, should strongly tinge any thing radially illuminated, should be that of the prominences.

But the strongest proof of the variability of the outer portion, and of the constancy of the inner portion, is afforded by the observations made on board the small fleet attempting to save the *Psyche*, off Aci Reale, where the eclipse was observed in unclouded splendor. Here were the ironclads, *Lord Warden*, *Caledonia*, and *Royal Oak*, and the tugs *Weasel* and *Hearty*, besides the Italian gunboat, *Plebiscito*, all within a stone's throw of each other. In all the drawings, and many have been received, we have a ring 5 min., or thereabouts, while the outer portion is as variable as may be.

I think that if the records of former eclipses be now examined, especially Mr. Carrington's drawing of the eclipse of 1851, and compared with the others taken at the same time, additional evidence will be gathered in favor of the compound nature of the corona, which, on the evidence now before me, I consider the great teaching of the present eclipse.

The Characteristics of Silver.

Professor Dembinsky, in the *Mechanics' Magazine*, gives the following facts in regard to silver:

Silver is malleable, ductile, laminable to a high degree, though inferior to gold; it is not changed by the air.

A wire 1-10 inch will support 270 pounds of weight. It is fusible at 1873° Fah., and remains in fusion at a lower temperature than is required to bring it into fusion.

If by means of a solution of borax a small bit of leaf silver be stuck to the top of a small glass cylynder and melted into it, it will give it a golden tinge.

By long exposure to violent heat it has been converted into a glass of an olive-green color. In the focus of a burning glass it yields a white pulverulent matter, and there appears to exist but little affinity between it and oxygen.

Gold and silver readily combine and form a useful alloy. Having different solvents, they may be parted three different ways:

1. By dissolving the silver of the alloy by nitric acid; but for this process it is necessary first to take care that the gold is more than a quarter part of the mass. This process is called quartation.

2. By cementation, or parting by concentration, the alloy being placed in a crucible, in strata, with the cementing powder. The ingredients of this powder must be such that by an intense heat it will yield either pure nitric or pure muriatic acid vapor, as these will lay hold of the silver and leave the gold untouched.

3. By dry parting, which is by fusion with sulphur, the silver quitting the gold to unite with the sulphur. When silver is alloyed with copper it is rendered hard and fit for silversmiths' work and for coinage.

The alloy for the British coinage is 11 ounces, and one pennyweight fine.

With sulphuric acid, if concentrated, the silver is converted into a true oxide of silver, mixed with a small quantity of sulphate of silver. It is dissolved in nitric acid with rapidity if water be added to the acid, and much nitrous acid gas is disengaged.

The solution is at first blue, but this color disappears when the silver is pure, and degenerates into a green if it be alloyed with copper.

Nitric acid will dissolve more than half its weight of silver, the solution letting fall crystals in hexagonal, triangular, or square plates, which are called nitrate of silver, or lunar crystals, lunar niter, or caustic of silver.

This, melted with a gentle heat and poured into molds as soon as fused, forms the *lapis infernalis* or lunar caustic.

By fixed alkalies, silver is precipitated from its solution white, by ammonia grey, and by lime water olive green. It may be precipitated from a dilute solution by a plate of copper. The silver adheres like moss to the copper, and the liquid acquires a blue tinge from the copper, which is dissolved in place of the silver. It is likewise precipitated by mercury, with which it will also amalgamate. These crystals being articulated into each other give them the form of a vegetation, known by the name of the Tree of Diana, Arbor Dianæ, etc.

Nitrated silver, being precipitated and separated from the solution, exposed three days to the light and air, and mixed with liquid ammonia, becomes, when dry, fulminating silver. This exceeds gunpowder, and even fulminating gold, in power.

Once obtained it cannot be touched without a violent detonation, the weight of one grain being sufficient to give rise to a dangerous fulmination, and the silver is then found reduced or revivified, its oxygen having combined with the hydrogen of the ammonia, by which water is produced. This water instantly vaporizes, and possessing all the elasticity and expansive power of that state is the principal cause of the phenomenon, in which the nitrogen of the ammonia with its whole expansibility bears a part.

It is readily combined with muriatic acid by adding this acid to a solution of silver in the nitric acid, the muriate of silver being precipitated. This muriate is very fusible, running into a gray and transparent substance, like horn, which is then called Luna Cornea, or horn silver. This, being fused with four parts of potash, the silver is found in the purest state, and under a stratum of sulphate of potash and the remaining alkali.

It may likewise be decomposed by several other metals. If re-dissolved in pure nitrous acid, horn silver will be obtained, and a small quantity of a black powder remain at the bottom, which seems to have the property of gold. To appearance, part of the silver is converted into gold, but this is accounted for by the silver containing it, although called pure.

The muriate of silver exposed to the light of the sun soon becomes brown, oxygen gas being disengaged.

Nitrated silver and most of the solutions of metals thus emit their oxygen and become colored.

Carbonate of silver may be obtained by precipitating it by the carbonate of alkali.

Sulphur unites with it, and this sulphuret of silver is known as vitreous silver ore.

An alkaline sulphuret of silver may be obtained by fusion with alkaline sulphuret, and from the solution of this a hydro-sulphuret of silver may be obtained by precipitation by an acid.

Phosphuret of silver is obtained by the fusion of silver and phosphor. A mixture of vitriolic and nitrous acid has the peculiar effect of dissolving silver copiously, also oxidizing tin, mercury, and nickel dissolving, however, a small quantity of the latter, and having little or no action on other metals.

By dilution the mixture becomes less capable of dissolving silver, and more capable of acting on other metals.

Stucco and Plaster Work.

The treatment of stucco and plaster work may be classed under two heads: that molded by hand, and that cast in molds. The two methods may also be blended. In working plaster-relief ornament by hand, a great freedom of touch and variety of form are attainable and desirable. At the same time, thin edges or deep undercutting are rendered undesirable by the friability of the material. The degree of finish must depend rather on the conditions of application, since its texture may be rendered as fine as that of ivory, and a pure and even tone of color may be obtained, either in the material or by subsequent tinting. Almost any degree of vigor may be given by bold modeling, keeping the lights broad, and not too much softening away the tool marks.

Excellent examples of plaster treatment may be seen in the ceilings of many old London houses of the period of the Georges, and the elegant and spirited stuccoes of both ancient and medieval Italy afford valuable teaching. Where the ornament is intended to be painted or colored, care should be taken to avoid narrow quirks, which may become stopped, and thin edges, which will easily be broken. If the relief be very low, an indented outline is useful. For the treatment of plaster ornament cast from molds, we cannot do better than observe Arabic or Moorish work. Ornaments produced in this way should be clear, well defined, not undercut, and arranged so as to draw readily from the mold, and require little subsequent finish. It is applicable, of course, chiefly for repeated or diaper ornament. In Moorish work, beautiful soft gradations of shade are obtained, not by rounding, or molding the face or edge of the ornament, but by introducing two or three distinct *strata* of ornament, interlacing with each other, each on its own level—a plan in every way adapted for work cast in molds. In combining the cast and hand-worked methods, the simpler and more rigid parts may be cast, leaving the lighter detail to show the workman's hand.

Cotton Gins.

The return of peace, and the consequent increased attention to the culture of the great southern staple, have caused marked activity in the department of cotton gins.

On account of the present efficiency of the McCarthy gin, the subject in England of at least a hundred patents, or on account of the laudable desire of our inventors to produce a machine which will perform more work in the same time, there has not been a single improvement patented on this gin during the past year. This gin, otherwise known as the roller gin, is composed of two cylinders, revolving toward each other, and provided with a fixed blade which bears against the upper cylinder just above the point where the cotton is presented, and a reciprocating blade which, in its downward motion, strikes against and removes the seeds from the cotton fiber, the cotton being drawn in a clean condition through the rollers. This style of gin is employed to gin Sea Island or long fiber cotton exclusively; but while it works well, it moves slowly. The saw gin on the contrary, which is employed for the common or short fiber, is, in its ordinary form, totally unsuited for Sea Island cotton. The rapidity of its operation, however, has attracted the attention of several inventors, and efforts have been made to adapt it to ginning Sea Island cotton. It is obvious that any improvement which would effect this result would be of great importance, as it would materially reduce the price of long fiber cotton, of which only about forty pounds per day can be ginned by the ordinary roller gin, while a saw gin, if effective, could gin five times that quantity.

Of the improvements made in this direction two have reference to the saw and one to the rib. Those of the former character consist, first, in substituting, for every alternate saw, a disk without teeth, thus widening the distance between the saws and preventing the tearing of the fiber, which is, at the same time, supported by the disks; and, secondly, in constructing each saw with blank places at intervals of, say, every six teeth, the area of blank spaces being about equal to that occupied by the teeth. The improvement on the rib consists in constructing the same with a ridge on the hopper side of the ribs, which ridge serves, to hold the fiber while being acted upon by the saws, and to prevent them from taking hold of it at too short intervals, whereby breaking is apt to take place.

Several patents have been taken out on what may be called the saw roller gin, comprising, as it does, many of the features and advantages of both the saw and roller gin. In this machine there is provided a large cylinder, which may have saws, but which is generally covered with a serrated wire arranged spirally. Between every two circles of this serrated wire is placed a packing of some description, generally metal. Above this cylinder, and revolving in the same direction, is placed a small corrugated or fluted stripping roller, which strikes back and removes the seed, etc., its operation being assisted by a horizontally reciprocating bar with a plain or serrated edge.

A patent was granted during the year for an improvement intended to adapt the ordinary saw-gin to cleaning cotton seeds. It is known that the ordinary gin turns out the seed covered with lint to such an extent that a ton of the seeds will sometimes have as much as eighty pounds of cotton adhering to them. Nor is this loss of cotton the most objectionable feature, for seeds th s covered with lint have a tendency to clog in planting, rendering that operation difficult. The improvement referred to, and it is the only patent issued during the year for the purpose, consists of a longitudinally grooved roller placed in the hopper in front of the saws, and which serves to keep the seeds in a state of continual agitation, every side of each being presented to the saws, which completely remove all the adhering lint.

An ingenious English patentee some years ago proposed to remove this lint by passing the seeds over a flame, and employed an endless apron of wire cloth for that purpose, while an American inventor, at a later period, claimed to have discovered an equally efficacious remedy, namely, the application of gunpowder, sprinkled among the seeds in sufficient quantity, and then fired. As the "sufficient quantity" is the all important question in the process, it will be well to make sure of it before experimenting, as an overcharge might remove the seeds as well as the lint.—*Commissioner Capron's Report.*

NEW STEEL PEN.—A new form of steel pen, containing a reservoir of ink, has lately been introduced by a Birmingham (Eng.) firm, who have named it, with a singular oblivion of the meaning of the word, the "*Automatic* Wonder Pen." The patentees claim that a fortnight's supply of ink can be carried in the pen; and from the description, we find that the ink is in a solid form, as only a little moisture, such as water, milk, or beer, is required. Pens loaded with ink of several colors are made, and are used by being dipped in the fluid, as is usual with the ordinary pen and ink.

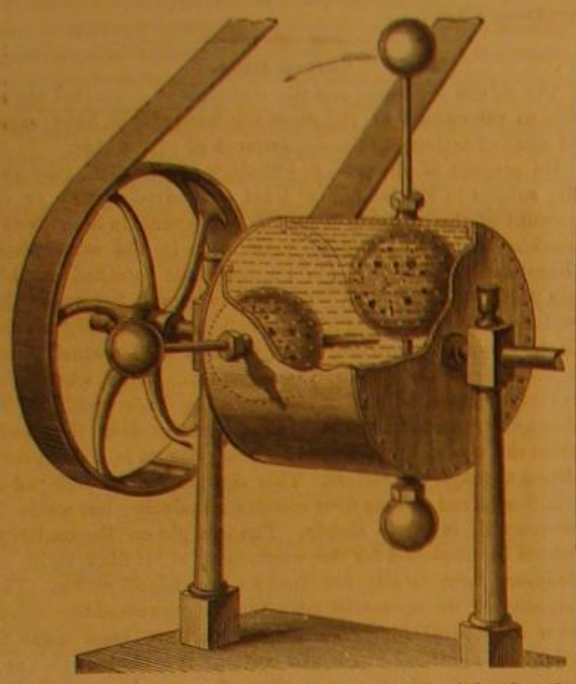
PERPETUAL MOTION.

NUMBER XII.

We this week conclude our series of articles upon perpetual motion, with an illustration of a machine, invented by a Canadian inventor, and a couple of letters upon the subject, lately received. We also would call attention to an article entitled the "Mechanical Equation," published in our editorial columns, and designed to show the folly of spending time and money in the pursuit of this chimera.

Fig. 30 is the device above referred to. It consists of a

FIG. 30.



cylinder containing a fluid, with two or more weighted rods passing through stuffing boxes in the shell. To the middle of each of these rods is fixed a ball of cork, which is expected to rise to the upper side of the cylinder whenever the revolution thereof brings it a little below the axis of the cylinder. In thus rising, it will carry the upper weight away from the center, and bring the lower one toward the center, so that it is thought the center of gravity of cylinder arms, corks, and metallic balls will be kept constantly on one side of the geometrical center, and constant revolution will result. The fact is, however, that the center of gravity will remain always in a perpendicular drawn through the axis, and, consequently, the expectations of the inventor will never be realized. Even if the movement of the arms expected to occur should take place when the cylinder is turned by hand, the decrease of weight, on that side of the cylinder to which the cork would rise, caused by the displacement of the heavier fluid, and the increase of weight on the opposite side caused by the displacement of the cork, would counterbalance the leverage of the weighted arms, and so the exact balance of the machine would remain undisturbed.

MESSRS. EDITORS:—This communication is especially designed for the benefit of those who still believe the perpetual motion of machinery possible. Let it be granted that the the terms weight and force are synonymous, *i. e.*, twenty pounds of weight will require a force precisely equal to the force of its own pressure to sustain it, or neutralize that pressure; for example: if a twenty pound weight be placed upon a scale, and a hand be placed upon the opposite scale, the force applied by the hand must equal twenty pounds to exactly balance the twenty pound weight.

So far we only affirm what every school-boy is aware of.

Keeping strong hold upon this self-evident fact, we may next affirm that each twenty pounds is at an equal distance from the center pin, or fulcrum of the beam. Observe also this additional fact. If either weight be depressed, the opposite one will rise at the same speed and through the same distance which the other has fallen; *i. e.*, equal weights will balance each other, at equal distances from a common point of support, and will move in opposite directions with equal velocities.

Suppose it be required that one of these weights shall rise faster than the other falls. To accomplish this, we must remove it further from the fulcrum or point of support. Observe that a scale beam corresponds to the diameter of a circle, and the arms to the opposite radii of this circle. To the unscientific, these self-evident definitions may appear puerile; but let them reflect that the grandest theorems of scientific investigation wholly depend upon a recognition of self-evident truths.

Returning again to what was proposed, viz.: to cause weights at the extremities of a lever to move at unequal velocities, we find that to do so they must describe arcs of different circles, as the radii are unequal.

But in removing one weight farther from the fulcrum than its opposite, we destroy the balance; for example: suppose its distance to be double that of the other, it will now move with double the velocity, but will require first double weight, or force at the opposite end to balance it; in other words, "all that is gained in velocity, must be replaced in force at the opposite end of the beam."

The converse of this is true, *i. e.*, we may cause a weight to raise a greater, as already shown, but if we raise forty pounds with twenty, we only raise it half the distance which the twenty pounds falls.

The above, being the essence of the "law of virtual velocities," needs only to be comprehended to entirely explode all possible theories of perpetual motion.

Every attempt to produce a self-moving machine has been in open defiance to the co-ordinated relations of force and motion, and any man who comprehends this law of velocities will no sooner attempt to solve the problem of perpetual motion, than to climb upon his own shoulders as a higher point of observation.

I do not propose to exhaust the numerous theories in support of the fallacy, but will analyze a few, serving as a death knell to all.

Before attempting this, let us remark that, in the search for an impossibility, so many valuable and practical certainties have been demonstrated, that perhaps no time has absolutely been thrown away; for as alchemy has fostered and developed chemistry, so has the search after perpetual motion taught how to apply force through complicated machinery, and thus, through unsought channels, has knowledge and civilization flowed all over the world.

A favorite device of the "perpetualista" is one which proposes to employ an overshot water wheel, that shall pump or convey the water back to a reservoir as fast as it comes out! To accomplish this, it only becomes necessary that all the water shall move, in equal volume or weight and equal velocity, in a given circle, or at opposite ends of the scale beam. A simple recognition of the principle laid down at the beginning of this article demonstrates that this is absurd.

The supporters of this species of nonsense, occasionally propose to lift this water above the highest point of the circle. As this supposes the less to exceed the greater, it does not require refutation. The foregoing reasoning applies with equal force to all combinations of tubes and endless chains, belts, cups, etc., proposing finally to act upon a given circle, and to be lifted back to their proper positions to continuously act upon a greater circle, or longer set of levers. The simple fact set forth, that equals can only balance equals, when acting oppositely at equal distances, completely upsets all possible theories of perpetual motion. But a few days since, one of this class of enthusiasts called upon the writer with a rude drawing, in which appeared some half dozen geared wheels, with about an equal number of mystical-appearing levers, by which he exultingly proposed to propel a first-class steamship across the Atlantic, by employing one man at a crank turning a geared wheel two feet in diameter. Of course I dissented, but his faith was sublime; and he left, evidently disgusted with my short-sighted ignorance, and mechanical bigotry. And so it will continue until minds of this class pause and observe a few simple and obvious truths, which, clearly recognized, make the theories of perpetual motion to fade like "the baseless fabric of a vision, leaving not a wreck behind."

I. D. J. SWEET.

A humorous correspondent gives the following as a method whereby a perpetual motion may be obtained. He says he has seen a steam boiler advertised which saves 33 per cent of fuel; a valve which saves 15 per cent; a governor which saves 10 per cent; a cut-off which saves 10 per cent; a fire grate which saves 20 per cent; metal packing and and damper regulator which saves 12 per cent; and a lubricator which will save 1 per cent; making in all a saving of 101 per cent. Combining all these improvements, an engine would, he thinks, run itself, and produce an additional one per cent of fuel, which might be used for domestic purposes.

IMPROVEMENTS IN CASTING PULLEYS AND GROOVED ROLLS.

The accompanying engravings illustrate improvements in lasting pulleys and chilled rolls. Figs. 1 and 2 show a method of casting pulleys invented by W. Neemis, of Pittsburgh, Pa., in which the box, A, slides, C, and pattern, B, together with the cast iron case, D, for forming the outer side or face of the pulley, are used, in conjunction with sand molds, made in the box, A. Foundrymen and molders will understand the application of the device without further description. The device was patented in March, 1867.

Fig. 1.

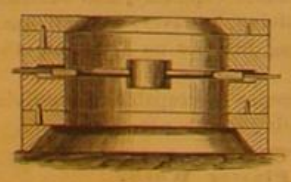


Fig. 2.

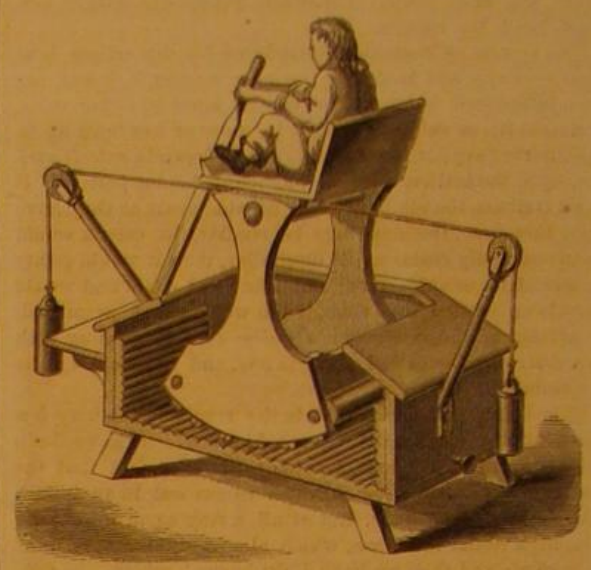
Fig. 3 illustrates a method of casting grooved rolls, invented by R. C. Totten, also of Pittsburgh, Pa., in which a series of metallic rings, made in one or more pieces, with angular, rectangular, or curved inner faces, for forming the grooves of a chilled roll, is employed. The rings are packed in a mold of sand or metallic composition, arranged, substantially as shown in the engraving, with other rings which form the cylindrical surface of the mold. This invention was patented in April, 1867.

