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THE NEW TELESCOPE IN THE PARIS OBSERVATORY.

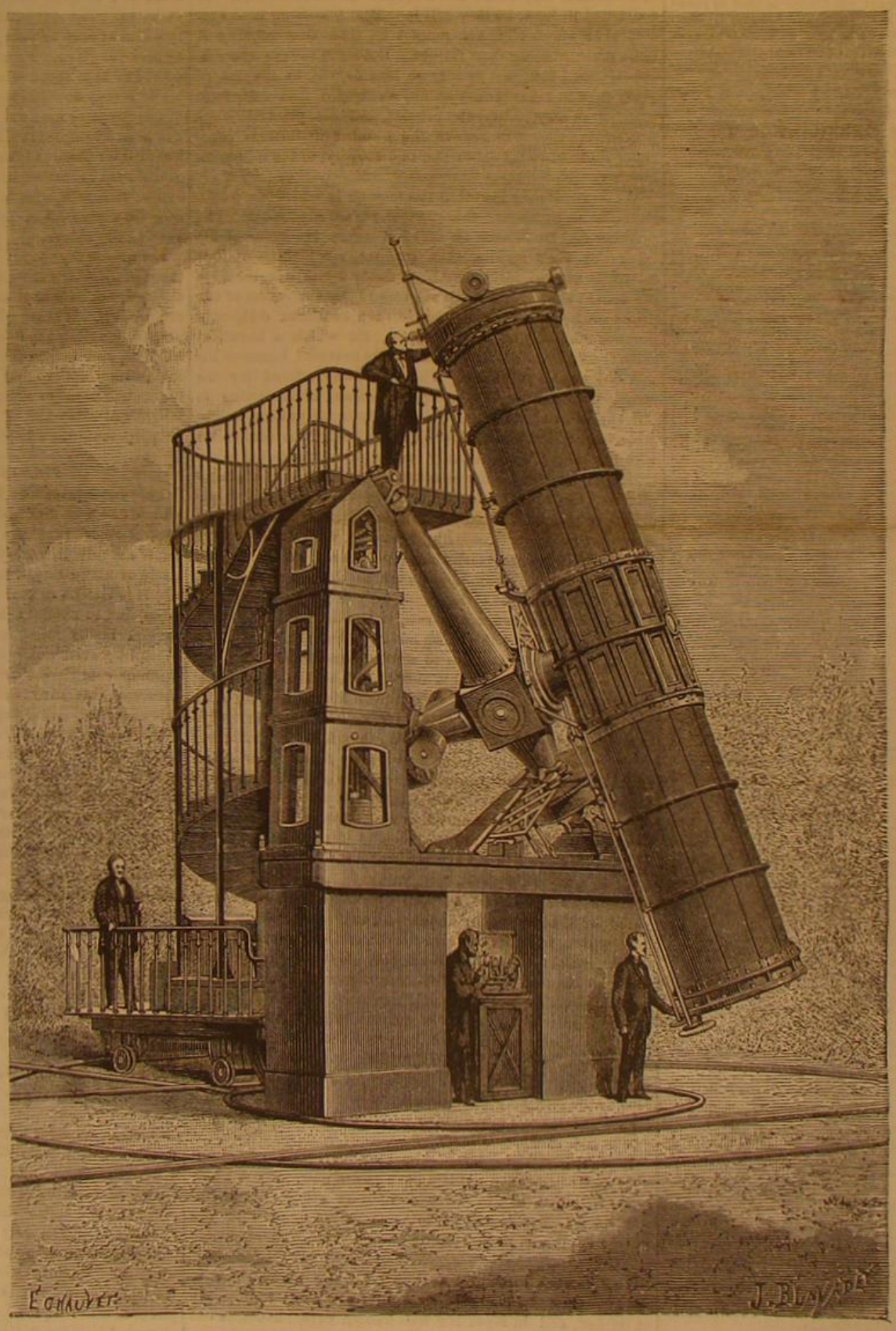
An immense reflecting telescope, equaling in size the similar instrument located at Melbourne, Australia, has lately been constructed under the supervision of M. Leverrier, at the Observatory at Paris, France. The reflector, which is 46·8 inches in diameter, is mounted in a tube 23·3 feet in length, which is composed of a central cast iron cylinder, to the extremities of which two smaller tubes, 9·6 feet long each, are secured. The end tubes are formed of four rings of wrought iron connected by 12 longitudinal bars of like material. The whole tube is covered with thin sheets of steel, and weighs 5,280 lbs. At the lower extremity is affixed the cast iron barrel which holds the reflecting mirror; at the upper end a circle, movable on the open orifice of the telescope, supports a plane mirror which reflects sideways the cone of rays previously reflected by the large glass, and directs them into the field of the eyepiece.

It will be seen from the above that the telescope is constructed on the Newtonian system, and differs from the Melbourne instrument in that the latter is built on the Cassegrainian plan. The weight of the huge reflector in its barrel is 1,760 lbs., and the eyepiece, with its accessories, aggregates the same. The poising of the mass is so perfect that even in the most unfavorable positions the mirrors are exactly concentric, and not the least deflection is perceptible. For the accommodation of the observer a carriage running on rails, as shown, is used, which supports a lofty balcony. The latter is sufficiently elevated to allow easy access to the eyepiece, which can be adjusted at any point around the orifice of the instrument.

The equatorial mounting turns on an axis of cast iron and steel, the direction of which is parallel to the axis of the celestial sphere. The telescope can be inclined more or less on this axis by turning around a second steel axis, which traverses the first at right angles, and participates in its movement of rotation. The two axes taken together are a marvel of mechanical accuracy. With the telescope they weigh 22,000 lbs., and yet so perfect is the machinery that the great tube follows the movements of the heavenly bodies, in obedience to the regulation of a chronometer, with as much certainty and delicacy as move the hands of the timepiece itself.

The optical portion of the telescope is as perfect as the adjusting mechanism. Both mirror and eyepiece are faultless, and the former, it is stated, reflects fully nine tenths of the light received. With an instrument, therefore, uniting in itself so many highly important advantages, it may be hoped that valuable discoveries will be made.

M. Wolf, the well known astronomer, to whom has been confided its care, proposes to begin with the study of the planets and their satellites, with the view of investigating many unsolved questions relative to the rotation of the worlds furthest removed from our own; and at the same time, an extended series of spectroscopic and photographic studies of the fixed stars will be prosecuted.



THE GREAT TELESCOPE AT PARIS, FRANCE

Treatment of Horses in Winter.

A writer in the Baltimore *Trade Review* is of the opinion that horses that have been in the habit *of running* in the pastures during the summer suffer very much during the winter, for the want of green food to which they have become accustomed. They give evidence, he says, of this by the loss of appetite, by becoming hide-bound, and losing the glossy appearance of their coats. When the coat of an animal loses its gloss and assumes a dry, dull appearance, it is a sure indication that that animal needs green food or medicine capable of supplying the place of green food. Green food is much to be preferred, for an animal in such condition, to medicine for two reasons, partly because it is cheaper and leaves no bad after effects, and partly because it is better, being the remedy provided by Nature, and Nature is always more skillful than art in providing natural remedies for natural evils, just as a genuine diamond is of more value than any paste imitation. A couple of carrots, chopped up very small and mixed with the feed of horses, has upon them a very beneficial effect. They are slightly cathartic, and, given two or three times a week to horses standing in stables during the winter, they keep them in good condition, supply to a great extent the need of green food, increase their appetite, and prevent their coats from becoming *dry, dull*, and hard. Horses are very fond of them. When the weather is dry and not very windy, horses that are not much used should, *in town*, be taken out for exercise daily, and, in the country, should during the day be allowed to run at large in the fields, or they will become cramped and stiff from long standing.

Decreasing Flow of Rivers.

The Vienna Academy of Sciences is occupied with a question which concerns all Europe—the decrease of the quantity of water in springs, rivers, and water courses. A circular, accompanied by a very instructive report, has been addressed to the scientific societies of other countries, inviting them to undertake observations which, in time, may yield useful results. The Academy calls attention to the fact that during a certain number of years there has been observed a diminution in the waters of the Danube and other large rivers, especially since the practice of felling forests has become common. The Austrian Engineers' and Architects' Union are also occupied with this question, and have appointed a hydrostatic commission to collect facts and prepare a report The Danube, the Elbe, and the Rhine have each been assigned to two members, while two others will be occupied with the metereology relating to the same subject and with the influence that glaciers and Alpine torrents may exercise on the general result. The commission considers the question urgent, and recommends the immediate adoption of measures to remedy the evil. According to the *Revue des Eaux et Forêts*, it is unanimous in declaring that the prime cause of the disastrous decrease of the water is the devastation of the forests.—*Nature*.

Remarkable Locomotive Accident.