ALL persons using coal oil, for illuminating purposes, will read with interest the statement of the manufacturers of "Astral oil," in another column.

INFANTILE POWER WASHING MACHINE.

The credit of this invention—the application of baby-power to washing machines—in the unique manner illustrated in the annexed engraving, belongs to John Highbarger, of Sharpsburg, Md., who not long since secured the patent.

A tank with ribbed sides is intended to hold the clothing, and the water and the soap. The clothes are washed by the oscillation of a rocking chair, with ribbed rocker bottom, as shown, the rocking being effected by the hands of the operator, which grasp a hand bar. The rocker is counterpoised by weights, as shown.



This plan of utilizing baby power is certainly novel, and is, no doubt, amusing to the operator, and we are sure it will be to our readers.

The Rice-Paper Plant.

It is only within a very few years that the true nature of the beautifully smooth and uniform, though very brittle paper, so largely used by the Chinese for drawings of birds, butterflies, and other objects of natural history, has been ascertained. It received its popular name of rice paper from an erroneous notion that it was made in some way from rice. It is, however, the pith of a plant not very distantly related to our common ivy, though having a very different appearance. The plant is called by the Chinese Tung-tsau (hollow plant). It grows wild in great abundance on the hills in the northern districts of the island of Formosa, where it is gathered by the natives, and exchanged on the coast for Chinese produce. It is a small tree, at first growing with a simple stem, after flowering, two or more branches are produced, and the tree increases in size until it reaches a hight of twenty or thirty feet; but as the pith deteriorates in the parts of the tree that have become old, it is generally cut down before it is twelve feet high. The large, sycamore-like leaves crown the slender stem, and, when in flower, are surmounted by several wand-like bunches of small, pale-yellowish flowers. A single flower is very insignificant, but the great number of them, borne on thin whitish-pale stalks, have a striking and beautiful effect, especially from the great contrast between them and the crown of large dark green leaves. The stem is strongly marked by the transverse scars formed by the fallen leaves. It is covered by a thickish bark, and the wood is hard, heavy, and durable.

The collectors cut the stems into lengths of nine or twelve inches. The pith is about two inches in diameter, and is very uniform in texture, except in the center, where it is broken into a series of doubly concave cavities. A straight stick is inserted into the end of each piece, and the pith is forced out at the other end by hammering on the ground The pith is then placed in the hollow bamboos, where it swells to its natural bulk, and dries straight. The pith is then dexterously cut by workmen, who hold against the cylinder a long, sharp knife, which is kept quite steady while the pith is moved round and round.

The paring thus goes on continuously until the inner broken pith is reached. Each cylinder produces a smooth, continous scroll, about four feet long. The sheets as they are cut are placed one on the other, then pressed and cut into squares of the required size. These are about three inches and a quarter square, and are sold in packets of one hundred each, at rather less than one penny the packet. The small squares are dyed different colors, and made into artificial flowers for ornamenting the hair of the Chinese ladies.

Large piths occur in other plants besides the Tung-tsau. An Indian plant named Shola, belonging to the leguminous or pea tribe, was by many believed to be the source of the rice paper. It is extensively employed in Singapore for the manufacture of floats and buoys for fishermen, and for the light sun hats worn in the east: but it is greatly inferior in color and quality, to the true rice paper. The Taccada, an erect shrub growing on the shores of India and Ceylon, has a pith of considerable size, and of a firm, white appearance. It is much used by the Malays and Siamese for making artificial flowers, small figures, and other articles used as decorations at feasts and festivals. Among British plants the elder tree has a very large pith, which has not, however, been applied to any practical use. It can be readily pushed out of the stem, in the same way by which the Chinese get the pith of the Tung-tsau. The hollow stems that remain have given to the tree its popular name of bore tree.

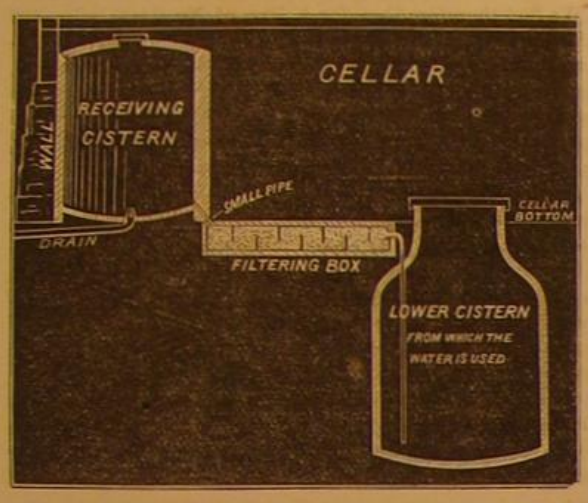
Correspondence.

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

How to Construct a Cistern.

MESSRS. EDITORS:—As some inquiries have occasionally been made in the SCIENTIFIC AMERICAN in regard to the best method of filtering rain water, I send you herewith a sketch illustrating my views, founded upon many years' experience, knowing that if it be of no value to you, no harm will result from so doing.

To obtain the best water at all times, it is not enough that the water be well filtered. To illustrate: A cistern of 2,000 gallons is filled. After some weeks of continued dry weather, the amount is reduced to, say, 1,000 gallons, at which time the quality of the water will have sensibly improved. A shower occurs, pouring into the cistern, say, 300 gallons. The 1,000 gallons is violently mixed with the newly fallen rain, and the result is, the quality of the water is injured for a time, or until sufficient time has elapsed to allow it to settle again.



Again, the process of filtration cannot properly be accomplished in the short time allowed by some devices. Water should be filtered very slowly.

Then, every filtering apparatus should be cleaned out, and all the materials employed thoroughly washed or renewed, regularly and somewhat frequently, as required by the character of the roof and the situation of the house, as regards smoke, cinders, dust, etc.

To accomplish the best results, I would construct a cistern of requisite capacity, above the bottom of the cellar, into which all the water from the roof should be turned. Another cistern of equal capacity, of what is known as the "jug" pattern, should be built below the cellar bottom, having a neck of proper size extending slightly above, and kept closed by a tight cover. Between the two cisterns, construct a box of wood or bricks, say 6 to 10 feet long, and 12 to 16 inches square, with partitions alternately extending nearly to the top and bottom, as shown. Fill this box with the proper filtering materials; broken stone, well washed coarse and fine gravel and sand, charcoal, and, finally, at the outlet, fine sponge.

The stream of water from the receiving cistern should be very small, say ¼ inch in diameter, which, entering the box box at one end, would gently percolate through the mass of filtering materials, and by a small block tin pipe, be conveyed to the bottom of the lower cistern, from which it would be pumped as wanted. The flow would be constant, or until the upper cistern was emptied. This box should also be kept closed by a tight cover, which, when lifted, would allow ready access to remove all the filtering materials, to be washed and returned, or, what is better, to be replaced by clean, fresh materials.

The bottom of the upper cistern should be concave, connecting by a pipe and stop-cock with the drain. Occasionally, when nearly exhausted, it could be easily and thoroughly cleaned and rinsed out, the sediment and dirty water escaping by the drain. The bottom of the lower cistern should also be concave, and at intervals the pipe between the two cisterns should be closed, to allow the lower one to become exhausted in order to cleanse that also.

The upper cistern should be covered by a brick arch, or by matched pine plank, made perfectly tight. Otherwise the evaporation from such a body of water will be injurious to both structure and inmates.

The device of making a filter by a brick partition, or well in the cistern, drawing the water from the side opposite the ingress pipe, is quite effectual for a time. A little reflection however, will show that the sediment taken from the water remains: either in the pores of the brick, or in the form of a coating on the surface; and that, after a time, it will vitiate its purpose, and become comparatively inoperative and useless.

The objection to the system shown is the increased expense; and those parties obliged to depend upon a rain water supply, and who, from necessity or choice, prefer the cheapest article, when first cost alone is considered, will not adopt it; but in many places in the country, where persons want permanently pure water, even if obtained at a greater expense, I think no better arrangement has been devised.

The principal value of a filter depends upon keeping it clean; and to continue to use water, month after month, after the filtering materials have become foul, is not consistent with our ideas of cleanliness, and is positively injurious.

The cistern from which the water is used being at a distance below the cellar bottom, the water is kept sufficiently cool, even in hot weather, to be very palatable.

Some persons, not using a filter, adopt the expedient of having two cisterns on the same level, both connected with the pump, using from each alternately as the other becomes exhausted. This arrangement is a great improvement upon a single cistern, but will not compare with two, arranged as shown in the sketch.

The cost of two first-class cisterns, of 2,000 gallons capacity each, with filter constructed in the most thorough manner, would, in most localities, be less than the cost of a properly constructed well forty feet in depth.

ALFRED BICKNELL.

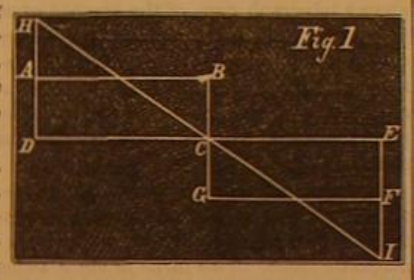
Action of Reciprocating Parts of Steam Engines.

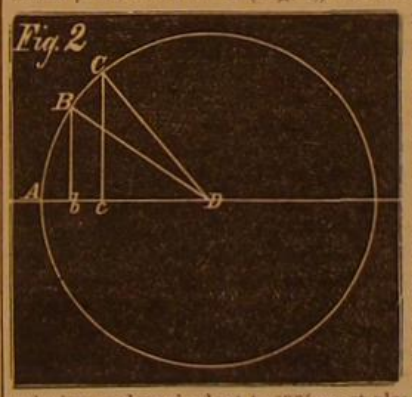
MESSRS. EDITORS:—In the paper read by Charles T. Porter, before the Polytechnic Club of the American Institute, published in the SCIENTIFIC AMERICAN of Feb. 4th, we have the following paragraph:

"We are arrived now at our final proposition: that the resistance offered by the reciprocating parts to this alternate acceleration and retardation is, at its culminating point, the dead center, precisely the centrifugal force that the same weight would exert continually if it were revolving with the crank pin."

If we admit the truth of the above "proposition," the logical inference is, that the reciprocating parts of a steam engine will answer as a substitute for a fly wheel; and that the motion will be carried through the dead points by a single crank, with sufficiently heavy reciprocating parts, as effectually as by a fly wheel.

The absurdity of this inference is so obvious that it is unnecessary to review the argument whereby Mr. Porter arrives at his remarkable conclusion. It may not be amiss, however, to call the attention of your readers to the apparent source of the error in Mr. Porter's argument: He says the line, H I (Fig. 1), is a straight line; whereas, it is readily seen, by calculating the ordinates according to his rule, that the ordinate for 45° is about two thirds of D H; and therefore the line, H C I, is a curve, with contrary flexion at C. Moreover, it is easily demonstrated that the tangent to this curve, at the point, H, is parallel to D E, and therefore the acceleration, as well as the motion of the reciprocating parts, is reduced to zero at H. It follows, therefore, that if the momentum of the reciprocating parts has not been expended in work before the crank pin arrives at A (Fig. 2), the amount of momentum not expended will, at that point, be exerted on the piston to prevent its return, and will therefore be so much force lost.





I need hardly add that, as the velocity of the reciprocating parts is reduced to zero at the dead points, the centrifugal force, which is a function of the velocity, and equivalent to $\frac{mv^2}{r}$ must also be zero at the same points.

It is obvious, therefore, that all the centrifugal force we have, in reciprocating engines, is that derived from the motion of the crank and the end of the connecting rod or "pitman," that is, from the parts that revolve.

Des Moines, Iowa. J. E. HENDRICKS.

Ice Phenomenon.

MESSRS. EDITORS:—A few mornings ago I observed a very curious phenomenon in connection with the freezing of water, which, I think, may be of interest to some of the readers of the SCIENTIFIC AMERICAN. I therefore respectfully submit it. On the evening of the 3d inst., I left a pint wash bottle, filled with water up to the bend of the neck, in a cool place, with the cork loose. The next time I looked at it, it was in the condition represented by the figure. The water had frozen, and the ice reached some distance up the neck of the flask. The tubes were supported by the ice, as shown in the figure, reaching down about half an inch below the surface. From *a* to *b* could be faintly seen the course which the tube had taken as it was forced up. R. H.

Ithaca.

Cure of Aneurism by Manual Compression.

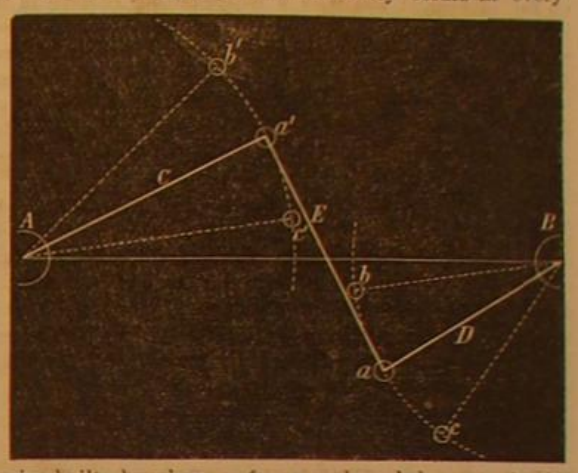
MESSRS. EDITORS:—In your journal of the 28th ultimo, you record what you demonstrate a "remarkable cure of aneurism," giving to Mr. Buxton Shillitoe the credit of being the originator of the method by manual compression. In this, I believe, you are in error. The method of treating aneurisms by digital compression was, I believe, devised some years ago by Mr. (now Sir William) Fergusson, Professor of Surgery in King's College, London. This mode was, I know, in vogue six or seven years ago, when I was in Great Britain. It is evident that it can, as a rule, only be carried on in a hospital, where the surgeon has dressers and relays of assistants from among the medical students constantly at hand; and it is, moreover, too fatiguing a plan to be adopted in ordinary practice, and would, I imagine, only be attempted in cases like the one you record, where the vessel could not be secured by a ligature.

CHARLES JOHNSTON, Surgeon and Physician.

St. John, N. B.

Practical Problem.

MESSRS. EDITORS:—Your readiness in admitting to your columns problems for solution, when such solutions are of general utility, emboldens me to present the enclosed sketch and statement, with the assurance that a thorough investigation of the matter, resulting in an accurate practical solution, would be gladly received by builders of western steamboat engines—for the problem inevitably occurs in every



engine built—by whom, so far as my knowledge extends, the answer is obtained, or "fudged out," as Byrne would say, by means of trams, etc., in a tedious and patience-killing manner.

I will not, in this article, occupy your space with an explanation of the "whys" and "wherefors," but endeavor to give, in as few words as possible, what is given and what is required in the problem, referring to the drawing to make the matter clear.

A and B, represent two shafts, parallel and in the same plane. These shafts carry arms, C and D, of different lengths, connected by a link, or connecting-rod, E. The driver-shaft oscillates, and communicates a corresponding oscillating motion to the driven.

Now the distance between the centers of the shafts, A and B, the length of arms, C and D, and angle of oscillation, b B c, or distance b c (— b' c'), *must* be given; and the length of the link *may* be given.

Required the angle that arms, C and D, make with the line between centers of A and B (above and below, as shown, to give reverse motion), length of link, if not given, and a' b' to equal a' c', and a b to equal a c. The distances a a', b b', and c c' must also be equal.

The drawing is reduced from a case in actual practice, in which A B — 14½ inches, arm C — 7½ inches, arm D — 5¾ inches, link E — 6¾ inches, angle of arm, C, with line, A B — 25½ degrees, angle of arm, D, with same line — 32 degrees, and chord of arc a b — $2\frac{5}{16}$ inches.

The relative proportions here given do not vary much in practice, but neither the arm, D, nor link, E, should be less than five inches in length.

Perhaps some of your readers can give me a readier method of solution than I now have, and thus confer a favor.

Madison, Ind. DRAFTSMAN.

Popular Errors Regarding the Watch—Chronometer Balances.

MESSRS. EDITORS:—Probably no part of a watch is less understood by the mass of those who use watches than the chronometer balance, or, more properly speaking, the compensating balance. Some persons have a vague idea of the principles upon which it is constructed, and others have no notion whatever, except that somehow it imparts some peculiar and valuable quality, and that a watch so gifted is the *ne plus ultra* of horological skill. It is very easy to explain the principles upon which it is constructed; it is only necessary to remember that if the balance of a watch be made longer in its diameter, it will run slower; if the diameter be diminished, the watch will gain time. Also, it must be recollected that heat tends to make the watch run slower, and cold produces the opposite effect. Now, the compensating balance, as its name indicates, is designed to counteract the tendencies of heat and cold in their influence on the running of the watch, and it will do that in the most perfect manner, provided that it be so adjusted that the mechanical changes produced in the diameter of the balance be just sufficient to counteract the effect of temperature, and no more. When such an adjustment is not made, the action of a compensating balance upon the running of the watch is quite as likely to be wrong as right; consequently, an unadjusted balance of that kind contains as many elemen s of error as of truth, and is far less reliable for accuracy in time keeping than a plain steel or gold balance.

Nine tenths of the watches now sold in the market have apparently compensation balances, that is, the balance has a lot of screws fixed in its edge, which, when in action, look formidable: and those dealers who palm off, on unsophisti-

cated confiding buyers, these "chronometers," invariably, before showing them, give the movement a furious shake, giving to these balances a bewildering velocity of rotation. The dealer, in order to sell these pretended chronometers, must lie outright, or by implication. American watch manufacturers have committed a great error, and done the community a grievous wrong, by putting into their watches of all grades, good and bad, compensation balances. It gives the dishonest dealer an unjust advantage over the honest one. No person, not even the maker himself, can tell an adjusted from an unadjusted balance by inspection; the quality of adjustment can only be determined by actual trial. A knave can sell, to a confiding customer, an unadjusted balance at a price far below that for which an honest dealer could sell an adjusted one; and no person should buy a watch purporting to be adjusted, of anybody without the signed certificate of the manufacturer as to the adjustment of the watch of that particular number. Then, if you be deceived, you are in a position to claim the rights of that certificate. It ought to be so that the watch of any manufacturer or company, with their names on the movement, and with a compensating balance in it, should be adjusted; then the buyer would know, by inspection for himself, that he was getting what he paid for; and I am glad to see that a Boston firm is engraving the word "adjusted" on the plates of all its watches which are sold as adjusted. This is what all the manufacturers ought to do, so long as they will put in market watches with unadjusted balances.

As things now are, watches from ten shillings to hundreds of dollars in price, have all of them the "patent double back action, rotary, self-regulating chronometer balance." And the buyer must shut his eyes, pay his money, and take his choice among these mechanical humbugs. Oh! for the time to come, when the community will cease to be like unfledged birdlings, with their mouths agape, clamoring for somebody to cram them with "numbug." R. C.

Cleveland, Ohio.

Petroleum as an Illuminator.—Dangerous Oils vs. Dangerous Lamps.

MESSRS. EDITORS:—An article in your issue of the 11th inst., entitled "The Adulteration of Petroleum," no doubt reflects the views of many intelligent firemen—those whose business it is to combat the fire fiend—and all will concur in the propriety of legal enactment to secure to consumers unadulterated oil; but I would suggest that a complete prevention of the distressing burning disasters, which so often occur in families, by the use of this light, is not to be found in that direction.

Many of the brands of oil in the market are as safe as refined petroleum can be, while still more are unquestionably dangerous; but I wish to call attention to the fact, that, as generally used in the common lamp, these oils are all dangerous, and, I will add, the difficulty is not with the oils alone, for I am confident they can be used with perfect safety.

Now, to say that "well-refined petroleum forms neither gases nor vapors," is to state what can easily be disproved; and to attribute all accidents to adulterated and worthless petroleum, is equally incorrect.

The great mistake is, in supposing that good kerosene will not generate an explosive gas until heated to 100° or 110° Fah.

Now, I am prepared to affirm that the temperature of the flashing point is not a reliable test, so far as determining the explosiveness of an oil; and I do not hesitate to say, that out of any number of samples of good oil, that will not vaporize or flash under 100° (tested in the usual way), the larger part—when used as they generally are, in common lamps—are dangerous, because of their liability to create explosion.

If this be a fact (and I can demonstrate it by experiment to be so), it clearly shows that it is one thing to "test" oil, when exposed in a shallow, open vessel, and a very different thing to test it after it has been confined closely, in the tight vase or reservoir of a lamp.

In the first test, the vapor rises slowly, and immediately mingles with, or is imbibed by, the stratum of air next over the surface of the oil; and when the match is applied, a flash cannot be produced, because the gaseous mixture contains too little of the inflammable material, carburetted hydrogen. In the other test, the reservoir not being full of oil, and being confined closely, enough vapor will accumulate, after the lamp has stood some hours, to form an inflammable compound, that will certainly explode, if ignited.

Now, who can say that the rigid enforcement of stringent laws against adulterating petroleum will completely put an end to these terrible burning accidents?

It comes to this: we must recognize the fact that the evil is not alone with the oils in use, but is largely in the faulty construction of our lamps.

There is no cheap lamp that will render kerosene oil perfectly free from the danger of explosion, or that will obviate the many accidents occasioned by filling the lamps at night.

Of course, I leave out of consideration those lamps made entirely of metal, and constructed on philosophical principles, of which I know there are several in the market, that are really a near approach to a perfectly safe lamp; but the vital objection to them all is, that they are too high in price. We must have a cheap, safe lamp—one suited to the wants and pockets of the million, for kerosene oil is now in almost universal use.

Understand me, I demur only to so much declamation against dangerous oils, while we hear so little said against dangerous lamps. It strikes me, the tendency of this course is to divert attention from some of the more frequent causes of these burning disasters.

Instead of asking for additional legislation preventing or regulating the vending of dangerous oils, enforce existing laws; and let us seriously consider the means of further improving and rendering safe our dangerous lamps. Instead of so much ado about oils to stand the "fire test," in all conscience give us lamps and burners that will stand the fire test.

When we scan the exhibit of death and destruction caused by adulterated oil, don't let us forget to ask for the record of lives lost by defective and badly constructed lamps.

Intelligent persons do many things in using these lamps that invite disaster. I could name a number of such things, but will only mention one at this time.

The heat thrown off from an *A*, or No. 1 flat-wick burner, when the blaze is at full flame, as shown by placing a thermometer near the chimney, is 108° Fah; now the same lamp, with a small-sized, common paper shade on it, shows 126° of heat; and with a small metal shade, the mercury runs up to 138°. Producing by reflection thirty degrees greater heat on the lamp than no shade at all, metal shades must have a dangerous effect.

I will only add now, that I have personally investigated every case of accident from kerosene lamps occurring in this city during the past two months; by nine or ten accidents, three lives were lost—clear cases of burning to death from lamp explosions. I could not get the oil to examine in these cases, but the evidence afforded by the badly-constructed burners, which I *did* carefully examine, left no doubt on my mind as to the real cause. CHAS. B. MANN.

Baltimore, Md

(For the Scientific American.)

ON THE PROPER RESISTANCE OF TELEGRAPHIC RELAYS.

There is not, as a general thing, any well-defined idea, among telegraph men, of the amount of resistance which develops the greatest attractive force, or magnetic effect, in a relay. If there be no resistance, there is no effect, and, on the other hand, when the resistance is infinite, the effect is also nothing. The practical question therefore, is to determine the amount of resistance that produces the maximum effect.

In order to make this point clear, it is necessary to state that every turn or convolution of a conducting wire, around the core of an electro-magnet, produces in the latter a certain magnetic effect. Two turns produce twice the effect of one turn, but the length, and consequently the resistance, of the wire is also doubled.

Now, as the magnetic effect is always inversely in proportion to the resistance of the circuit, this effect would remain unaltered—that is, it would be the same with two turns as with one turn, were there no other resistances in the circuit. But there are other resistances in the circuit; namely, that of the battery, and the connecting wires, and the sum of all the resistances must be doubled, in order to halve the attractive force of the magnet. Therefore by multiplying the turns of wire in the helices, the magnetic force is augmented.

If we wind one layer of convolutions of silk-covered wire in a helix of given size, we get a given number of turns, and it is evident that, with a smaller sized wire, we can get a greater number of turns, but, on the other hand, the smaller wire has a greater resistance, and this again diminishes the magnetic effect.

To illustrate this: I have taken a spool of the dimensions of an ordinary telegraphic relay. The spool is two inches in length, and the inside diameter one half inch. It is wound with silk-covered wire to the depth of one half inch. The spool then has a diameter of one and a half inches, by two inches in length, outside measurement. Of course one half inch of the diameter is the iron core in the center.

The spool was first wound with No. 20 wire (Birmingham gage), the turns or convolutions carefully counted, and the resistance measured. Both the resistance and the number of convolutions in a relay will be double that of a single spool. Therefore, by winding this spool successively with the different sizes of wire, from No. 20 up to No. 35 (Birmingham gage), counting the number of convolutions, and measuring the resistance in Siemens' units, we have the following table of results:

Relays. Size of wire.	Number of convolutions.	Resistance, Siemens' units.	Relays. Size of wire.	Number of convolutions	Resistance, Siemens' units.
No. 20	1,616	4·2	No. 28	6,536	87·0
" 21	1,904	5·92	" 29	8,016	135·3
" 22	2,256	8·32	" 30	9,496	181·2
" 23	2,816	16·6	" 31	10,781	280·1
" 24	2,376	25·6	" 32	12,080	376·0
" 25	4,136	39·8	" 33	12,568	416·0
" 26	5,088	46·2	" 34	13,064	504·0
" 27	5,825	67·4	" 35	13,600	560·0

This table may be considered a fair approximation to the actual value of the resistance and magnetic effect produced in relays wound with silk-covered copper wire, from No. 20 to No. 35 (Birmingham gage). In practice, we are required to select from these relays the one best adapted to the conditions of a given circuit, that is, the one which has the greatest attractive force. The latter is in direct proportion to the number of convolutions in its helices, and inversely in proportion to the total resistance in the circuit.

Suppose, for example, we have a wire 100 miles in length, of the usual average resistance, say 20 units per mile, and we wish to use one relay at each terminal without intermediates. Say there are 50 cells of battery giving 2 units resistance per cell. We can find by trial and calculation which relay will give the best result, and is therefore best adapted to the circuit

	Units.
The line resistance is	2,000
The battery resistance is	100
For trial, we select the relay wound with No. 30 wire.	
The two relays will give twice 184·2=	368
Total	2,468

These relays have 9,496 turns of wire each, which, divided by the total resistance in the circuit, gives a quotient of 3·84, and this represents the effective strength of the magnet wound with No. 30 wire.

We will now substitute the magnets wound with No. 35 wire, and observe the comparative effect:

	Units.
Resistance of line and battery (as before)	2,100
Resistance of 2 magnets (as per table)	1,120
Total resistance in circuit	3,220

Dividing the number of convolutions by the above resistance, we have $\frac{13,600}{3,220}=4·22$.

We find therefore that, for a line of No. 9 iron wire, 100 miles in length, relays wound with No. 35 wire produce a much greater effect than relays wound with a coarser wire, and are better adapted to that circuit, when only two relays are used, one at each terminal. By the same process we find that the relays become less and less adapted to the circuit, as the size of the wire in the helices is increased.

For another example, we will take a wire with many intermediate stations. Say the length of the line is 100 miles, and the number of relays in circuit, twenty.

Calling the resistance of the line and battery 2,100 units, as before, add, to this resistance, 20 times that of any one of the relays in the above table, and dividing the number of convolutions by the total resistance, we find, by trying each magnet separately, that No. 28 wire, with 87 units resistance, gives the highest quotient, and is consequently the relay best adapted to that circuit.

Commencing with the No. 20 wire and going through the list, we have for quotients, or magnetic effects, the following:

No. 20	0·74	No. 28	1·70
" 21	0·85	" 29	1·67
" 22	1·00	" 30	1·64
" 23	1·15	" 31	1·40
" 24	1·29	" 32	1·24
" 25	1·42	" 33	1·15
" 26	1·68	" 34	1·06
" 27	1·69	" 35	1·00

We will now take the case of a short local telegraph of two miles of wire and four relays used as sounders, in which it is required to find what resistance in the sounders will produce the best results. Say the battery has ten cells of 2 units resistance each, and two miles of wire, at 20 units per mile. The total resistance of the battery and line will be 60 units. By trial, it will be found that the No. 22 wire sounder, having a resistance of 8·32 units, is the best instrument for such a circuit.

This investigation of the effect of winding a spool, or constructing a helix with different sizes of silk-covered copper wire, was carried no farther than to No. 35. It is evident that if the spool had been lengthened one inch, we would have obtained 50 per cent more convolutions, and increased the resistance in the same ratio, giving us 20,400 convolutions and 840 units resistance for the relay.

On a line of 300 miles, with a relay at each terminal, the gain in magnetic effect, with this relay of 840 units resistance, is about 50 per cent over the one wound with No. 32 wire, having a resistance of 376 units. On a line of 500 miles the gain is about 55 per cent, and on 1,000 miles 72 per cent, showing that the greater the resistance of the circuit, the greater the number of convolutions required in the relays, the resistance of which will necessarily be in exact proportion to this number.

Ruhmkorff's astatic galvanometer, an instrument made to detect currents in a circuit of great resistance, has itself a resistance of 7,000 units, and 40,000 convolutions of very fine wire.

We can see from what has been shown above, how unsuited an ordinary relay is for a local sounder. We could probably get about 1,000 turns of No. 18 wire on these spools, and the resistance would not be over one unit. With one Grove cell for battery, we would have but two units resistance in circuit. Dividing the number of convolutions by the resistance, we get a quotient or magnetic effect of 500. If we wind the same spools with No. 32 wire, and divide the number of convolutions, 12,080, by the resistance, 377 units, the quotient is 32, or less than one fifteenth the effect produced by the coarse wire.

By the aid of the above table of convolutions and resistances, and a Siemens' galvanometer, any one can determine, with a sufficient approximation to accuracy, the resistance of the relays best suited to the circuit, and work up his own particular case.

RULE.—Select from the column of resistances that of any particular magnet. Multiply this resistance by the number of magnets in the circuit. To this product, add the resistance of the line and battery. Divide the number of convolutions, in the relay selected, by this sum. By this method, ascertain the relay giving the greatest quotient, which is the one best adapted to the circuit. B.

THE steam plows used in the United States are made in England, and imported at a cost of about $10,000 in gold each. This price, of course, includes the customs duty on the importation of machinery.

[For the Scientific American.]

PEANUTS AND PEANUT OIL.

BY H. E. COLTON.

As we write this title, a friend at our elbow asks, "What can you say about peanuts for the SCIENTIFIC AMERICAN? There can't be a thousand bushels sold in the city of New York." This is a great mistake; there is hardly an article of American production, of apparently so little note, that has grown so rapidly in importance as the peanut. Instead of 1,000 there are fully 550,000 bushels sold annually in the city of New York alone. Previous to 1860 the total product of the United States did not amount to more than 150,000 bushels, and of this total, fully five sixths were from North Carolina. Now North Carolina produces 125,000 bushels; Virginia, 300,000 bushels; Tennessee, 50,000 bushels; Georgia and South Carolina, each, 25,000 bushels; while from Africa come about 100,000 bushels a year.

These data are not mathematically correct, but are so approximately. In one week of the month of January, 1871, there were received at the port of New York 2,751 bushels. It is stated that there are now 300,000 bushels on the way to this port from Africa, but, as peace is likely to be made between France and Germany these will not land, but immediately re-ship to Marseilles.

What is done with all these peanuts? In this country they are eaten, and are sent all over the land, from Maine to Oregon, for this purpose. The demand is greater than the supply.

In France they are used for making oil, which is by many considered to be superior to the best olive oil for salad purposes. In the South, during the war, it was so used. The oil made was also used as a lubricator, and as a substitute for lard, while the cake residuum was ground, roasted, and sold as a substitute for coffee. At present peanuts are not used in this country for oil, the price being too high. Thus, it will be seen, that their uses are extensive and varied, and that the crop which now yields over $2,250,000, and which did not add to the commerce of the country more than $200,000 ten years ago, is at least not unworthy of note.

Peanuts vary with the soil upon which they are grown. The Virginia peanut has the thickest hull, and is usually the largest and finest looking; but it weighs only 24 pounds, and hardly yields a quart of oil, to the bushel. On the other hand, the African peanuts weigh 34 pounds, and yield 5 quarts of oil to the bushel. The Georgia peanuts weigh about 32 pounds, and yield one gallon of oil to the bushel, while the North Carolina peanuts weigh 28 and 30 pounds, and yield 3 quarts of oil. These last bring the highest price, though some handsome Virginia peanuts bring high rates as fancy lots.

The price, as we are informed by Messrs. Dibble, North & Co., who make a specialty of the article, ranges usually from $2 to $2·50 per bushel, though bad-looking lots sometimes fall below $2.

The yield per acre averages 40 bushels, but frequently runs up to 60 bushels, especially near Wilmington, N. C. They are therefore a better crop at $1·50 per bushel than cotton at 15 cents per pound. Much land, however, which will grow cotton well, will not grow peanuts to the same extent. It is by many considered best to be near the sea, and very essential to have lime in the soil, or to manure with marl.

As with many other products, peanuts have been materially enhanced in value, and their production economized by modern inventions. For years before the war, the old, fashioned oriental style of thrashing with a flail, and winnowing by throwing up in the air, was the universal custom Both were overcome by the skill and talent of an ingenious mechanic of Wilmington, N. C., Mr. Thos. L. Colville, now deceased.

When the war commenced, the great demand for oil urged the necessity of using peanuts for this purpose; but how could the hull be gotten off? The same mechanic over came this difficulty. A modest, retiring man, not anticipating the proportions the peanut trade has even now assumed, and hence depending on his making the machines to supply all the demands, he did not have either improvement patented, and others now reap the benefit of his skill.

Again, the Virginia peanuts, being grown in a rather clayey soil, had at first a very dark appearance. This, as well as their inferior grade, made them sell so low that, two years ago, many farmers lost money, but here Mr. John M. Realing came forward with a machine, by running through which, the peanuts are so much improved in color and appearance that they have been enhanced in value full fifty cents per bushel. I might also mention the handy little machine with which the street venders roast peanuts, or take my reader down to the large establishment on Greenwich street or Peck Slip, where the glowing coke gives out its gentle and steady heat, while great cylinders, swung on large iron axles, are slowly revolving above the ruddy bed—dozens in a row—all turned by a steam engine. Here my friend might realize something of the vastness of the peanut business, and the extent of the edible capacity of our American nation, for one little article of, we may say, fancy diet.

But who eats them? Well, just ask the owner of that little sign, "PEANUTS—FRESH ROASTED EVERY 5 MINUTES," and he will tell you, everybody, from the wealthy banker to the homeless newsboy; and that his own sales are over a thousand bushels a year. We even hear from æsthetic Boston that they have taken their place among other nuts in the refections supplied to fashionable entertainments; who then will dare gainsay their right to aristocratic, or to commercial, importance?

How the News was Sent to Paris.

Attempts to establish a ready communication between the beleaguered inhabitants of Paris and their relatives and friends beyond the German lines have given rise to many contrivances, which are not unlikely to make a new era, in the history both of æronautics and photography. Among them may be mentioned the ingenious device by which the matter of two whole pages of the *Times* has been transmitted from London to Paris. This has been accomplished by photography. Those pages of the paper which contained communications to relatives in Paris were photographed with great care by the London Stereoscopic and Photographic Company on pieces of thin and almost transparent paper, about an inch and a half in length by an inch in width. On these impressions there could be seen by the naked eye only two legible words, *The Times*, and six narrow brown bands representing the six columns of printed matter forming a page of the newspaper. Under the microscope, however, the brown spaces became legible, and every line of the newspaper was found to have been distinctly copied, and with the greatest clearness. The photographs were sent to Bordeaux, for the transmission thence by carrier pigeon to Paris. When received there, they were magnified, by the aid of the magic lantern, to a large size, and thrown upon a screen. A staff of clerks immediately transcribed the messages, and sent them off to the places indicated by the advertisers The success of this experiment gives rise to the hope that the new art of compressing printed matter into a small compass will not stop here. If a page of the *Times* can be compressed into a space little larger than that occupied by a postage stamp, the matter of an octavo volume might be made to cover not more than two of its own pages, and a library could be reduced to the dimensions of the smallest prayer book. What a relief it would be to the learned persons who frequent the library of the British Museum if, instead of having to make fatiguing journeys from letter A to letter B of the ponderous catalogue of books, they had its many hundred volumes reduced to a space a yard square, over which a microscope could be hurriedly passed! Such suggestions are now occupying the thoughts of photographers.—*London Times*,

DYERS' RECIPES.

From Haserick's Secrets of Dyeing.

BLUE PURPLE.—A curious purple was very fashionable about twenty-five years ago. 100 pounds of wool were first dipped a light blue in the vat, and well rinsed. Then take a stone pot, put in 3 pounds of half-refined tartar, 3 pounds of feathered tin, 5 pounds of blue vitriol, and 20 pounds of muriatic acid; heat all in a sand bath until dissolved.

From this mordant take 10 pounds in a suitable kettle; add 5 pounds half-refined tartar to it, stir it well, and enter the wool at 170° Fah.; let it boil for one hour; take it out, cool, and let it lay for twenty-four hours. Then boil out 20 pounds of good logwood for three quarters of an hour in fresh water; cool off the kettle to 150° Fah., enter the wool, and handle it well for half an hour, then heat it up to 185° Fah., but let it not boil; let it go for one hour more, when it will be a dark purple. This color stands the sun remarkably well, perhaps owing to the fact that there is not any alum or sulphuric acid used, except that contained in the blue vitriol.

BLUE PURPLE, FAST COLOR.—100 pounds of wool are first dipped in the blue vat to a light shade, then boiled in a solution of 15 pounds of alum and 3 pounds of half-refined tartar, for one hour and a half; the wool taken out, cooled, and let stand twenty-four hours. Then boil in fresh water 8 pounds of powdered cochineal for a few minutes; cool the kettle to 170° Fah.; handle the prepared wool in this for one hour, in which time let it boil for three quarters of an hour, when it is ready to cool, rinse, and dry. By coloring first with cochineal, as aforesaid, and finishing in the blue vat, the fast purple or dahlia, so much admired in German broadcloths, will be produced. Tin acids must not be used in this color.

LOGWOOD BLUE.—There are many ways to color that, and the dyer must choose for himself which is the best for his goods, as one way is preferable for some kinds of fabric to the other.

THE OLD-FASHIONED LOGWOOD BLUE.—To 100 pounds of cloth or wool dissolve 15 pounds of alum, 2 pounds of half-refined tartar, and 3 pounds of blue vitriol; enter the fabric, and let it boil for one hour; take it out, cool as usual. Then boil in fresh water for twenty minutes 10 pounds of good logwood in a bag or otherwise, cool the dye to 170° Fah., and enter the fabric. Handle it well for half an hour, during which time raise the heat nearly to boiling, then take it out and cool; cool the dye to 136° Fah.; add 5 pounds of pearl-ash, or 4 pails of urine. Enter the goods again, and handle for half an hour, when they will be a fine blue. Soda ought never to be used, as it makes a dull color. Rinse and dry. This color is suitable for blue-mixed hosiery.