The Rochester *Democrat and Chronicle*, of January 20, states that on January 17, while a train, bound for Attica, on the Buffalo division, was nearing the river bridge about a mile west of the village of Avon, an accident occurred which was most singular in itself and serious in its results. The iron network over the top of the smokestack on the locomotive became clogged up with cinders, etc., in such a manner that the gas generated could not escape from it; consequently it was pent up within the furnace, and as soon as the fireman loosened the fastening of the door to open it an explosion occurred, the fire being blown with great force out into the cab, enveloping the persons in it in a sheet of flame. The fireman, William Russell, who was nearest the door, was flung backward with great force. His leg was broken and his body was badly burned. William Farnum, the engineer, was not so badly hurt. His left hand was burned in a painful manner, and the whiskers of the left side of his face were burnt off. M. Breen, a brakeman, who happened at the time to be

in the cab, was very seriously injured. His face and shoulders were terribly burned, and his eyes were so injured that is thought he will be blind for life.

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RE-DISCOVERIES AND RE-INVENTIONS.

The investigator who thinks he has hit upon some new and important fact, but finds, on publishing his discovery to the world, that he has merely re-discovered an old and long-known phenomenon, is very much in the position of an inventor who has spent months in perfecting some machine which he believes to be new, but which, as the Patent Office examiners tell him, was patented years ago: perhaps it was used and abandoned before he was born. The airy castles each has been building are dashed to the earth, and dire disappointment destroys the searcher's peace of mind. Under these trying circumstances, it is difficult for him to sit patiently down and feel that the experience gained while prosecuting his work is a sufficient reward for his time and toil. Yet such is frequently the case; and but for the fact that most inventors and investigators are dependent on their daily labor for the bread they eat, they could in all cases feel that an honest, conscientious labor in the pursuit of a noble end, whether successful or not, is its own sufficient reward. Failure is to some minds a spur to greater exertion; it incites them to increased care, and thus proves more beneficial than success would have done. That man (or crew) that comes out of a race second best is generally confident of his ability to win next time; and he goes into training with eagerness for another chance to test his power. To another class of minds, failure is very discouraging. They have not perseverance enough to try again; or if they stand the shock of a few failures, they break down at last under the weight of continued ill luck, as they call it. That "nothing is so successful as success" is not more true than that nothing is more disheartening than failure. But since failure and disappointment fall, in a greater or less degree, to the lot of every man in every undertaking, we would first offer such balm as we may to heal the bruises, and then prescribe some preventives that will reduce the number of failures, especially those of re-invention and re-discovery, to the minimum number.

We have already hinted at the manner in which we would have the unsuccessful investigator regard his labors. The searcher for truth can no more measure the value of his labors by their results, than can the competitors in our intercollegiate contests, whether literary or athletic, measure the benefit they derive from the training by the value of the prizes conferred. A school boy of ten or fifteen diligently pursues the study of some subject, for which a beautiful prize is offered, with that prize and its inherent honor as his sole object and incentive. The prize was offered for the purpose of teaching the boy perseverance, of imparting to him the habit of study, and, in some cases, of putting him in possession of the knowledge thus acquired. The competitor who has labored industriously for the prize, but failed to obtain it, is benefited quite as much by the training he has received as the one who is successful, provided only that disappointment does not breed discouragement. While boys may strive for prizes with no higher end in view, it is beneath a man, and more especially an investigator, to work with that aim only. Work undertaken in the proper spirit is never without benefit to him that does it; and although it does not yield the expected fruit, it has been all the while conferring other benefits, more lasting, if less pleasing. There is a story, no doubt familiar to most of our readers, about an old man, who, when on his death bed, told his sons that treasure had been buried somewhere on his farm. Eager for gold, they explored every field, digging over every foot of it to a considerable depth. Of course, they found no gold; but the increased fertility of the land amply repaid their labor. Parallel cases are abundant, wherein the object sought was never found, but where incidental results proved of immense importance. The old alchemists worked with but two aims before them, to transmute the base metals into gold, and to find the elixir of life. They succeeded in neither, but they gave us many substances more valuable than either. Many of the acids and metals, as well as phosphorus, were prepared or discovered by them, and their experiences have been woven together to form the foundation of the science now called chemistry. Unfortunately, however, their selfish jealousy induced them to conceal rather than promulgate their discoveries, and many of their most important secrets were buried with them. It is only recently that men have begun to observe and carefully record the little incidental discoveries. These little facts, trifling and disconnected as they are, may some day find a place of importance in the science, or they may become the seed which, falling on the fertile soil of some other active brain, will there spring up in a new and unexpected form.