CHROME BLUE.—100 pounds of wool are boiled for one hour in a solution of 3 pounds of bichromate of potash, 6 pounds of alum, 1 pound of half-refined tartar: then it is taken out, cooled, and rinsed. Boil 6 pounds of good logwood in a bag for half an hour in fresh water, add 3 pounds of cudbear, well moistened and dissolved. Cool the dye to 180° Fah. Enter the prepared wool, and handle it for three quarters of an hour; bring it to a boil in this time. This color ought to be always left a shade lighter when finished, as all chrome colors darken in drying.

Scientific and Theological Aspect of the Hog.

A writer in the *Chicago Post* thus expatiates on the hog:

The hog has been in disrepute a long time, at least ever since he began to play his part in the ancient religions. It is fashionable to ridicule and denounce him, to call him a filthy brute, and to insist that he is the dire author of leprosy, consumption, cancer, scrofula, and the most disgusting diseases that afflict humanity. This is the teaching of prejudice, not of science.

The hog outlives all hostility, and laughs, so to speak, at the success of his slanderers. Still is the reeking roast pig the sacrifice of many a dinner table, and still is the rural ceiling festooned with the savory sausage, and the smoke house fragrant with ham. We deal with facts, not sentiment. The hog is a true cosmopolite—a citizen of the world. He increases and multiplies, and inherits every part of the habitable globe. He is as ubiquitous as the bat. He does not stand in high repute for his manners, but he is most accommodating, thriving with equal content in the sty of the rich and the kitchen of the indigent. He wallows sometimes, but naturalists tell us he does this for the sake of cleanliness, which is next to godliness—for the same reason that the Pacific Islanders grease themselves. Among his quaint peculiarities are his grunt of satisfaction and his squeal of remonstrance and reproach. He should never be fed till he stops his squealing; it is the approved method of breaking him of the habit.

Homer, in his "Odyssey," honored the swine keeper with the confidence of Ulysses, and why not? The hog, called stupid, is really one of the most enterprising and sagacious of animals. The gamekeeper of Sir Henry Mildway actually broke a black sow to hunt game in the woods; and she ran in the hunt with wonderful success. She would track game, back and stand, and point partridges, pheasants, snipes, and rabbits as skilfully as a bred pointer. She would bound in response to a whistle, and would wag her head and squeal with delight on being shown a gun.

The Babylonian Talmud says: "Cursed be he that breedeth hogs;" and the history of the Maccabees tells us that the scribe Eleazer walked straight to the tortures of persecution rather than eat a slice of spare rib, heroically preferring the martyr's stake to the pork steak. This animal has been under the ban of many religions. The Mohammedans learned from the Jews, as the Jews had previously learned from the Egyptians, to hate him because he perversely declined to "chew the cud;" but he still manages to masticate and digest considerable pottage in the course of a year.

The hog is the product of nature's most economical thought. There is no part that cannot be utilized. His flesh, fat, bristles, hair, hoofs, and bones are all turned to account. "The divisions of his unctuous body," says Apicius, "are as familiar as the division of the earth. His ears and feet go to souse: his brains are a choice dish for the epicure. His tail has for ages been claimed by successive generations of children as their particular property. Tradition points out how to appropriate it; roast on the coals, take in the fingers, and eat without salt."

The hog is the staff of life, the arch enemy of famine, the poor man's best friend. Moreover, in his earlier days, he is strikingly playful, frisky, cunning, and graceful—as much more interesting than a human infant of the same age as the latter is more interesting than so much putty. In adult pighood, he is omnivorous and self reliant, bold and expeditionary, and he breeds faster and keeps cheaper than any other domestic animal.

America is pre-eminently the home of the hog; he is a legical deduction from Indian corn. He was introduced into Virginia in 1600, and here he multiplied so rapidly that the colonists were compelled to palisade Jamestown—high, to keep out the Indians; close, to keep out the hogs. Mrs. Hog can produce ten to twenty at a birth, as often as twice a year. The descendants of a single pair—allowing six young for a litter—would amount to six million in fifty years. The gratitude of the country is due to Cincinnati, for that, by assiduous harvesting, she keeps down the inundation which constantly threatens to overwhelm us in an uncommon ruin.

Product of Coal.

A pound of coal may be regarded as equivalent to a day's labor of a man; hence 300 pounds will represent the labor of a man for a year. It has been estimated that 20,000,000 tuns of the annual product of Great Britain is devoted to the development of motive power, and that this is equivalent to the labor of 133,000,000 men. The area of the coal fields of the carboniferous age, lying within the limits of the United States, has been estimated at 150,000 square miles. The area of Ohio is not less than 10,000 square miles, or quite equal to that possessed by Great Britain, and far in excess of that of any other European nation.

The annual coal production of Great Britain is over 100,000,000 tuns; in Ohio it is now about 3,000,000 tuns.

MICROSCOPICAL WRITING.—A machine is now on exhibition in London, Eng., with which a writer, using a pen in the usual manner, can, at the same time, produce a duplicate so small as to be invisible to the naked eye, yet so distinct that a microscope will reveal every line and dot. A most useful application of the apparatus will be for the prevention of forgery, as private marks can be made, on notes and securities, legible under microscopic power, but which no imitator could see or even suspect the presence of. The inventor, a Mr. Peters, states that the entire contents of the Bible can, with the help of this machine, be written twenty-two times in the space of a square inch.

COST OF LIVING ON THE PACIFIC COAST.—A comparison between bills of fare at respectable but not extravagant restaurants and hotels, in Boston and San Francisco, shows that living is seventy per cent cheaper in the latter city. There is nothing to justify the high prices which are maintained everywhere along the Eastern coast, and which have undergone scarcely any diminution since the war and the ending of the gold mania.

Improved Grate Bar.

Our readers will recall a description of a locomotive grate bar, published in our issue of Feb. 4th. We this week illustrate a furnace grate bar, in which the same principle of curved cross-pieces is carried out, with modifications which will appear upon examination of the annexed engravings and the previous ones referred to.

It is claimed that an important saving of fuel is effected by the use of this bar, and that it is not warped and twisted out of shape by the effects of heat; also that it possesses greater durability than other grate bars, and is easily adapted to any furnace, without alteration therein.

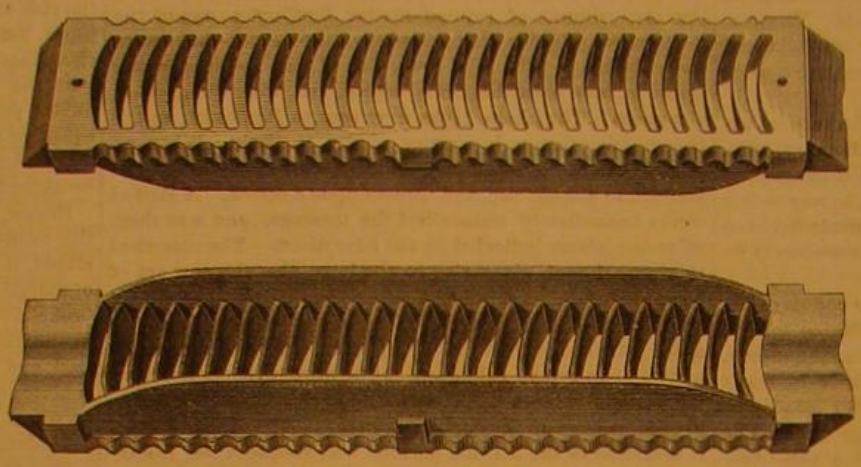
Perfectly free access of air to fuel is attained in this grate, the total space between the cross-pieces being large, as will be seen on inspection of the engravings, and all sorts of fuel may be used with it, even those considered the most difficult to burn, as nut coal slack, sawdust shavings, spent tan bark, etc.

The curved cross-pieces act as braces, and are formed like the locomotive bar, with re-entrant curves at bottom. They form a flat, even, upper surface, and their peculiar form enables the grate to be made very light in proportion to its surface.

Semicircular openings along the side pieces, form circular apertures when the bars are placed together in the furnace, admitting air to the fuel, and having no large blank spaces in the grate. The grate is not liable to be injured or broken by unequal expansion, and it is claimed that it will outlast two or three sets of ordinary bars.

Numerous testimonials submitted to us vouch for the validity of the claims made for this grate bar, both as to economy and durability.

For further information address Greenleaf Machine Works, 319 South Tennessee street, Indianapolis, Ind.



GREENLEAF'S FURNACE GRATE BAR.

Preserving Meat in Cans.

A new method of preserving meat in tin cans, which is favorably commented upon, is that of Mr. R. Jones, of London. In this process the meat is first packed in its raw state into tins of any desired size. The lids are then soldered down, the top of each lid having a small tin tube in it, which communicates with the interior of the tin. These tubes are next inserted in the exhauster, which is a receptacle connected with a machine designated a "Torricellian vacuum," an apparatus in which the air is exhausted by the action of water. The tins are then placed in the cooking bath, and at the proper juncture the vacuum is created and the meat thoroughly cooked, at a temperature varying from 180° to 228°. At this stage another feature of the invention comes into play. The vacuum having been created, a supply of gravy is turned on from a receptacle, and the tins filled with nutritious fluid. The feed pipes of the tins are then nipped and the cases hermetically sealed. By thus filling the tins with the gravy, the difficulty of collapse, which has always hitherto prevented large tins being used, is obviated, while the whole space of the package is utilized. Testimonials from captains of ships and others who have used it are furnished by the inventor, certifying to the excellent quality of the meat. By this improved process the great objection of over-cooking has been obviated, and as now prepared, the meat would seem to merit general approval.

Improved Form of Daniell's Galvanic Battery.

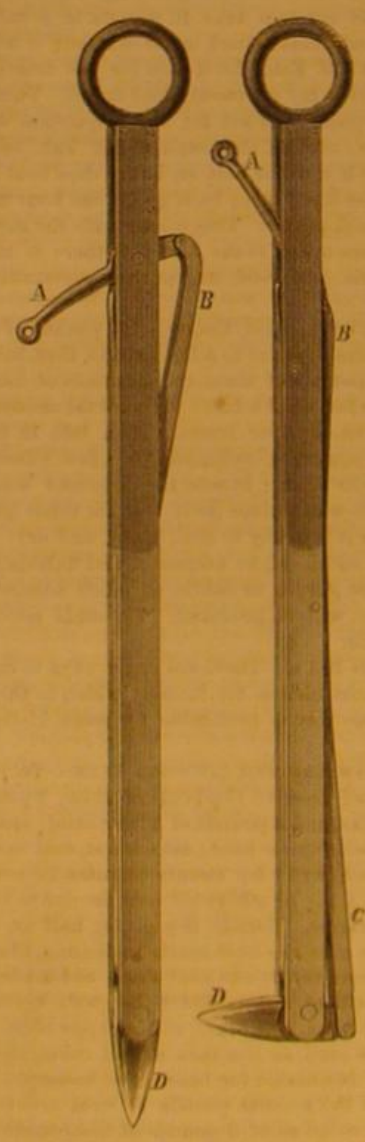
The requirements of many inventors of electric bells, signals, and other appliances using a constant current, will, according to an English scientific journal, be met by the following description of a battery, which has been used for more than two years, without any attention, except the addition of water and sulphate of copper, to supply the waste caused by evaporation. A common earthenware quart pot has a porous cell inside it, and between the two cells, a strip of pure zinc and a strip of copper riveted to the zinc above the water line, and carried with another porous cell, in a similar earthenware pot. Four cells should be arranged in this way, and the outer cells or pots filled with water, and the porous cells with sulphate of copper to the level of the surface of the water. Add some crystals of the salt of copper to continue the strength of the solution. Metallic copper will be slowly deposited in the outer cell, and can be made available for a further supply of sulphate of copper. A similar battery cost nineteen cents per cell for materials in England, and we believe it would not cost more in this country.

The Origin of Locomotives.

Somewhere about the year 1780, so runs the tale, a travelling millwright—in those days of the kings of mechanics—footsore, and with the broadest of northern Doric accent, stopped at Soho, a locality once indicative of field sports, but then and now the factory of Boulton and Watt, and asked for work. His aspect was little better than one of "beggary and poor looks," and Mr. Boulton had bidden him God speed to some other workshop, when, as he was turning away sorrowfully, Mr. B. suddenly called the poor fellow back: "What kind of hat's yon ye have on your head, my man?" "It's just timmer, sir," replied the man, "Timmer, my man!" ejaculated the manufacturer, "just let me look at it—where on earth did you get it?" "I just turned it in the lathe," said the mechanic, with just a flush of pride. "But it's oval, not round, my man," said Mr. Boulton in surprise, "and lathes turn things round." "Aweel! I just gar'd the lathe gang anither gate to please me, and I'd a long journey before me, an' I'd thocht I'd have a hat to keep out water; and I had na muckle to spare, so I just made ane." By his inborn ingenuity the man had invented the oval lathe, and made his hat with it, and the hat very soon led to making his fortune, so mysteriously do trifles work out great ends. The fact was, Mr. Boulton was a man of sharp penetration, and not one at all likely, in those days when good men were scarce, to lose sight of so valuable a helper, when he found him; and so the after famous William Murdoch took suit and service under Boulton and Watt, and in 1784 made the first wheel vehicle impelled by steam in England—ay, made it with the very hands and brain cunning that had before produced the "timmer hat." Out of that seed, after ninety years of sowing and reaping, a goodly crop has sprung up, which, like the grain of mustardseed, replenishes the civilized earth, and will yet civilize the uncivilized, though kindred still rise against kindred, and nation against nation in mortal, cruel strife, slaying each other with the infernal inventions, of men's brains, that for a time usurp all the honor and praise, that should be reserved alone for those things which tend to peace and tranquillity, brotherly love and prosperity.

IMPROVED HORSE-POWER HAYFORK.

We think the Commissioner of Agriculture was at fault in recommending grapple power forks, and suggesting that



they could be used both for unloading hay and for loading manure. There would be many practical difficulties, in adapting such a tool to both purposes, which we need not here dwell upon, but which will readily suggest themselves to practical farmers.

A grappling fork could no more be conveniently used for manure than the common light pitchfork. In this matter, the old rule of providing special tools for special purposes finds no exception.

If the necessity of special tools be conceded, the question of what principle of construction is best for raising hay stands by itself and must be decided on its own merits. Without attempting to decide this question we will say that there are strong claims made, for the fork which forms the subject of the present article, and an engraving of which accompanies this description.

This fork is extremely simple in construction and is sold under the name of "Steele's Power Saber Fork."

The working parts are nearly covered and protected by a scabbard, the form of which much resembles that of a pocket clasp knife, it being made of a strong back piece to which side plates are riveted, and between which the connecting rods, B and C, and the lever, A, work. The lever, A, is pivoted to the scabbard, as shown, and also pivoted to the upper connecting rod, B. The connecting rod, B, is pivoted to the lower connecting rod, C, in such a way as to form a toggle joint about midway of the scabbard, which, when actuated by the lever, A, forces the point, D, into a position at right angles with the scabbard, or throws it into line with the scabbard, according as the lever is moved up or down.

In use the lever, A, is first employed to bring the point into line with the scabbard. In this position the instrument is easily thrust deep into the hay, its tapering form, from handle to point, greatly facilitating its entrance. A movement of the lever then throws the point into a position at right angles with the scabbard, by which its hold upon the hay is secured. The fork, with its load, is then hoisted, and when raised to the desired hight and position, a cord, attached to a ring in the lever, is pulled, which trips the point, and the hay falls.

The shielding of the working parts by the scabbard prevents entanglement and clogging. It is claimed that this fork enters the hay when it is damp, or where it has stood a long time, much easier than forks heretofore used; and that it holds its load perfectly and releases it instantaneously when the point is tripped. The instrument, of which one has been sent as a sample to this office, is well made and strong. We are told that it has taken four premiums in public competition with other forks.

Patented, March 10, 1868, by Harvey B. Steele, M. D., of West Winsted, Conn., to whom letters should be addressed for further information.

The Sherman Process.

The Sherman process consists in the application of iodine for the purpose of removing sulphur and phosphorus from the iron. Mr. Sherman's patent covers all forms and methods by which a metallurgist can directly or indirectly apply iodine for effecting the purpose in view. The rationale of the process, however, is not given in this specification, nor is it readily perceptible on the face of any description of the process itself, particularly when the smallness of the quantity of iodine employed by Mr. Sherman is taken into consideration. It appears, however, that an indirect action may take place between the phosphide of iron in the liquid metal, and the free iodine in contact with it, by which a combination of iodine and phosphorus is formed This new compound is readily decomposed by contact with the atmosphere, or with additional quantities of phosphide of iron, and the iodine leaves the phosphorus in the amorphous state, in which it seems to be unable to combine with the iron, but is readily burnt, and escapes, as vapor or phosphorous acid, with the flame. The property of iodine to render phosphorus amorphous is well known, and the action upon the phosphorus combined with the iron may be analogous to this interesting reaction of the two elements upon each other.

The principle that iodine has a certain effect upon the phosphorus and sulphur in the iron seems to be established as a fact, by the trials hitherto made by Mr. Sherman in different metallurgical works in this country and in America, but the precise mode of applying the "medicine" so as to make it suit the requirements of the different processes of manufacturing iron and steel, will have to be developed by patient and persevering practice. In the puddling furnace Mr. Sherman appears to have had the greatest success. This may be due to the fact that the action takes place under the eyes of the workman, and can therefore be closely watched and regulated at will. For the other processes for manufacturing iron and steel, the Sherman process is said to be equally valuable, and experiments in this respect are now in progress, of which we shall publish the details in due course.—*Engineering.*

Oxygen Gas.

The use of oxygen gas in the arts and manufactures is now so general that cheap and accessible means of producing it have been eagerly sought, and, in one instance at least, with an encouraging amount of success. Dr. Kirkpatrick, of Brussels, recommends the use of a hydrated salt, or hydrated oxide of cobalt or nickel, in combination with a soluble hypochloride, such as of lime or of potash. Nitrate or chloride of cobalt and the bleaching powder of commerce, form the best combination; the bleaching powder should be of concentrated strength, to avoid too much bulk, and made into a milky fluid with water. The mixing will be accompanied with some effervescence, and a mutual decomposition of the components. The oxygen will be freely evolved, and may be collected in a gas receiver. The superfluous fluid may be poured off, and a further supply of liquid chloride of lime introduced, to disengage any remaining oxygen The beautiful and brilliant light, produced by throwing a small jet of oxygen gas on to the point of combustion in a common gas lamp, may become of general use when oxygen can be cheaply and easily produced.

Scientific American.

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NEW YORK, SATURDAY, MARCH 4, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

THE MECHANICAL EQUATION.

A true balance, with equal weights in the pans, may be said to be the type of a mathematical equation, the equality being indicated or verified by the horizontal position of the beam. Another type of the mathematical equation may be found in the double inclined plane, with a pulley at its apex, having a cord with equal weights attached to its extremities, passing over the pulley, and the weight resting upon the inclined surfaces. In this type of the equation, the horizontal position of the base of the inclined plane is the verification of the equality of the weights suspended from the cord.

No element of machinery exists in which one or both of these types of the mathematical equation is not found, and it might be shown that all the changes in the relations of parts on either side of the fulcrum of the balance are types of the changes and transformations which the members of an equation may undergo without affecting their relation of equality. A very interesting series of analogies might be thus traced, but this would be foreign to the purpose of this article, the intent of which is to show that, in the construction of machines, Nature permits no permanent violation of the grand mechanical equation which underlies her works. Man may disturb, but Nature will ultimately restore, equilibrium.

To show this in the form of a demonstration, of course, wrecks the hopes of perpetual-motion seekers, who suppose that they can add to, or multiply one side of the equation without increasing the other. Nature has provided for all this beforehand. She has uttered her fiat, that masses of matter shall all tend to a common center, that heated bodies shall transfer their heat till all reach a common temperature, and that, during the transfer, only a portion of this heat can be converted into mass motion. She has affirmed that "what goes up must come down," with a force exactly equal to that which raised it, and that, if a body be raised, or carried away from the center to which it is attracted, and its return be resisted, the force with which it would have returned, if left free to move, shall be transmitted through its support to the attracting body, and expended in changing the path of motion of that body through space. She has said that the parts of every body when left free to move must balance themselves around a common center of gravity, and, this accomplished, must forever cease their motion in relation to that center unless disturbed by some external force. She has laid down the law, that when two bodies are so connected by any medium, solid or fluid, that the motion which each tends to produce is in an opposite direction to that of the other, so that the distances through which each would move, if an additional force were made to act on either, would be inversely as the weights of the bodies, they shall not move unless some additional force be made to act upon one or the other of them.

Thus she has established her perpetual mechanical equation, which is forever opposed to perpetual motions in the sense of self-moving machines.

She has also established her mechanical equation in the transfer of motion by the law, that no motion of any kind shall diminish in one mass without an equivalent increase of motion in some other mass, or the conversion of mass motion into heat, which last is considered by many able thinkers to be only a mode of motion. If heat be really motion, then she has said "let no portion of matter, no infinitesimal part of the great aggregate of motion in the entire universe be lost;" and she has also as unmistakably decreed that no addition to either matter or motion shall be made.

We have said a demonstration of these truths would wreck the hopes of perpetual-motion seekers. This is, however, not the time nor the place for such a demonstration, which would only be a repetition of what has been written over and over again in books on physics, and taught in the lecture room, since physics became a science. In whatever way Nature has been importuned, whether by experiment, or the logic of mathematics, she invariably has responded that she will permit no violation of the laws above enunciated.

Whoever, then, invents a self-moving machine must begin by the discovery of some new law which annuls all hitherto discovered laws of motion and force. Let these dreamers cease their attempt to coerce matter into disobedience, and by experiment and study try to acquaint themselves with Nature's unchangeable statute book, and they will soon drop their chimeras, and turn their attention to something practical.

This week we publish the last of our series of articles upon Perpetual Motion. The illustrations contained in those articles exhibit every principle tried since the search began. All have been shown absurd and impracticable, and if the record of the vain search serves to show inventors the folly of its pursuit, the end we sought will be accomplished.

DANGERS OF PETROLEUM OILS. REPORT OF THE HEALTH BOARD OF NEW ORLEANS. A LAW REGULATING THE SALE OF SUCH OILS RECOMMENDED

Copies of the reports of the Board of Health of the city of New Orleans for 1869 and 1870, have been forwarded to us, and our attention has been particularly called to portions pertaining to the sale of petroleum oils, and accidents resulting from their use. Although we have said much upon this topic, we believe it to be our duty and the duty of the press generally to continue agitating it, until some adequate measures of reform shall be adopted. We therefore willingly give place to the very interesting and even startling facts made public in the reports referred to.

In the report for 1869 is given a statement of the qualities of seventy different specimens of oils used for illumination, obtained of various dealers throughout the city.

Fourteen specimens gave a flashing point from 110° Fah. to 120°; nineteen from 100° to 110°; fifteen from 90° to 100°; thirteen from 80° to 90°; seven from 2° to 28°; one gave the flashing point at zero, and one even flashed at 2° *below zero*. Only thirty-three out of the seventy were fully up to the New York standard of safe oils. In nine specimens the oil itself ignited at temperatures below 90°. One specimen of heavy oil, adulterated with benzine, flashed at 28°. Thirty-seven specimens were of a quality which the Massachusetts law requires to be branded "unsafe for illuminating purposes."

A lamp was filled with oil from No. 47 of the table, lighted, and allowed to burn for two hours; upon being purposely permitted to fall and be broken, the whole mass of oil instantly took fire.

Lamps filled from Nos. 1, 2, 3, and 5, when allowed to fall and break, burst into flame, and when water was poured on the flame, the oil continued to burn until entirely consumed.

Two specimens, No. 32 (Virginia brand) and No. 33 (Downers oil), were experimented with in the same manner. The wick continued to burn, but the oil did not take fire, and could not be lit, though tried repeatedly. This would be the result with any oil whose "flashing point" is 110° and upward. An oil whose flashing point is 110° does not itself take fire and burn till its temperature is raised to about 135° Fah.

The Board express the belief that the admixture of light oils is very general, and add that this mixing of heavy oil and naphtha may be done by persons ignorant of the rapid and great deterioration which is effected by adding small portions of naphtha to an excellent high fire-test oil. Their experiments prove that good oil is rapidly contaminated and rendered dangerous by the addition of small portions of benzine, and if burned in lamps of brittle material or bad construction, continually exposes to accident those who use it.

The following observations are worthy the consideration of all consumers of such oils:

There is probably more danger of explosion of a lamp or can containing a mixed oil than of one containing pure benzine, because the latter evolves vapor with such rapidity, as in most cases, immediately and permanently to expel all atmospheric air from the vessels containing it, although this volatility adds to the danger of fire.

Those using coal oil, can, by simple means, protect themselves from the worst oils. Pour into a cup or saucer a tablespoonful or two of the oil to be examined, and apply an ordinary match, lighted. If the oil does not take fire it may still be an unsafe oil; but if it does take fire, the oil is a very dangerous one. It is necessary to remind the experimenter that great care must be used in so simple a matter as this seems, as the flame may communicate by vapor or otherwise to vessels containing bad oils, and give rise to fire and personal accident.

The report for 1870 gives a tabulated list of thirty-four explosions, which occurred during the year in New Orleans. By these explosions seven females and one man were burned to death, and twenty persons more or less burned, of whom the greater number were women, some of whom were disfigured for life.

The names of the oil with which explosions occurred are given as follows: *petroline, puroline, black diamond, sunlight, septoline, anchor oil, etc.* Our readers will now see the force of our warning them to "beware of fancy names," given in a recent article entitled "Kerosene Murder."

The Board complete their report, by a draft of a law, two excellent provisions of which are: that persons selling oils not up to the prescribed standard shall not be able to collect pay for the same by legal process, and that they shall be liable to pay for all damages resulting from the use of such oils for illuminating purposes, with costs of suit for the recovery of the same.

We would not be understood as meaning to say that all oils sold under fancy names are essentially bad. There are notable exceptions, of which we may mention Pratt's "Astral Oil," an article which we have used for several years, and found to be excellent in all respects. Moreover, we have never heard of an accident arising from its use. The adoption of this name, however, might raise doubts in the minds of purchasers who have been cheated by other fancy names, and as we know such doubts have no foundation in regard to this particular oil, it is but just to make an exception in its favor.

A GOVERNMENT BUREAU OF MINES.

An extraordinary proposition has been laid before Congress: to create a mining fund by the issue of $50,000,000 in bonds by the Government, for the purpose of subsidizing mines of the precious metals, in amounts not exceeding $250,000 to any one mine, and to the extent of $25,000,000 a year for all mines. As it is only proposed to lend the money to the mines, and to allow the Government to participate in the profits of the venture, the direction and working of the subsidized mines will be put in the hands of government officials; in other words, the United States Government will go into the mining business on shares. The proposed bureau is to be under the control of an officer who is to receive a salary of $10,000 a year, and be known as the Chief of the Mining Bureau. Subordinate to him will be five chiefs of division, at salaries of $7,500 each, with deputies at $5,000, clerks at $2,000, and messengers at $1,000 each. These officers are to constitute the executive corps, and will be stationed at Washington. On the field will be a corps, to consist of attorneys, inspectors, and supervisors, at salaries of $5,000 each, assisted by associates who are to receive half that sum per annum.

The standing army of laborers, the medical staff, the commissary department, the chaplains, the drill sharpeners, commission merchants, assayers, brokers, and mechanics are not mentioned in the bill, but it is understood that the trifling expense of supporting them will be borne from the profits of the business, and not in any way fall as a tax upon the country.

It is proposed to discover and "to bring into being" 200 new mines every year for ten years, until the maximum of 2,000 mines has been reached. "If the working days of the mining year are reckoned so few as 250 only, the average annual yield of ore per mine should be set down at 25,000 tuns, and the aggregate product of the 2,000 mines, at the prodigious total of 50,000,000 tuns! Taking the average net returns at only $12·50 per tun, the profits receivable, over all expenses, from the 2,000 gold and silver mines, sum up $625,000,000!"

Such is the enthusiastic statement of one of the advocates of the scheme, and, according to him, the bill ought to be called a way of paying the national debt, and extinguishing all taxes. It would solve at one blow the whole question of tariffs, income tax, and the like, and fill the coffers of the Government with untold wealth.

NARROW GAGE RAILWAYS.

We are in receipt of a pamphlet on this subject forwarded to us by Paul, Brothers, of Akron, Ohio, containing general arguments in favor of a system of narrow gage railways which they style "*our system.*" Upon what grounds the gentlemen referred to claim the system as theirs does not appear. This matter has been discussed for years, and the question of gages is not a new one. We should suppose any one might exclusively claim a system of sawing boards twelve feet in length as consistently as Paul, Bros., can claim a narrow gage railway system. We find, however, in this pamphlet, a pretty fair statement of argument in favor of narrow gages; and though we have already expressed our own views upon the subject in brief, a review of this argument will not be out of place.

The pamphlet is opened by the statement of the generally unprofitable nature of railroad investments, and the fact that these investments are, for the most part, made with a view to obtain indirect advantages through the stimulation of business along the route, the development of resources, and enhancement of the value of real estate.

The question is then asked: "Is it not worth our while to inquire what the reason is, that we cannot as well build railroads with a view to direct returns upon capital invested as when we put our money into any other business?"

The attempts to economize through the use of cheaper iron and inferior construction and care have proved failures. The average number of trains run over the New York State railroads is only one half their capacity, and this average is mostly made only on the great trunk lines, the majority averaging far below this, a large portion being only able to secure traffic for from four to six trains per day. The point is now taken that it is folly to construct roads whose capacity for business is four times as great as the business done.

It is maintained that the only way to reduce the capacity of these roads down to their traffic is to narrow their gages. This would at the same time, it is claimed, reduce their cost in the following items, viz., the moving of masses of earth and rock; the curves, by shortening the radius; the right of way; the weight of iron; the cross ties, ballasting, bridging, culverts and masonry, engines, cars, and machinery; and commissions in raising the capital, by reducing the capital required.

These are the points made in the pamphlet, and we are

perfectly willing to concede them all, with the reservation that the reduction will, in our opinion, be much less than is estimated by the authors, whose figures we have not space to give.

The arguments are not new, and the most of the various items of reduction were spoken of by us in a recent article. We will not therefore go over them again at this time. Much may be said on both sides of the question, but there can be little doubt that narrower gages might be profitably adopted, on a very large proportion of American roads, at least until such time as the growth of business along their lines shall render increased carrying capacity necessary.

THE AMERICAN ECLIPSE EXPEDITION.

As is well known, an appropriation of about $30,000 was made by our Government, to be expended, under the direction of the Chief of the Coast Survey, in making observations in Europe upon the total eclipse of the sun, in December last. Some of the members of the expedition have returned to the United States, and we find, in the *American Gaslight Journal*, a preliminary account of the results obtained, from the pen of one of the most distinguished observers, Professor C. A. Young, of Dartmouth College. The observers were scattered over the continent, on the track of total obscuration, and it was well that this arrangement was made, as, in some localities, the weather was so unfavorable as to defeat the objects of the expedition.

Professor Winlock's party, of which Professor Young was a member, was placed at Jerez, some thirty miles north of Cadiz, and they were fully provided with the best instruments. They first determined accurately their geographical position, by the use of chronometers and a 46-in. transit. The photographic apparatus comprised two telescopes, equatorially mounted, with clock work, one of eight inches aperture and the other of six inches; a horizontal telescope of five inches aperture, and about thirty feet focus, with a plain unsilvered mirror of glass to reflect the sun's rays into the tube. Four spectroscopes of peculiar pattern were mounted in a way to produce the best effects, one of them with a battery of two prisms, another with a dispersive power equal to thirteen prisms. In order to fix the scale of reference, Geissler tubes, filled with hydrogen, mercury, magnesium, and sodium, were employed.

The experience acquired in the two recent total eclipses, was of great service in pointing out the precautions to be observed in this, and greatly facilitated the preparations requisite to be made.

The day and night previous to the eclipse was very fine, but early in the morning it clouded up, and even rained from time to time. The party made all their preparations, however, and before the first contact, at 10.25 A. M., there were many patches of partly clear sky, but there was always, even when clearest, considerable haze; not enough, however, to prevent photographs of the partial phases from being taken. At the moment of total obscuration a small rift in the clouds passed over the sun, and permitted the observer to see the sublime phenomenon in a satisfactory manner. Within five minutes after the end of the totality, the sky was wholly clouded, and the astronomers did not see the sun again till just at evening, after a heavy storm of wind and rain.

During the totality, one good photograph of the corona was obtained, with a six-inch glass and a one and a half minute exposure. A fine copy of this was exhibited at the last meeting of the Lyceum of Natural History, by Professor Morton, where it attracted great attention. No attempts were made to photograph the prominences, as they can be seen and studied at any time; but all efforts were concentrated on the corona. This peculiar phenomenon appeared more extensive than in 1869, but much less definite in its outline. The form of the corona was roughly quadrangular, nearly square. There was no prominence on the sun's limb which could compare with the "anvil" of 1869, but there were many small ones which were bright and active. By means of the spectroscope, two or three iron lines were observed, also two barium lines, and a magnesium line, and at the base of the chromosphere, a thin layer, in whose spectrum the dark lines of the ordinary solar spectrum are all reversed.

Professor Young is of opinion that the observations tend to confirm Kirchoff's theory of the constitution of the sun, and the origin of the dark lines in the ordinary solar spectrum. Such are the results obtained by the Spanish branch of the expedition, as contained in the preliminary report of Professor Young; but, doubtless, the official report of Professor Winlock will add somewhat to the information. It is to be hoped that some one will give us a digest of the results obtained by all the expeditions, in popular language, in order that the facts may be incorporated in our text-books, and be made common property. That a line was observed at C, another at 1474, another just grazing D, is all very well for the knowing ones, whose lines have been cast in pleasant places, but for our purposes we want these expressions to be translated into popular language.

PEAT FUEL FOR LOCOMOTIVES.

Now that the peat excitement has died out, and capitalists have had time to recover from the chagrin of poor investments, it is possible to take a rational view of the application of this fuel to the various purposes of trade and manufactures. If we could have believed the stories told by persons who had large bogs to sell, there is nothing in the earth that is capable of so many useful applications as peat. It was asserted that candles could be made from the paraffin contained in it, of a better quality than from any other source; the gas from the distillation of peat was richer than the product from the best cannel coal; the absence of phosphorus and sulphur made it the best fuel for metallurgical purposes; its heating power was considerably superior to coal; it left no clinker, ash, soot, or incrustation, on the grate or in the flues; and no such sparks were emitted from it as from wood. In fact, coal was a drug in the market, alongside of peat. This, of course, was an exaggerated statement of the case, and, in discounting it, many persons have gone to the other extreme of too greatly undervaluing a really important fuel.

The scientific experiments made upon peat, in Germany, have shown that, when properly prepared and compressed, it is admirably adapted for use in locomotives. We have seen it in constant use on the railroad from Berlin to Dresden, and on the roads through Bavaria, as well as in other parts of Europe. We procured specimens at the time, and still have them in our collection. The thorough manner in which the peat was cleaned and dried previous to being compressed, had much to do with its value as a fuel, while it did not increase its cost as much in Europe as it would in this country. There was no question in the minds of the engineers that the absence of sulphur, arsenic, and phosphorus was a decided advantage, as the flues and grate-bars were less liable to corrosion than with ordinary coal. The same observation was made in reference to the application of peat for metallurgical purposes. The metals obtained from it were found to be unusually pure. As a fuel in glass making and in chemical laboratories, the experiment proved to be quite successful. In cases where a uniform heat is required, it has been found that peat can be advantageously used.

We understand that in this country, also, peat has been successfully employed in locomotives; and where it can be obtained at reasonable cost, we have no doubt that it offers many advantages over other fuel. The disinfecting properties of ground peat are of the highest order; and in the earth-closet system it has particular value. This use of it in making compost heaps has long been known, but less attention has been bestowed upon it than it deserves.

It is well to bear in mind the really valuable properties of peat, and to encourage its industrial application.

THE LIFTING CURE.

The various ways by which men have sought to be healed of their diseases, are almost beyond enumeration. People seem to be more superstitious upon this subject than almost any other, and well they may be, for in nothing is there greater mystery than in the origin and nature of diseases. The therapeutic action of drugs is also surrounded with mystery, so much so that it may be said our knowledge (if it can be called knowledge) of the effects of drugs internally administered, is almost entirely empirical, and confined to their pathological effects. No certain clue to the chemical or other changes which take place in drugs, or in the system, previous to final effects, has been obtained in regard to the larger number of remedial agents comprised in the *materia medica*. In regard to many of them, the effects are a matter of hot dispute. Some will maintain that the administration of a particular drug in particular cases is attended with great benefit, while others will maintain it to be absolutely injurious.

When, therefore, anybody asserts that any remedy for disease has proved itself efficacious, and can point to a large number of those who, having been treated by it, assert that they have received great benefit through its use, surely this remedy has as good ground for popular favor as any pronounced officinal. The "proof of the pudding" has been, in both cases, "in the eating of it."

The new lifting cure has been tried by a great many persons afflicted with various chronic complaints, who are loud in its praise as a method of treatment for such complaints. It is our purpose in this article to briefly state the nature of this "cure," and the method of its application.

As its name implies, it is a lifting exercise, very light at first, if the patient be much debilitated, and very gradually increased with the improvement in health and strength of the patient. The *rationale* of the peculiar effect produced by this exercise, can scarcely be said to be known; but it is claimed by all we have seen and conversed with, having experimental knowledge of it, as compared with other modes of exercise, that its effects are singularly marked, and entirely different from those of any other kind of muscular effort. Those in charge of various establishments we have visited claim that the effort seems to arise through the invigoration of the spinal cord—the grand trunk line, so to speak, of nervous communication from the brain to all parts of the human system.

The great point seems to be to secure longitudinal pressure upon the spinal column without shock. The apparatus employed is therefore so constructed as to prevent the weight being lifted all at once, the full exertion being only applied at the end of the lift, and the power exerted being gradually increased from the first beginning of the effort, till the weight is raised, when the effort is sustained uniformly for a few seconds, in holding the weight suspended, and then gradually diminished to the end. The patient then rests for a short time, alternately lifting and resting until the exercise is completed. Thus, neither shock nor sudden strain is possible, no matter how great the exertion may be.

Records shown us at the various establishments visited, exhibit an astonishing increase of power on the part of debilitated patients. It would seem from these records that an extraordinary increase of nervous energy and muscular force is imparted through some mysterious effect on the nerve centers. The immediate effect of the exercise upon excessively nervous persons is sedative; a feeling of calmness and quiet pervades the system, and a good sleep may be nearly always obtained by lifting before going to bed.

The machines used are for the most part Butler's, Reilly's, and Mann's. In Butler's machine, the patient stands upon an elevated platform—the platform resting on elliptic springs—and lifts the weight by a rod attached to a cross piece held between the legs. Every joint of the machine, and even the weights, have springs of rubber or metal placed between the solid parts—even the legs of the frame standing on springs, so that in lifting, all these springs have to be compressed by the amount of weight lifted before the weight is elevated.

The Reilly machine is, we believe, a "side lifter," that is, the weight is lifted by two connecting rods, one on each side of the exerciser. The principle of elasticity is also carried out in this machine.