Reader, if you are an experimenter, carefully record all your experiences, and publish such as are new, for you know not which of these tiny sparks will start a huge conflagration, or which trifle will be to some active mind what the falling apple was to Newton, or the oscillating chandelier to Galileo.

To give such directions as would aid the investigator to save his time and energies, on subjects already thoroughly examined, and in repeating well known experiments, is not difficult. Scientific men of the present century have been careful to record in permanent form most of their investigations, and hence it becomes possible for a person, before beginning a research, to ascertain just what has already been done, provided he has access to a good scientific library, such as the Astor or the Columbia College School of Mines Libraries in this city, both of which are free to all and possess excellent catalogues and obliging librarians. The method of study will be somewhat as follows: Suppose a chemical student is about to attempt the preparation of some new compounds of cobalt. He may first, if he chooses, make use of the excellent dictionaries of chemistry published in each of the principal languages, for our student ought to read French and German with some fluency. The best works to consult are Watts,' Wurtz, and Fehling, but every accessible work should receive attention. Having obtained a general idea of the subject in hand, he next proceeds to search the scientific journals one by one, from volume I to the latest number. Among the most important of these we would mention the *American Journal of Science and Arts*, 1818 to date, 110 volumes. The task of examining these numerous volumes is not so very great, since every tenth volume contains an index to everything in that and the preceding nine, so that only 11 indices have to be consulted. Poggendorff's *Annalen* now embraces over 230 volumes, from 1799 to date, but the titles of all the articles are registered in half a dozen indices. Dingler's *Polytechnisches Journal* now in its 218th volume, has 3 indices. The *Annales de Chimie et de Physique*, which now number 275 volumes, beginning as far back as 1789, have several index volumes. The same holds true of most of the scientific journals where original papers are to be looked for. *Comptes Rendus* is an unfortunate exception to this rule.

Before beginning this search, a suitable note book should be procured, and so arranged that every reference can be quickly recorded as soon as found, either chronologically or in some other systematic order. Or the references may be taken down in a blotter, and subsequently posted in the order desired, care being taken to give date, subject, name of author, and name of journal, with page and volume. Such an index of a subject, carefully carried out, will be found invaluable. The student now has a guide book which will direct him at once to the spot where just such information as he seeks is given. From these, it is easy to ascertain just what has been accomplished, and hence it is almost impossible to repeat unwittingly what another has already done.

The inventor may not find it quite so easy to learn what has been attempted in his line, as inventors usually jealously guard their ideas as invaluable secrets. The patent records of different countries, however, afford material for quite an extensive search, and, as in the case of the chemist, will be of great assistance in preventing a waste of time in re-inventing old things.

Let no one say that it takes too much time to make all these preliminary examinations, for it will prove a saving in the end, not only of time and labor, but of good nature and enthusiasm. If those who can afford the time would join in preparing reliable indices of the whole literature of different subjects, and permit them to be published by the Smithsonian Institute or other scientific body, they would be valuable contributions to Science, and great aids to their fellow laborers of today and of the future; and they would serve to perpetuate the compilers' own memories.

FELTING AND ITS USES.

The employment of felt for other purposes than hats, which use was described in a recent number, has created several other branches of industry. The most common products are felts in flat layers like cloth, and the most usual mode of manufacture is a kind of wadding (by means of a machine similar to that used for the same purpose in cotton mills) and to submit this to the felting process, often felting several layers together so as to obtain great thickness. With improved modern machinery, such wadding may be made of considerable dimensions. A special and peculiar article of this kind, and of great comparative value, is the felt used for the covering of the hammers of pianofortes. The best material for this purpose is derived from the wool of sheep found only in Hungary. They are called the Esterhazy flock; and the wool gives a more elastic felt, resisting better the cutting effect of the strings, which soon wear other kinds of felt away. These felts come in the trade in elongated pieces, very thick at one end and quite thin at the other, so as to suit the requirements, which are that the hammers striking the bass strings should be covered with thick felt, the substance being gradually diminished for the higher tones, so that the hammers striking the strings producing high tones have a very thin covering. The pianoforte makers have then only to cut those felts into strips to have all the needed assorted degrees of thickness, it being a first requisite of the pianoforte, and in fact of every other musical instrument, to attain equality of tone, avoiding sudden changes in power when passing from one tone to another of the scale.