The Mann machine is called a "reactionary lifter." The final weight to be raised is that of the body of the exerciser, the effort necessary to accomplish this result being graduated by an ingenious system of levers with adjustable fulcrums, the elastic principle also being observed.

We are not prepared to pronounce upon the relative merits of these machines. The reactionary lifter invented by Mr. Mann is much cheaper and more compact than the others, and we cannot see any reason why the effects of its use should vary in any important particular from those of the more expensive machines.

ALASKA.---CLIMATE AND PRODUCTS.

The question as to the advisability of the purchase of Alaska was much discussed at the time of the sale, and has been ably defended by its promoter, the Hon. W. H. Seward. With the policy of the statesman we have nothing to do; but our readers will be interested in knowing some facts as to our late acquisition, which is now one extremity of the scale of our varied climate. The weather in the interior is several degrees colder on the average than that of the coast, of which latter the mean temperature is about 40° Fahr. Very high winds, heavy and long continuing rains, and dense, damp fogs, are the chief characteristics of the seaboard, while at Sitka, the capital, the inhabitants have only been able to count thirty-five days, during the past year, on which they have not had rain or snow. The latter falls in enormous quantities, and Dr. W. T. Wythe reports that he has seen the ground, thirteen inches below the surface, frozen hard at midsummer.

With such hyperborean weather, it is to be expected that the general health suffers extremely. Lung diseases are the scourge of the country, bronchitis is endemic, and variations in the atmosphere are made known to the people by the fluctuating condition of the catarrh. Influenza and pneumonia are, of course, common; the latter occasionally turning to the typhoidal diseases. The Alaskan rheumatism is powerful against all the usual remedies, and tuberculous diseases and phthisis have their own way. The *lues venerea* is common, and is exterminating the natives of one region of the country. All these diseases are doubtless encouraged by bad and insufficient food, and scarcity of vegetables, fresh meat, and antiscorbutics.

These peculiarities of the locality are not likely to attract the labor and capital of the emigrant, nor is it to the interest of Alaska that the country should be densely populated. Its only value is as a hunting ground, and the subsistence afforded by this means, cannot be enough for a large population of Americans and Europeans, accustomed to the comforts and refinements of civilized life. The chief part of the furs procured in Alaska is sent to England, a small fraction only being sold in San Francisco, and the price in Europe being much higher than in California. In December last, a parcel of 60,000 seal skins sold in London for $300,000. The furs brought to San Francisco from Alaska last year valued over $2,000,000. This figure may be taken as the total value of the Alaskan exports, as it represents all the shipment, for consumption in this country and Europe, of the sole product of the territory.

THE SUTRO TUNNEL.—A bill is before Congress to aid the construction of the Sutro tunnel, with the proceeds of the sale of the mineral lands. It provides that all moneys received by the United States from the sale of mineral lands must be used in fostering the mining interest, and be known as "the Mineral Land Fund." As soon as the Sutro Tunnel Company shall have completed 500 feet of its tunnel, it is to receive $50,000, and for every additional 500 feet, a like sum. As there are a large number of Chinese miners in California, who might be tempted to turn the direction of the tunnel downwards towards the Celestial empire, in consideration of the $50,000 per 500 feet, the aggregate amount to be advanced under this act is limited to $3,000,000. The President of the United States is to appoint three commissioners to look after the interests of the Government, and hold the property as a first mortgage.

CARE OF TEETH.—Put a piece of quicklime the size of a walnut in a pint of distilled water. Clean the teeth frequently with this fluid, washing the mouth well with clean water afterwards. The application will preserve the teeth and keep off the toothache, and will harden the gums.—*A Correspondent of the English Mechanic.*

THE manufacture of reaping and mowing machines has attained such large proportions as to make it one of general interest. The annual production is now estimated at about 125,000 machines. Few facts more clearly demonstrate the immense wealth of the farmers of our country than that they expend each year about $20,000,000 in the purchase of implements of this one class.

STATISTICS OF STEAM BOILER EXPLOSIONS FOR THE YEAR 1870.

PREPARED FOR THE SCIENTIFIC AMERICAN BY THE HARTFORD STEAM BOILER INSPECTION AND INSURANCE COMPANY.

The steam boiler explosions in this country, for the year ending January 1, 1871, were numerous and destructive. We have kept the best record we could, our information having been received mostly through our agents and from newspapers published in different parts of the country. It must be remembered that the following record is of serious and destructive explosions only. There have been numerous slight accidents, such as ruptures of plates, resulting from overheating or carelessness in management, doing little damage and injuring no one. These are not included in the following record.

	No.	Killed.	Wounded.
Breweries	1	0	0
Propellers	1	4	0
Bone dust manufactory	1	0	2
Cotton mill	1	0	1
Britannia works	1	0	1
Carriage manufactory	1	0	0
Revenue cutter	1	0	0
Thrashing machine	1	2	3
Paper mill	1	0	0
Ferry boat	1	0	0
Car works	1	4	3
Agricultural works	1	4	3
Bleachery	1	0	0
Shoe factory	1	0	0
Steel works	1	1	0
Iron foundery	1	2	5
Chair factory	1	5	20
Pile driver	1	1	1
Boiler maker	1	0	4
Distillery	1	1	4
Sugar refineries	2	7	1
Public water works	2	1	1
Soap works	2	4	1
Brass founderies	2	1	2
Steam fire engines	2	1	10
Coal mines	2	7	14
Rag boilers	2	6	2
Heating and domestic boilers	3	1	0
Rolling mills	3	10	27
Woolen mills	3	1	7
Oil works and wells	3	1	3
Machine shops	4	2	3
Flour mills	6	14	7
Steamboats	7	136	26
Tug boats	10	41	13
Railroad locomotives	16	16	19
Saw mills	29	53	44
Total	118	326	227

A number of these boilers were under Government, State, or municipal inspection. In the cases of the steamboats, many of the killed were, without doubt, drowned or burned, as fire ensued in each case; but the original difficulty was with the boiler that exploded, killing and wounding many, and then other horrors followed.

We regard this record, and similar records of previous years, as evidence of the need of some well digested and effective system of boiler inspections throughout the country. If there be not compulsory law, many boilers in use would never be inspected; and yet, with the fact before us, that almost all public offices are more or less mixed with politics, it is very doubtful whether State and municipal regulations will ever accomplish the end sought.

This corporation (The Hartford Steam Boiler Inspection and Insurance Company) has made upwards of 12,000 examinations during the year. All the boilers under its care are examined at intervals of three or four months, and it is no uncommon thing to find defects, at those periodical inspections, which require immediate attention. The result is, that there never has been a serious explosion of any boiler under the care and inspection of the Company, and no person has ever been in the slightest injured.

We are aware that any boiler is, from careless management, liable to explode, no matter how carefully it may have been inspected; but we believe that an expert, familiar with boilers of all kinds, calling at a boiler room once in three or four months, looking over boilers or attachments carefully, and conferring with the engineer, will do much to remove the risk arising from carelessness. As we have already remarked, we fully believe in wholesome inspection laws; not such as have been foisted upon some States to the disgust of intelligent engineers and manufacturers, but laws prepared by men who know the wants of manufacturers and the community in this respect. And again, not such as are framed for the purpose of making a market for some "patent appliance," which may or may not have merit. We believe further, that inspection laws should recognize the work of companies making guaranteed steam boiler inspections.

This work is growing in favor with steam users, and there should be wholesome legislation on the subject, that such corporations may have guaranteed to them the privileges accorded to other corporations; and that steam users may be protected from worthless and irresponsible companies. This can all be done, and the steam user can then choose which he will have, the State or the guaranteed inspection—one he must have.

We are not able to estimate accurately the amount of loss to property from boiler explosions, but it will approximate to $2,000,000.

The Castor Bean in California.

The U. S. Commissioner of Agriculture, in his report for January, says the cultivation of the castor bean in California is rapidly increasing. The amount raised this year will be quite large. One of the largest and most succesful enterprises in this culture is that of Mr. Hedges, whose experiments are carried on in the vicinity of Marysville. Mr. Hedges has under cultivation this season about 200 acres, and expects to realize about 125 tuns, all of the small "Illinois bean." The stalks of this variety vary in hight from six to fifteen feet. The work of gathering begins in July and continues until the frosts set in. The drying grounds on this farm are described as large places cleared off to the "hard pan" of ground, and made smooth like a brick yard. On this surface the heads or clusters of beans are laid in the sun, many of them having been picked in a green state, and here, as they dry, they open. When pretty well "snapped," the heaps are raked over, and the beans removed and placed in a fanning mill, whence they are transferred in a merchantable condition to the sack. Mr. Hedges utilizes the hulls as manure, and it is asserted that they operate to loosen as well as to enrich the clay soil of his farm. This gentleman finds the cultivation of the castor bean so profitable that he purposes next season to plant 300 acres.

French Felt Waterproof.

We have been informed of the composition of this mixture, the manufacture of which has heretofore been regarded as a secret in France, and have made the following calculations regarding its cost:

The cost price varies according to the thickness or the quality of the fabric employed. The covers for wagons, in France, are generally 39 inches wide, and are sold for $1 per yard; the original cost is about 45 cents, and the labor three cents per yard. For cart and dray purposes, they measure about 32 inches in width, and cost about the same. Their dynamometric strength is 450 pounds per square yard. The price of the covers can be reduced considerably by using cotton fabrics instead of linen.

The joint closer is sold in France at 50 cents per pound, but it can be made to cost only 20 cents.

Mr. Parent, chief engineer of the steamer *City of Paris*, who kindly furnished the information regarding this material, has used it for years with great success. It has also been adopted by the Imperial Navy.

The inoxidisable compound for waterproof is made thus:

	Grammes or	Ozs.	Drachms.
India-rubber	106·5	3	12
Finely-sifted sawdust	175	6	3½
Powdered sulphur	10		52
Slacked lime	25		14½
Sulphate of alumina	125		7½
Sulphate of iron	125		7½
Hemp tow	10		52

To mix the above, use heated cylinders, so as to obtain a very homogeneous paste, which is made into thin cakes, and afterward divide into small pieces to be dissolved.

To dissolve this substance, take 4½ pounds of spirits of turpentine, benzine (common is preferable), petroleum or sulphuret of carbon to 2½ pounds of the mixture. It must be stirred five or six times during twenty-four hours, at the end of which time the mass thoroughly dissolves.

The solution is then spread on the fabrics or articles to be preserved, by means of rollers, knives, or spatulas, adapted to the purpose. Apply as many coats as may be necessary, and then let it dry. As soon as the fabric is dry, it is passed under pasteboard laminating rollers, in order to give a luster to the surface. The fabric is then rolled up on a hollow iron pipe, which is covered with cloth to prevent it sticking to the iron, and the whole placed in a copper pipe, with a perforated lid or cover; steam is then introduced at a pressure of four atmospheres, which pressure is maintained for one hour, at the end of which time the operation is ended.

If it be desired to give these impermeable covers a black color, a solution of sulphate of iron, gall nut, and logwood is applied with a brush.

To make caps or joint closers the following proportions are used:

	Grammes.
India-rubber	2,125
Sawdust	1,500
Sulphur	200
Minium, or red lead	300
Alum	500
Slacked lime	500
Hemp tow	500

Dissolve the india-rubber in the above named quantity of benzine, then add the other articles and make a paste of the whole, and apply it when desired for joint closers, on steam engines, hydraulic pumps, or boilers.

India-rubber of inferior quality is best adapted to these compounds.—*C. Widemann, in Journal of Applied Chemistry.*

The Different Methods of Distinguishing Vegetable Fibers.

On account of the frequent practice, now-a-days, of spinning and weaving together cotton, linen, wool and silk, and on account of the difference in value between such fabrics, it has become a necessity to find reliable, simple and rapidly executed tests to distinguish them, inasmuch as the practiced sight and touch no longer suffice for this purpose. If the question be simply whether animal and vegetable fibers are mingled in the same fabric, it is possible to decide by a few very simple chemical reactions; thus wool and silk dissolve in warm caustic alkali, while vegetable fibers—cotton and linen—do not. The animal fiber is dyed yellow by nitric acid, owing to the formation of picric acid, and red by nitrate of mercury.

Schweitzer has proposed an ammoniacal copper solution as a test for cotton, as it is an excellent solvent for it. According to Persoz, silk is distinguished from wool and cotton by its capability of dissolving in chloride of zinc.

If wool be brought into an alkaline solution of oxide of lead, it is gradually blackened; for the sulphur, which is always present in wool, combines with the lead to form black sulphide of lead, which is precipitated by the fiber.

Cotton may be discovered in linen fabric by the sulphuric acid test, proposed by Kindt & Lehnerdt. The finish is carefully removed from the fabric by repeated washings; the sample is then dried, about half of it steeped 1-2 minutes in sulphuric acid; it is then placed in water and rubbed gently and carefully between the fingers to effect a solution of the product formed by the action of the sulphuric acid upon the cotton. This process may be hastened by the addition of some alkali. The sample is then squeezed out and dried. During the time mentioned, the cotton thread has been dissolved, while the linen one remains behind; but the time mentioned must not be exceeded, otherwise the linen threads will also be attacked. To render this test applicable to colored fabrics, the color must first be removed.

Elsmer's coloring and discoloring test, is applicable to the same purpose. The alcoholic solution of madder, in the course of 10 or 15 minutes, colors linen uniformly orange red, cotton uniformly yellow; cochineal tincture imparts to linen, a purple, to cotton, a light red tint. Mixed fabrics, treated with these tinctures, are not dyed uniformly, but appear striped.

The decoloration test is founded upon the fact that a linen fabric, dyed with cochineal, is discolored by chloride of lime solution more slowly than a similarly dyed cotton tissue.

Liebermann recommends fuchsin as an excellent means of distinguishing animal and vegetable fibers. Boil a solution of fuchsin with an alkaline lye, filter the colorless liquid from the precipitate, and, after gently warming, immerse the sample a few seconds in it. It remains colorless; but after thorough rinsing with cold water, the wool is dyed red, while the cotton remains colorless. After drying, every individual woolen thread may be recognized by its red color. The solution is best when prepared by dissolving a few grains of fuchsin in water, and gradually adding potash or soda lye till the color has disappeared. The solution can be preserved and used for several tests. In this test, silk behaves like woolen, linen like the other vegetable fibers.

Zimmermann proposes to discover cotton in linen tissues by dipping the sample for 8 or 10 minutes into a mixture of 2 parts of nitric and 3 parts of sulphuric acids. If cotton be present, gun cotton, which can be extracted by a mixture of alcohol and ether, would be formed in this manner.

Better than this, and really excellent for tissues that are not dyed, is Frankenstein's oil test. A sample of the goods is dipped into olive or colza oil, which is eagerly absorbed by the fabric. The sample is then pressed between pieces of unsized paper in order to remove the excess of oil. If the tissue consist of mixed fibers, it will now appear striped, the linen threads having become transparent and appearing lighter than the cotton threads, which remain unchanged. If the prepared sample, on the other hand, be placed upon a dark surface, the linen threads appear darker than those of cotton. In this, as in all other tests mentioned heretofore, it is advisable to pull out a few threads from the edge of the sample before proceeding with the experiment.

In conclusion, let us mention combustion as a means of distinguishing animal from vegetable fiber. Burning silk and woolen fiber gives rise to a disagreeable odor, like that of burnt horn, and leaves behind a black, carbonaceous mass, which is more voluminous than the original fiber. Vegetable fibre burns up more rapidly, giving off no strong smell, and leaving no voluminous residue.

Decidedly the best and safest method, and one applicable in all cases, is a microscopic examination, by which not only the structure, but also the nature of the fiber can be demonstrated. Cotton, wool and silk are easily distinguished by the microscope, as they differ materially in appearance. Cotton forms flat, narrow ribbons, curled up in spirals like those of a corkscrew; wool fiber is stouter than all others, and may be recognized by its scaly surface, while silk is the thinnest fiber, has the smoothest surface, and possesses the least structure. These appearances are very characteristic, and any one who has observed them once will ever afterwards recognize them again at first sight.

Sir Joseph Whitworth on Horse Railways.

"The use of horse tramways is being urgently pressed forward, and a large outlay is contemplated. In my opinion, they are not suited to the present times, and mechanical engineers have a right to enter their protest, considering the many obstructions there have been for many years past to the employment of road locomotives. If tollgates were abolished, and each county had an organized staff for making and keeping the roads in good order, using the steam roller, steam sweeping machine, and other necessary appliances, where there is large traffic, mechanical engineers would then, I have no doubt, soon produce a small light locomotive that would do its work quietly and most effectively; at the same time, pedestrians and those who ride and drive would have the enjoyment of good and clean roads, instead of the present badly paved and rough Macadam roads. The broken stones of the latter are now left, for the horses' feet and narrow wheels to consolidate, in a way it is quite distressing to see. The consumption of fuel per horse power is now so small that road locomotives could be employed at far less expense than the overworked and ill-conditioned horses we now see, while pedestrians and those who keep horses for pleasure would have good roads, and many gentlemen, no doubt, would have their well-made locomotives."

FROSTED FEET.—To relieve the intense itching of frosted feet, dissolve a lump of alum in a little water, and bathe the part with it, warming it before the fire. One or two applications are sure to give relief.

Chloralum---Its Value as an Antiseptic and Disinfectant Denied.

This new disinfectant, recommended by Prof. Gamgee, an account of which was recently published in this journal, has, according to the *Scientific Review*, been experimented upon by Dr. Crace Calvert, who finds it valueless as a disinfectant.

Dr. Ballard, the medical officer of health for Islington also entertains modified notions as to the value of the chloralum. He has the greatest personal respect for Prof. Gamgee, and for the admirable work he has done—no one more; but Dr. Ballard is sure that he is not warranted in propounding chloralum as a "disinfectant," and still less in recommending its use as such, without, at the same time, adducing the evidence on which his opinion and recommendation are grounded. The *onus probandi* lies with him; he cannot make the assertion, and then leave the profession to show that he is wrong, although there are plenty of bad precedents for such a course. "Chloralum" may turn out to be the best disinfectant known; his discovery may possibly be one of the highest practical value, but he cannot be permitted to anticipate observation and experiment. He has as yet advanced nothing to satisfy Dr. Ballard or anyone, that chloralum used in any way is capable of destroying the peculiar manifestations of a morbid contagion. That it is capable of checking the throat lesions in diphtheria and scarlatina is no more than has been said, by the highest authorities, of ordinary alum.

Business and Personal.

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.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

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.

J. T. says: "I have made an improvement in machinery, by the use of which one half of the fuel now used in running machinery will be saved. I had my model about ready to send you, but have been informed that patents will not be issued to persons who participated in the late rebellion. Upon this I destroyed my models, until I can learn for certain, as I was a participant in that unfortunate affair." Our correspondent is informed that his participation in the rebellion does not debar him from applying for a patent. Since the close of the war, patents have been taken out, through the Scientific American Patent Agency, by General Beauregard, and other distinguished warriors. They have converted their swords into pruning hooks, and are heartily engaged in the conservation of peaceful and improving arts. Our correspondent is advised to reconstruct his model, and send it along by express, directed to Munn & Co., 37 Park Row, N. Y.

T. B. S., of Ind.—J. P. Joule once made an electro-magnet which raised 140 times its own weight. An account of this magnet is given in "Annals of Electricity," Vol. V., page 187. An ordinary electro-magnet will raise 20 times its weight, with proper battery power. Very small electro-magnets have been made to lift 2,834 times their own weights. The powerful electro-magnets of Joule were tubes with thick walls, split, and wound in the direction of their length.

J. C. W., of Mass.—Railroad managers have had their attention called to elastic car wheels, packed with rubber, paper, wood, etc. Some of these devices are now undergoing trials which will settle the question of their worth. All new improvements of magnitude are introduced slowly. If the wheels in question sustain in trial what is claimed for them, their general adoption is only a question of time.

B. N. P., of ——.—The same number of units of heat is required to heat a given mass of water, no matter whether the heat be conveyed into the water by steam, or hot water jets.

J. A. F., of Mo.—A gas, in expanding to its original volume after compression, absorbs as much heat as it evolved during the compression. There is neither gain nor loss in this respect.

A. R. S., of Ohio.—The marginal scale, on Auchindoss' Travel Scale is made to correspond with the travel scale.

FILING CIRCULAR SAWS.—I swage the teeth, at the point, to a gage on both sides, of sufficient width to clear the blade while in the log, and file perfectly square on the face and back of the teeth. If A. O. B. will dress his saw in this way, it will give satisfaction in soft or hard timber. —S. H., of Pa.

W. F. H., of N. Y.—You will not be able to stop the leaking of your cider vats without taking out the cider, and having them overhauled by a first-class cooper.

T. E. N., of Tenn.—You will find the information you wish in regard to capillary attraction, in any good treatise on physics. To answer you here would occupy too much space.

P. A., of Mich.—The subject of ice formation was treated at length in Vol. XXII. of this journal. We do not wish to reopen this subject at present. You will, by reference either to the volume referred to, or to works on physics, be able to answer your query.

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, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.]

1.—CEMENT.—We want a cement to fasten wooden drawer handles on bureau drawers, after the same are painted and varnished.—S. & C.

2.—SHELLAC VARNISH.—I wish a recipe for the best shellac varnish.—A. R. S.

3.—TO IMITATE ROSEWOOD.—Will some of your numerous readers please give me a good recipe for staining, in imitation of rosewood —H. G. W.

4.—SUPERHEATING STEAM.—I have a boiler of twenty-five horse power, from which I carry steam 800 feet. Can I profitably superheat my steam? and if so in what manner?—P. W. G.

5.—SOLDERING CAST IRON.—Can any of your correspondents let me know if there is any kind of fluid that can be used, with soft solder, to solder cast iron together, and if it will do for stove foundery iron and common gray iron, providing the surface be clean? I use chloride of lime, water, and sal ammoniac for wrought iron, steel, brass, copper, zinc, etc; chloride of lime, two fluid ounces; water, two fluid ounces; sal-ammoniac, one half a teaspoonful; but it will not work on cast iron to any advantage.—W. S. B.

6.—HARDENING TALLOW CANDLES.—Is there any cheap method of hardening tallow candles, so as to render them less objectionable?—E. H. H.

7.—SPIRAL SPRING.—What sized wire must I use for a spiral spring, and what size must the coils be, to stretch three fourths of an inch, with a strain of 200 pounds, without setting the spring? Also, what size rubber spring will do the same work? Is rubber as good as wire for such a spring?—F. W. H.

8.—WATER HEATER.—How can I stop my heater from leaking? It is constructed in the cylinder form, with six copper pipes passing through, and the escape steam passing around the pipes. The leakage occurs from the expansion and contraction of the pipes, where they are fastened in the cast iron head.

Recent American and Foreign Patents.

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

MOLD AND PATTERNS FOR CASTING GROOVED ROLLERS.—John Herald, Otsego, N.Y.—The object of this invention is to so construct the molds for casting rollers or sheaves with grooved edges, that the grooves in the edges will be accurate, and throughout of the desired shape.

TILE, OR FIRE-BACK, FOR FIREPLACE.—Joseph Hackett, Louisville, Ky.—This invention relates to a new tile, or fire-back, for fireplaces, which is so made, that it can be readily applied without cementing or special fastenings, radiate the heat in the most advantageous manner, and form part of the throat of the flue.

CARPET RAG LOOPER AND SEAM RIPPER.—Daniel A. Russell, Windham, Ohio.—This invention relates to a new apparatus for connecting the ends of woolen or other rags preparatory to the weaving of the same into rag carpet. The invention consists in the use of a perforated knife blade, which is pivoted to a block, and held in an upright position thereon by a spring catch.

BALING PRESS.—E. R. Wallace, Jonesville, S. C.—This invention relates to a new baling press, of that kind in which two followers are used, one above the other, they being secured, respectively, to right and left hand screws, and moved forwards or away from each other by being turned together with the box. The invention consists in a new combination of parts.

INDIA-RUBBER SHOES.—C. Meyer, New York city, and John Evans, Rochester, N. Y.—This invention relates to improvements in india-rubber shoes, and consists in shoes provided with raised ribs or other raised figures on the surface, with rows of stitching, or imitation thereof, by the sides of the said ribs, which inclose spaces representing the openings made in the front uppers of sandals, or representing other ornamental figures, the same being made by means of compressing rollers, one having the reverse of the ribs or other raised figures, and the indentations required, engraved on it, the other being plain, between which rollers the outer sheet of which the shoe is composed is formed from the mass, at the same time receiving the impressions the said rolling being done before the rubber is vulcanized and made up into the shoe.

HOOP SKIRT.—James O. West, New York city.—This invention relates to improvements in hoop skirts, and it consists in a novel construction of the same, calculated to form, by the arrangement of the hoops and an adjusting band, a prominent and efficient adjustable bustle.

BATHING BRUSH.—Joseph Marshall, Brooklyn, N. Y.—This invention relates to improvements in bathing brushes of that kind in which a sponge or other porous article is arranged within an annular rim or border of bristles. The invention has for its object to prevent the water from entering between the back of the brush and the plate which holds the bristles and from thereby injuriously affecting the wood and wire-work of the brush.

FASTENING END BOARDS IN WAGON BOXES.—George W. Diller, Odell, Ill.—This invention relates to a new and useful improvement in mode of fastening end boards in the boxes of wagons, and consists in a hinged cleat and staple, and hook, connected with the side of the box.

HAT SIZING MACHINE.—James H. Hopkins, Newark, N. J.—This invention has for its object to furnish a simple, convenient, and effective machine for sizing hats, which shall be so constructed and arranged as to do well and thoroughly work which has heretofore been done only by hand.

OILER FOR THE JOURNALS OF PULLEYS AND OTHER WHEELS.—E. Donden, Lykens, Pa.—This invention has for its object to furnish an improved oiler for oiling the journals of loose pulleys and drift car wheels, and for use in other cases where a hub revolves upon a journal, and which be simple in construction, conveniently manipulated, and prevent the waste of oil.

WASHING MACHINE.—Lawrence White, Orford, Iowa.—This invention has for its object to furnish a simple, convenient, cheap, and effective washing machine, which will wash the clothes quickly and thoroughly, and without rubbing and wearing them, the washing being done by squeezing out the water, and again allowing them to become saturated.

REVOLVING CHURN.—F. B. Chapman, Salisbury, Mo.—This invention relates to a new and useful improvement in a churn for converting cream and milk into butter, and consists in revolving the churn instead of the dasher.

CULTIVATOR.—William Gowen, Bartlett, Tenn.—This invention has for its object to furnish an improved cultivator, designed for use in cultivating cotton, corn, and other crops planted in drills or rows, which shall be simple in construction, effective in operation, and easily controlled when at work, and which may be easily adjusted for cultivating narrow rows, or for use as a harrow.

PLOW.—Alexander Rickart, Schoharie, N. Y.—This invention has for its object to improve the construction of plows so that the draft may be applied to the plow in the rear of the moldboard, which will enable the beam to be made lighter than is possible when the beams are made in the ordinary manner, and which will at the same time give it sufficient strength.

PRESS.—Christopher D. Findlay and David D. Craig, Macon, Ga.—This invention relates to improvements in presses for hay, cotton, and other like

ubstances, and consists in a combination with the screw and nut for working the follower, of anti-friction balls for reducing the friction. It also consists in a combination with the nut and nut holder of anti-friction balls under an arrangement calculated to relieve the friction of the end thrust.

HEELS FOR BOOTS AND SHOES.—Homer S. Smythe, Darlington, Wis.—This invention relates to improvements in the construction and arrangement of heels for boots and shoes, and consists in making the heels in two parts, one of leather permanently attached, and the other of india rubber or other substance, which may be molded and attaching it by means of a screw bolt passing through a metallic plate or block formed in the detachable part, and screwing into a metal plate bedded in the other part.

METHOD OF ORNAMENTING GOLD, SILVER, OR PLATED WARE.—H. G. Reed, Taunton, Mass.—This invention is an improved process, whereby gold, silver, and plated ware can be beautifully ornamented with chased, engraved, or etched designs, without the use of pitch, or the necessity of finishing or burnishing the articles afterwards, and so rapidly and pertectly that work can, by this process, be done in a superior manner for less than one twentieth its cost by the old methods.

MACHINE FOR CUTTING LEATHER.—H. Z. Baker, Pawtucket, R. I.—This invention has for its object the cutting of leather into strips for belting and other purposes, and it consists in a machine in which a pair of parallel rolls s employed, one having a circumferential cutting flange or knife fitting in a circumferential groove in the other.

HORSE HOLDER ATTACHMENT TO CARRIAGES.—G. W. Goodwin, Petersburg, Va.—This invention has for its object to prevent horses from running away with carriages, and consists in the arrangement of a lever, in connection with the carriage wheel and with the reins, whereby it is caused to draw the reins backward when the carriage moves forward.

GATE-OPERATING APPARATUS.—Patrick O'Neill, Murfreesboro, Tenn.—This invention relates to improvements in gate-operating apparatus, and it consists in the application, to the hinged end of the gate, of a projecting arm and friction roller, and in the combination therewith, of a pair of plates hinged together, and connected by chains with an operating lever and cords, all so arranged that on approaching the gate from either side, and pulling the cord, the gate may be raised, unlocked, and swung open by one of the plates acting under the roller, and taking the weight off the hinges upon its oblique side; then, on pulling the same rope again, the other plate similarly acting on the roller, will cause the gate to shut again.

MILL STONE.—J. W. Masury, Brooklyn, N. Y.—This invention relates to mprovements in the construction and dress of mill stones for grinding paint and other wet substances, which improvements are also applicable to stones for grinding plaster, grain, or other substances.

PLATING AND POLISHING COMPOUND.—M. J. A. Keane, New York city.—This invention relates to a new compound for plating or polishing articles of soft metals, such as spoons, forks, and the like, and consists in a compound made of silver, chemically pure, or chloride of gold, cyanide of potassium, and prepared chalk, or any coloring substance of a similar nature, to hold the other ingredients in a semi-fluid state.

BOLT STRAIGHTENING APPARATUS.—C. E. Hunter, Hinsdale, N. H.—This nvention relates to improvements in apparatus to be used in straightening bolts, and it consists in a combination of a shank-holding attachment and clamping and holding devices therefor, with a metal block or "sow," so called, preferably of iron, having grooves of different sizes in or across the face, corresponding in form and size to the heads of the bolts to be straightened, with which the said shank-holding attachment is so arranged that the shank of the bolt may be placed in it, and the head in the groove in the block, and so supported that the bolt may be readily straightened at the juncture of the shank with the head, or the head and shank brought into the same axial line by blows of a hammer delivered on the shank or head.

EXCAVATING MACHINE.—J. M. Hughes and A. J. Mahez, Independence, Mo.—This invention relates to improvements in excavating machines, and consists in a pair of rotary diggers or spaders of peculiar construction located in a vertically adjustable frame, under the fore wheels of a truck, and operated by gearing connected with the said wheels in a manner to spade up the surface of the earth, and throw it upwards and backwards upon a suspended tray or receiver, on which it may be carried away to be discharged by tilting the several boards of the bottom of said tray, which are paneled and provided with tilting apparatus for the purpose.

VEGETABLE CRUSHERS.—Reuben Daniels, Woodstock, Vermont.—This invention relates to improvements in machines for crushing vegetables, apples and other like substances, by passing them between two crushing rollers, and it consists in an arrangement with a scroll hopper applied to the upper and larger roller in such a way, that that the apples or other articles are forced, by the action of the roller, from the mouth, through a gradually decreasing space, in which they are flattened preparatory to entering between the rollers of a copper or other metal covering, non-corrosive in cider or vegetable acids, for maintaining a smooth surface, which is necessary to the success of the flattening operation, which is promoted if the surface is rough, owing to the apples sticking thereto.

FISH-HOOK AND LINE LOLDER.—Levi Arnold, Belchertown, Mass.—This invention consists in a metallic connection between the hook and the line, made in one or more pieces, and in fastening the hook and the line, or either of them, to the ends thereof by means of one or more rings sliding on said connection.

FANNING MACHINE.—E. P. Doremus, Washington, La.—This invention relates to a new mechanism for moving fans by means of clock work, and consists in the use of double jointed levers, which are combined with the escapement wheel of the works to impart oscillating motion to a connecting link and the fan. The invention will be very convenient for working fans in parlors and work-rooms, but can also be used as an appendix to machinery of all kinds.

NEW BOOKS AND PUBLICATIONS.

PRINCIPLES OF MECHANISM.—Designed for the Use of Students in the Universities, and for Engineering Students generally. By Robert Willis, M.A., F.R.S., Jacksonian Professor of Natural Philosophy in the University of Cambridge, Hon. Fellow of the Institution of Civil Engineers, etc., etc. Second Edition. London: Longmans, Green & Co. New York: John Wiley & Son, 15 Astor Place. Price $6·50.

This is a work the scope of which is so well set forth in its title that we need not dwell upon it in this notice. Those who read it must bring to its perusal a sound knowledge of elementary mathematics. To those possessing such knowledge, the method pursued is one calculated to lead the mind, by easy gradations, into a thorough knowledge of the principles of mechanism. We would not be understood to find fault with the mathematical character of the treatise. A thorough knowledge of mechanics cannot be obtained without mathematics, and it is a pity that such works as this cannot be made more widely useful by more thorough and general mathematical training. The work is a large octavo, well printed and bound, but, we are sorry to say, it lacks an index, an omission which is poorly supplied by its table of contents.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

251.—SEWING MACHINE.—W. A. Mack, Norwalk, Ohio, and James Blake, Scranton, Pa. January 31, 1871.

[illegible].—VAPOR ENGINE.—J. A. H. Ellis, Springfield, Vt. January 31, 1871.

262.—FILING AND SHARPENING SAWS.—Wm. Tucker and Prince Snell, Fiskdale, Mass. January 31, 1871.

293.—MACHINE FOR CUTTING CLOTH AND OTHER MATERIALS.—A. Warth, of Stapleton, and W. F. Jobbins, New York city, both in N. Y.

294.—ELECTRO MOTOR FOR RAILWAY CARRIAGES.—Solomon Jones, of New Orleans, La., William H. Smith, Randolph, Ala., and J. H. Weaver, New Orleans, La. February 2, 1871.

296.—MATTRESS AND LIFE PRESERVER COMBINED.—J. W. Wotton, New York city. February 3 1871.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING FEB. 21, 1871.

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111,896.—MACHINE FOR CUTTING AND MITERING PRINTERS' RULES.—Frank H. Aiken, Franklin, N. H.

111,897.—GOVERNOR-VALVE CONNECTION.—John F. Allen, Harlem, N. Y. Antedated February 4, 1871.

111,898.—FISH HOOK.—Levi Arnold, Belchertown, Mass.

111,899.—MACHINE FOR CUTTING SCREWS.—James S. Atkinson, Ormsby borough, Pa.

111,900.—MACHINE FOR CUTTING LEATHER.—H. Z. Baker, Pawtucket, R. I.

111,901.—CURRIER'S TOOL.—James T. Barnstead, Peabody, Mass.

111,902.—TAP FOR OIL CANS.—Jabez A. Bostwick, New York city.

111,903.—SPRING CARRIAGE CUSHION.—T. S. Burnett, Syracuse, N. Y.

111,904.—WOOD PAVEMENT.—William Bushnell, Elizabeth, N. J.

111,905.—WIRE STRETCHER.—Albert Byington, Rochelle, Ill.

111,906.—WASHING MACHINE.—Wm. H. Carman and R. P. McCollum, Philadelphia, Pa.

111,907.—CHURN.—Franklin B. Chapman, Salisbury, Mo.

111,908.—VALVE FOR WATER ENGINES.—Abraham Coates, Watertown, and George W. Lascell, Syracuse, N. Y.

111,909.—WASHING MACHINE.—John Court, Memphis, Tenn.

111,910.—TREATING BLOOD FOR THE MANUFACTURE OF FERTILIZERS AND AMMONIACAL SALTS.—John J. Craven, Jersey City, N. J.

111,911.—PLOW.—Francis Cremer Elmwood, Ill.

111,912.—MANDREL FOR GAGING AND CUTTING SOLDER WIRE.—Lewis Cutting, San Francisco, Cal., assignor to himself and Francis Cutting.

111,913.—VEGETABLE CRUSHER.—Reuben Daniels, Woodstock, Vt.

111,914.—BASE-BURNING STOVE.—Edward Mortimer Decy, New York city.

111,915.—FASTENING END BOARDS IN WAGONS.—George W Diller (assignor to himself and George B. Woodbury), Odell, Ill.

111,916.—CONDENSER AND FEED-WATER HEATER FOR STEAM ENGINES.—Joseph Dilworth, and John C. Hodgins, Toronto, Canada.

111,917.—FANNING MACHINE.—E. P. Doremus, Washington La. Antedated February 11, 1871.

111,918.—LUBRICATOR FOR WHEELS, PULLEYS, AND JOURNALS.—Edwin Douden (assignor to himself and Chas. Broome), Lykens Pa.

111,919.—REFLECTOR.—F. P. Doyle (assignor to himself and John Cooke), New York city.

111,920.—CRUET STAND.—Josiah W. Ells, Pittsburgh, Pa.

111,921.—MACHINE FOR FORMING ARTIFICIAL STONE.—J. S Elliott (assignor to the Union Stone Company), Boston, Mass.

111,922.—MACHINE FOR MOLDING TWEERS.—Samuel English (assignor to himself and James Ostrander), Troy, N. Y.

111,923.—PRESS FOR HAY, COTTON, ETC.—C. D. Findlay and D. D. Craig, Macon, Ga.

111,924.—HORSE-HOLDER ATTACHMENT TO CARRIAGES.—G W. Goodwyn, Petersburg, Va.

111,925.—CULTIVATOR PLOW.—William Gowen, Bartlett Tenn.

111,926.—EARTH CLOSET.—Edmund Griffith, Wilmington Del.

111,927.—MILLING TOOL.—Levi Griswold, Branford, Conn.

111,928.—CARRIAGE.—Chauncey Holmes Guard, Toronto Canada.

111,929.—FIREPLACE.—Joseph Hackett, Louisville, Ky.

111,930.—MAKING CIDER.—George B. Hamlin, Willimantic Conn.

111,931.—PATTERN FOR CASTING GROOVED ROLLERS.—John Herald, Unadilla, N. Y.

111,932.—COW MILKER.—Elisha A. Hewitt, Groton, Conn.

111,933.—SELF-ADJUSTING CAR TRUCK.—Edward Hipkins, Burford township, Canada.

111,934.—CAR TRUCK.—Edward Hipkins, Burford township, Canada.

111,935.—HAT-SIZING MACHINE.—J. H. Hopkins (assignor to himself and William Carrollton), Newark, N. J.

111,936.—FLY TRAP.—Peter D. Horton aud Ezra T. Bryan Marengo township, Mich.

111,937.—STEAM ENGINE.—John Houpt, Springtown, Pa.

111,938.—ROOFING TILE.—Charles Howard, Warren, Ohio.

111,939.—SNOW-SHOVEL TIP.—Eber Hubbard, Seneca Falls, N. Y.

111,940.—EXCAVATING MACHINE.—Joseph M. Hughes and Andrew J. Mapes, Independence, Mo.

111,941.—MACHINE FOR STRAIGHTENING BOLTS.—Charles E. Hunter, Hinsdale, N. H.

111,942.—LIFTING JACK.—Benjamin F. Johnson, Glasgow, Mo.

111,943.—LOCK-STOP COCK.—J. Evans Jones, Tidioute, Pa.

111,944.—DRAFT DEVICE FOR THREE HORSES.—Owen W. Jones, Columbus, Wis.

111,945.—COMPOUND FOR PLATING AND POLISHING.—M. J. A. Keane, New York city.