Other felts are manufactured into carpets, and printed with figures, forming the so called rugs, and others, well known, are blankets and materials for cloaks, women's skirts, socks, slippers, insoles for boots and shoes, etc. Some kinds of fine felts are saturated with varnish or paint, and changed into a material not unlike patent leather; this is used for the shades of caps, by carriage makers, etc., being much more tenacious and elastic than pasteboard, in which the fibers are not interlaced, and only are held together by a simple adhesion originated by great pressure during the process of manufacture. We must also mention the use of felt for roofing, for which purpose it is saturated with asphaltum, coal tar, pitch, or other equivalent waterproof material; and felt is also used in shipbuilding, as a layer below the copper sheeting, and on steam cylinders, conduits, and boilers as a non-conductor of heat, for which purpose it is often prepared with various ingredients, intended either to make it less combustible or to increase its capacity for retaining heat. A modern industry of this kind sprang up during the late war. Contractors, in order to increase their gains, had blankets and even soldiers' clothes made from felts of which the hair was not of the proper kind, but consisted of the offal of woolen factories, fibers too short to be spun, but which, by felting, could be made to hang together and form an apparently woven fabric; which, however, soon showed its tru

nature by its lack of strength. This material has obtained the name of shoddy; and while felt made from the proper kind of hair, of sufficient length, is as strong as any good woven fabric, this shoddy, or felt made from unsuitable kinds of hair and hairs of insufficient length, is comparatively worthless. Unfortunately thousands of dollars have been made in this disgraceful way before the nature of the deceit became known.

NO REST.

Science teaches us that the crust of our earth is perpetually moving, and that the sea level is constantly changing. Our globe has its daily rotation on its axis and its yearly revolution about the sun. The sun, with all its satellites, sweeps on toward a moving point in the constellation Hercules. Every so-called fixed star is in motion. Fifty thousand years ago the constellation of the Great Bear or Dipper was a starry cross; a hundred thousand years hence the imaginary Dipper will be upside down, and the stars which form the bowl and handle will have changed places. The misty nebulæ are moving, and besides are whirling around in great spirals, some one way, some another. Every molecule of matter in the whole Universe is swinging to and fro; every particle of ether which fills space is in jelly-like vibration. Light is one kind of motion, heat another, electricity another, magnetism another, sound another. Every human sense is the result of motion; every perception, every thought is but motion of the molecules of the brain translated by that incomprehensible thing we call "mind." The processes of growth, of existence, of decay, whether in worlds or in the minutest organisms, are but motion.

TIMBER WASTE A NATIONAL SUICIDE.

"At a meeting held this 29th day off Aprill, 1699, in Breucklyn (Brooklyn), Benjamin Van de Water, Joris Haussen, Jan Garritse Dorlant" were chosen officers to consider the "greate inconvenience and lose" that the inhabitants of the town suffered because that unauthorized tradesmen "doe ffall and cutt the best trees and sully the best woods."

This appears to be the first step toward the first law promulgated in this country against the wasteful hewing down of timber: trees a proceeding recognized as an important waste, be it noticed, at a period when vast forests stood on the sites of our now most popular western cities, and when, so far as human knowledge of the continent went, the supply of wood might be inexhaustible. Since the date of this local ordinance, State legislatures and the general government have enacted laws carrying with them penalties, apparently of sufficient severity to deter the reckless use of the axe. The United States statute of March, 1875, imposes $500 fine or a year's imprisonment for wanton destruction or injury to, or the unlawful cutting of, "any timber tree or any shade or ornamental tree, or any other kind of tree" on national grounds; and $200 fine, or six months' imprisonment, for permitting cattle to injure trees and hedges on similar territory. Despite, however, the stringency of the various laws, their effect has not been to stop the waste, and the denudation of our timber lands continues at a rate which may be well deemed a matter of grave alarm.

In the very admirable statistical atlas prepared by General Francis A. Walker, Superintendent of the last census, appears a chart showing accurately the distribution of forests throughout the country. It seems to us that the government would do a good work if it would lithograph this map and scatter it broadcast, with copies of the statutes forbidding the destruction of forests, over the whole land; for it certainly shows, in a manner little less than startling, how very small are the heavily wooded tracts having 360 or more acres of timber to the square mile. Of the western domain, Nevada has no such districts, neither has Arizona, nor New Mexico, nor Texas, nor Colorado, nor Dakota, nor Nebraska, nor Kansas, nor the Indian Territory. In fact, considering the whole face of the country, there is a patch of heavy forest in Maine and New Hampshire, a small one in New York, large areas covering half of Minnesota, Wisconsin, and Michigan; the largest tract of all is located in the far northwest corner of the country; and there are heavily-wooded districts in Florida, Georgia, Alabama, Tennessee, Virginia, and the Carolinas. After eliminating these widely separated regions, the total area of which appears to be about equal to that of the Atlantic States, of the remainder of the country (fully four fifths of our whole territory), one half has no timber at all; the map shows a uniform blank.