111,946.—SASH HOLDER.—W. H. King, Newark, N. J., and Jared Rowland, Williamsburgh, N. Y., assignors to W. H. King.

111,947.—SECURING STEEL OR IRON PINS IN WOOD.—Richard Kitson, Lowell, Mass.

111,948.—PASSENGER REGISTER FOR CARS.—John Kurz, Philadelphia, Pa.

111,949.—HORSE POWER.—Daniel L. Lamon, Boston, Ga.

111,950.—REFRIGERATOR.—John H. Lester, Niantic, Conn.

111,951.—BASE-BURNING STOVE.—D. G. Littlefield, Albany, N. Y.

111,952.—METHOD OF ATTACHING HANDLES TO SCRAPERS.—Edward C. Locke, Providence, R. I.

111,953.—SAW-TOOTH SWAGE.—John Lough, Buckingham, Canada.

111,954.—BEAM COMPASS.—Josiah Lyman, Lenox, Mass.

111,955.—BATHING BRUSH.—Joseph Marshall, Brooklyn, N.Y Antedated February 17, 1871.

111,956.—MILLSTONE.—John W. Masury, Brooklyn, N. Y.

111,957.—LEATHER-PUNCHING MACHINE.—John Matheis Ottowa, Ill.

111,958.—WASHING MACHINE.—Erwin W. Maxson, Scranton Pa.

111,959.—BURGLAR ALARM.—John McDowell, Washington, Pa.

111,960.—LAMP BURNER.—William C. McGill, Cincinnati Ohio.

111,961.—PUMP.—Charles L. Merrill, Watertown, N. Y.

111,962.—INDIA-RUBBER SHOE.—Christopher Meyer, New York city, and John Evans, New Branswick, N. J.

111,963.—COOKING-STOVE ATTACHMENT.—Nathan S. Minniss Oil City, Pa.

111,964.—ANTI-RATTLING WASHER.—Benjamin Morton, Fertility, Pa.

111,965.—PLOW.—James Oliver, South Bend, Ind.

111,966.—DEVICE FOR GRINDING THE FLAT FACE OF VALVE SEATS.—Samuel J. Peet and Daniel Sawyer, Boston, Mass., assignors to Samuel J. Peet. Antedated Feb. 11, 1871.

111,967.—CURTAIN FIXTURE.—Phineas W. Phillips (assignor to James F. Almy), Salem, Mass.

111,968.—FELTED FABRIC.—James Ezra Pollard, Franklin City, Mass.

111,969.—MINIATURE WAR GAME.—Casimiro Portillo, New York city.

111,970.—LARD AND BUTTER BOX.—William Pratt, New York city.

111,971.—FIREPLACE GRATE.—William Pulsfort, Louisville, Ky.

111,972.—CAR COUPLING.—Samuel H. Reed and George A. Reed, Fredericktown, Ohio.

111,973.—MACHINE FOR BRONZING.—Israel L. G. Rice, Cambridge, Mass.

111,974.—SPRING BED-BOTTOM, SEAT, ETC.—Charles Rich, Poughkeepsie, N. Y.

111,975.—PLOW.—Alexander Rickard, Schoharie, N. Y.

111,976.—PRIVY.—Frank Riedel, San Francisco, Cal.

111,977.—IMPLEMENT FOR SLITTING AND LOOPING RAGS FOR CARPETS.—Daniel A. Russell, Windham, Ohio.

111,978.—SHIRT.—Adolphe Salmon (assignor to Cahm & Salmon), New York city.

111,979.—CORN PLANTER.—Joseph Schott, Peoria, Ill. Antedated Feb. 6, 1871.

111,980.—REVOLVING SHOWCASE.—William J. Scott, Albany, N. Y.

111,981.—HOSE RING.—George Sewell, Brooklyn, N. Y.

111,982.—STEAM ENGINE.—Joel Sharp and Joseph W. Thompson, Salem, Ohio.

111,983.—PUMP.—George F. Shaw and Henry F. Shaw, West Roxbury, Mass.

111,984.—NON-CONDUCTING MATERIAL FOR COVERING STEAM BOILERS, ETC.—Benjamin F. Smith (assignor of one half his right to G. L. Langsland), New Orleans, La.

111,985.—RAILWAY CAR COUPLING.—Marcus B. Smith, Mattoon, Ill.

111,986.—HEEL FOR BOOTS AND SHOES.—Homer S. Smythe Darlington, Wis.

111,987.—HARVESTER.—George H. Spaulding, Rockford, Ill.

111,988.—CONSTRUCTION OF CYLINDER FOR CARDING AND OTHER MACHINES.—Joseph M. Stone North Andover, Mass.

111,989.—CRADLE FOR CHILDREN.—William J. Stowell, Baltimore, Md. Antedated Feb. 20, 1871.

111,990.—COMBINED AUGER AND REAMER.—Owen W. Townsend (assignor to himself and George O. Townsend), Fond du Lac, Wis.

111,991.—SPINNING WHEEL.—Franz Voegtli, Montgomery City, Mo.

111,992.—SEEDER.—Teunis Vreeland, Oneida, Ill. Antedated Feb. 11, 1871.

111,993.—BALING PRESS.—Edwin R. Wallace, Jonesville, S.C.

111,994.—BREECH-LOADING FIREARMS.—William G. Ward, Edgewater, N. Y.

111,995.—SASH HOLDER.—Wm. M. Warren, Watertown, Conn.

111,996.—PRESSED NUT BLANK.—Frank Washburne, Brooklyn, N. Y., assignor to Steele & Johnson Button Company, Waterbury, Conn.
111,997.—PISTON PACKING.—George Wells, Providence, R. I.
111,998.—HOOP SKIRTS.—James O. West, New York city.
111,999.—WASHING MACHINE.—Lawrence White, Orford, Iowa.
112,000.—FAUCET.—William Crosby Wise and John Ashman, Chelsea, Mass.
112,001.—CONDENSING DOUBLE-END LOCOMOTIVE ENGINE.—Joseph P. Woodbury, West Roxbury, Mass. Antedated Feb. 6, 1871.
112,002.—SLIDE VALVE.—John C. Woodhead, Pittsburgh, Pa. Antedated Feb. 18, 1871.
112,003.—REFINING IRON, REDUCING ORES, ETC.—John F. Allen, Tremont, N. Y.
112,004.—TOWEL HOLDER.—Henry Alsop, Elkhart City, Ill.
112,005.—PAPER BAG MACHINE.—Peter Edward Armstrong, Philadelphia, Pa.
112,006.—CORN PLANTER.—James M. Aitchison, Omar, N. Y.
112,007.—BUCK SAW FRAME.—John Gulick Baker (assignor to Henry Disston), Philadelphia, Pa.
112,008.—HAND CAR.—William T. Beekman, Petersburg, Ill.
112,009.—WINDOW WASHER.—Charles Edward Bell, Greenfield, Ohio.
112,010.—PORTABLE WATER CLOSET.—Peter Bergqvist, Austin, Minn.
112,011.—SEAL LOCK.—Wilson Bohannan, Brooklyn, N. Y.
112,012.—MACHINE FOR CLEANING GARDEN WALKS.—Peter Boice, Chatham Village, N. Y.
112,013.—DETACHABLE MAGAZINE FOR COOKING STOVES AND RANGES.—Lewis Bridge (assignor to David Stuart and Richard Peterson, Philadelphia, Pa.
112,014.—MOP HOLDER.—John Brizee, Alvarado, Cal.
112,015.—VALVE GEAR FOR DIRECT-ACTING ENGINES.—Adam S. Cameron, New York city.
112,016.—SEWING MACHINE FEEDING MECHANISM.—Mary P. Carpenter, San Francisco, Cal.
112,017.—SIGNAL BOX FOR FIRE-ALARM TELEGRAPH.—Stephen Chester, New York city. Antedated Feb. 18, 1871.
112,018.—PUMP.—Nathan T. Cotlin, Knightstown, Ind.
112,019.—BINDER FOR SEWING MACHINES.—Jacob L. Coles, Newark, N. J.
112,020.—LUBRICATOR FOR STEAM ENGINE.—Henry C. De Land, Syracuse, N. Y.
112,021.—IMPLEMENT FOR DRIVING SPOKES INTO HUBS OR WHEELS.—Wesley Edwards, Indianapolis, assignor to himself, John Holloway, Crawfordville, and John F. Snider, Indianapolis, Ind.
112,022.—FRUIT DRYER.—B. F. Ells, Dayton, Ohio.
112,023.—MOSQUITO NET.—J. J. A. Ergenzinger, Atlanta, Ga.
112,024.—PATTERN FOR APPLYING MEASUREMENTS AND LAYING OUT GARMENTS.—Sarah C. Ewing, Indianapolis, Ind.
112,025.—FLOATING WATER ELEVATING WHEEL.—Chas. F. Fisher (assignor to himself, Lewis Moses, Bernard Moses, Gustave Moses, and William Bogel), New Orleans, La.
112,026.—APPARATUS FOR CARBURETING AND GENERATING GAS.—F. A. Fisher, Westfield township, N. J.
112,027.—KNITTING MACHINE.—G. W. Folts, Boston, Mass., and J. L. Branson, Chicago, Ill.
112,028.—WATER WHEEL.—Charles James Fox, Charlotte, N. C.
112,029.—LUBRICATOR.—S. F. Gates, Cambridge, assignor to the Lowell Oil-Cup Co., Lowell, Mass.
112,030.—HAY TEDDER.—Luke Hale, Hollis, N. H.
112,031.—LOUNGE AND BED.—John C. Hall (assignor to himself and Allen C. Richards), Cincinnati, Ohio.
112,032.—OIL CLOTH PRINTING MACHINERY.—William H. Halsey, Philadelphia, Pa.
112,033.—HOLDER FOR NEEDLES IN SEWING MACHINES.—H. J. Hancock, New York city.
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112,038.—SCHOOL DESK AND SEAT.—C. J. Higgins, Indianapolis, Ind.
112,039.—PLOW COLTER.—Ephraim C. Hodge, Oneonta, N. Y.
112,040.—FOLDING CHAIR.—Francis March Holmes, Boston, Mass.
112,041.—FOLDING CHAIR.—Francis March Holmes, Boston, Mass.
112,042.—WINDOW SASH LOCK.—B. Hotchkiss, New Haven, Conn.
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112,046.—MANUFACTURE OF FLOUR.—Elias S. Hutchinson, Baltimore, Md.
112,047.—VALVE.—John Johnson, Brooklyn, N. Y.
112,048.—HALTER BUCKLE AND RING.—L. E. Jones and T. M. Barber, Syracuse, N. Y.
112,049.—STEAM GENERATOR.—James L. Judge, Milwaukee, Wis.
112,050.—TUCK MARKER FOR SEWING MACHINES.—James F. Kellogg, North Bridgewater, Mass.
112,051.—LATHE.—James Kievlan (assignor to himself and William Wisdom), Chicago, Ill.
112,052.—DUMPING CAR.—S. D. King, Middletown, N. Y.
112,053.—FOLDING BEDSTEAD.—Kasimir Krenkel, New York city.
112,054.—CASTING SOLDER WIRE.—Eduard M. Lang, Portland, Me.
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112,056.—BOOT.—J. S. Lewis, Baltimore, Md.
112,057.—MODE OF LASTING SHOES.—W. H. Lovejoy, Lowell, assignor to himself and Christopher Robinson, Lynn, Mass.
112,058.—ENGINE GOVERNOR.—John D. Lynde, Philadelphia, Pa.
112,059.—QUARTZ MILL.—David D. Mallory, Mystic Bridge, Conn.
112,060.—AIR PUMP.—Robert Mudge Marchant, London, England.
112,061.—HARNESS SADDLE TREE.—J. H. Martin, Columbus, Ohio.
112,062.—CARPENTERS' PLANE.—William Miller (assignor to himself and C. E. Woodman), Boston, Mass.
112,063.—AUGER BIT.—John C. Mills (assignor to himself and Richard Leake), Rochester, N. Y.
112,064.—FENCE.—John Morton, Thornville Mills, Mich.
112,065.—TOBACCO, HAY AND COTTON PRESS.—L. H. Moss, Brownsville, Ky.
112,066.—ROTARY STEAM ENGINE.—Joseph C. Mossholder, Lebanon, Oregon.
112,067.—CURTAIN.—Robert Nenninger and Friedrich Bräger, Newark, N. J.
112,068.—MANUFACTURE OF SILICON STEEL.—C. M. Nes, York, Pa.
112,069.—APPARATUS FOR STEAMING OIL WELLS.—William Nevins, Titusville, Pa.
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112,079.—COMBINED GANG PLOW AND CULTIVATOR.—Orestes Sampson, Petersburg, Ill. Antedated Feb. 20, 1871.
112,080.—GRINDING MILL.—George Selsor, Philadelphia, Pa.
112,081.—HOT-AIR FURNACE.—S. B. Sexton, Baltimore, Md.
112,082.—FRUIT CAN.—J. S. Shaneman and J. S. Hoon, Beaver Falls, Pa.
112,083.—KITCHEN TABLE.—John Shaw, Whitby, Canada.
112,084.—MANUFACTURE OF METAL TUBES AND COLUMNS.—F. H. Smith, Baltimore, Maryland.
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112,088.—PRODUCING GAS FROM SOLID CARBON.—Levi Stephens, Washington, D. C.
112,089.—ATTACHMENT FOR RANGES AND STOVES.—David Stuart (assignor to Stuart, Peterson & Co.), Philadelphia, Pa.
112,090.—CHEESE VAT.—E. H. Stuart and W. A. Stuart, Cedarville, N. Y.
112,091.—LIQUID METER.—W. G. Stuart, Chicopee, Mass.
112,092.—MEAT TENDERER.—L. B. Tarbox, Colliersville, N. Y. Antedated Feb. 16, 1871.
112,093.—GRAIN DRILL.—J. H. Thomas and P. P. Mast, Springfield, Ohio.
112,094.—HANDLE FOR CROSS-CUT SAW.—E. W. Tilton, Oshkosh, Wis.
112,095.—COTTON PRESS.—Gabriel Utley, Chapel Hill, N. C.
112,096.—WHIFFLETREE HOOK.—Amos Verbeck, Sterling, Ill.
112,097.—PROPORTIONAL SCALES FOR THE CONSTRUCTION OF TOOTHED GEAR.—John Walker, Philadelphia, Pa.
112,098.—WHIFFLETREE.—Joseph Ward, Honeoye Falls, N. Y.
112,099.—WHEELS FOR VEHICLES.—James Weathers, Greensburg, Ind.
112,100.—WATER WHEEL.—W. N. Whipple, Niles, N. Y.
112,101.—WRENCH.—Rollin White, Lowell, Mass.
112,102.—DUST PAN.—Henry Whittemore, Orangetown, N. Y.
112,103.—DRIVING MECHANISM FOR ROVING, SLUBBING, AND OTHER MACHINES.—Alfred Wilcock, Richard Robinson, and Frederick Wilcock, Rochdale, Great Britain.

REISSUES.

4,266.—PAPER-FOLDING MACHINE.—Cyrus Chambers, Jr. Philadelphia, Pa.—Patent No. 15,342, dated October 7, 1856; reissue No. 4,079, dated July 26, 1870.
4,267.—PIPE AND FIXTURE FOR WELLS.—J. H. Duck and E. K. Whitcomb, Elgin; said Whitcomb assigns his interest to J. T. Whipple, Chicago, Ill.—Patent No. 58,721, dated October 9, 1866.
4,268.—SEAT FOR SCHOOL DESKS.—G. W. Hildreth, Lockport, N. Y.—Patent No. 55,290, dated June 5, 1866.
4,269.—Division A.—HOISTING APPARATUS.—Otis Brothers & Co., Yonkers, N. Y., assignees of E. G. Otis, deceased.—Patent No. 124, dated Jan. 15, 1861.
4,270.—Division B.—HOISTING APPARATUS.—Otis Brothers & Co., Yonkers, N. Y., assignees of E. G. Otis, deceased.—Patent No. 124, dated Jan. 15, 1861.
4,271.—Division C.—HOISTING APPARATUS.—Otis Brothers & Co., Yonkers, N. Y., assignees of E. G. Otis, deceased.—Patent No. 124, dated Jan. 15, 1861.
4,272.—BARREL.—H. G. Porter, Grand Rapids, Mich.—Patent No. 102,432, dated April 26, 1870.
4,273.—HOISTING MACHINE.—H. J. Reedy, Cincinnati, Ohio. Patent No. 78,829, dated June 9, 1868.
4,274.—ELECTRO-MAGNETIC GATE-OPENING APPARATUS.—William Robinson, Brooklyn, N. Y.—Patent No. 105,494, dated July 19, 1870; antedated July 8, 1870.
4,275.—BED LOUNGE.—James Seymour, administrator, W. H. Coolidge and Charles Stimson, Leavenworth, Kansas, assignees of W. H. Colley, deceased.—Patent No. 103,301, dated May 24, 1870.
4,276.—SAW FRAME.—The Bissell & Moore Manufacturing Co., New York city, assignee of Daniel Moore and Edwin Moore.—Patent No. 94,500, dated Sept. 7, 1869.

DESIGNS.

4,664.—POCKET-BOOK TIP.—J. C. Arms, Northampton, Mass.
4,665.—HAND STAMP FRAME.—J. P. Barnes, Rochester, N. Y.
4,666.—RAILROAD STATION INDICATOR.—F. F. Bibber, South Boston, Mass.
4,667.—SPOON.—Elise De Busson, Yonkers, N. Y.
4,668.—CLOTHES-LINE REEL IRON.—Daniel Densmore, Red Wing, Minn.
4,669.—STUCCO CENTER PIECE.—James John, Chicago, Ill.
4,670.—SHAWL.—Martin Landenberger, Philadelphia, Pa.
4,671 and 4,672.—CARPET PATTERN.—C. S. Lilley (assignor to Lowell Manufacturing Co.), Lowell, Mass. Two patents.
4,673.—TYPE.—Andrew Little, New York city.
4,674.—OIL-CLOTH PATTERN.—James Paterson, Elizabeth assignor to R. H. Reeve and B. C. Reeve, Camden, N. J.
4,675.—PARK SEAT.—E. O. Schwagerl (assignor to himself and Shickle, Harrison & Co.), St. Louis, Mo.

TRADE-MARKS.

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174.—MEDICINE.—G. H. York & Co., Cambridge, Mass.

EXTENSIONS.

ACCELERATING FIRE ARMS.—A. S. Lyman, of New York city.—Letters Patent No. 16,568, dated Feb. 3, 1857.
METHOD OF JOINING BOXES, ETC.—James Stimpson, of Baldwinsville, Mass.—Letters Patent No. 16,557, dated Feb. 3, 1857.
ABDOMINAL SUPPORTER.—J. M. Milligan, of New Albany, Ind.—Letters Patent No. 16,602, dated Feb. 10, 1857; reissue No. 403, dated Sept. 15, 1857
MACHINE FOR CUTTING TENONS ON BLIND SLATS.—S. C. Ellis, of Jersey City, N. J.—Letters Patent No. 16,534, dated Feb. 3, 1857.

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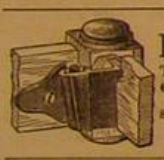

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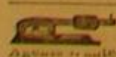

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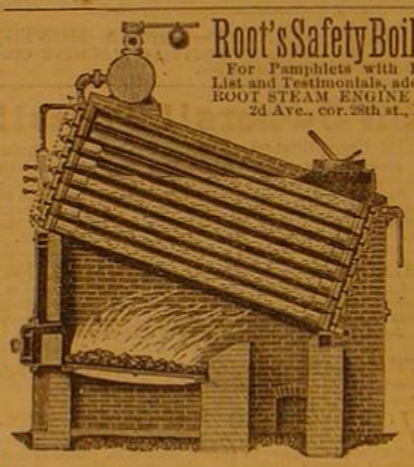

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