Although there are no available statistics to show the exact rate of speed with which we are using up our wood supply, it is easy to see that we are doing so with great rapidity. Taking the legitimate use of lumber alone, industries based on its manufacture constitute the second in point of magnitude in the country, and are only exceeded by the iron interest. About 150,000 persons are employed in producing sawn lumber alone; $143,500,000 are invested therein, and 1,295,000,000 laths, 3,265 000,000 shingles, and 12,756,000,000 feet of timber are yearly manufactured. Considering next in order the secondary industries based on the use of lumber as a raw material, carpentry, cabinet making, shipbuilding, and so on through all wood workers, we shall find millions of our people employed. Now add to this Professor Brewer's assertion that wood forms the fuel of two thirds the population, and the partial fuel of nine tenths the remaining third, and some general idea will be obtained of the enormous drain upon our forests that is constantly in progress. If we restricted our use of wood to manufactures and its limited employment as fuel: in other words, if we rigidly cut off every source of waste, did not burn forests to render the land fit for agriculture, and took proper measures to prevent those forest fires of unknown origin which, just at present, are a colossal source of waste, and if we constantly planted trees: the timber yield would, without doubt, be practically sufficient for our needs for some long period to come. But this is exactly what we are not doing, and as a result we are drifting to a condition which few adequately realize.

With these considerations before us, it is easy to foresee that, with the disappearance of the forests, the conditions of all our territories will change, and that eventually, when the land no longer becomes suited to the needs of our descendants, then gradually but surely they will abandon it. It may take centuries for this to be brought about, but not many, if the present rate of waste be maintained; and thus we are led to face the fact that a period, so near as to be practically tomorrow, as compared with the history of the race, is at hand when our existence as a nation will end.

SHALL WE UNDERGO DISSECTION?

To yield up our lives for the advancement of Science is something that few of us would be willing to do, but to yield our bodies as a sacrifice on the altar of truth and knowledge, after we no longer have any use for them, is not a very hard thing; and therefore we are not surprised to read that a society has been formed in Paris, the members of which bind themselves, by a special testamentary disposition, not to be interred after death. Their bodies are to be delivered to the dissecting rooms of the various medical schools for dissection.

The cremation fever of 1873–4 accomplished something in the way of making people more indifferent to the disposition of this earthy tabernacle when life has fled. There were thousands of people who had firmly resolved that, if the projected cremation societies had their furnaces in successful operation, they would "give their bodies to be burned." The cremation cry is smoldering, the cremation corporations have turned to smoke and vanished in thin air, the gasmen will not take our carcasses, and what are reformers to do? They are now offered the expedient of our Paris friends, who invite them to throw themselves on the dissecting table, and be of some use to the world after they are dead, if they never have been before. We are not afraid that the whole world will follow this example, and flood the market with useless corpses. There will still remain those who desire an old-fashioned burial. The scarcity of subjects in many countries at the present time, the attendant necessity of working on those in an advanced stage of decay, and the premium offered in some localities to body snatchers are a few of the reasons that may be advanced in favor of the formation of mutual dissecting societies. One of the great objections urged on moral grounds against cremation, that it would shield crime by destroying its chief witness, does not apply to dissection. The first duty, of the student into whose hands the body fell, would be to determine beyond a doubt the cause of death. If this fact alone did not deter the poisoner or malpractioner from his nefarious work, it would at least have the effect of bringing to light many crimes which now are hidden without any suspicion being aroused. It might even prove a protection to a man's life to be known as a member of a mutual dissecting club.

PATENT MATTERS BEFORE CONGRESS.

Our abstract of the patent bills now before Congress, given in another column, exhibits the opening raid of the sewing machine monopolists, proving that these indefatigable individuals, nothing daunted by repeated defeat in previous Congresses, are about to bring all their forces to bear on the present one. The country is indebted to Mr. Dobbins, of New Jersey, for the presentation of the Wilson petition, which aims at a third term of seven years for the feed motion patent, used in the Wheeler and Wilson and other machines. The effect of this job, should it succeed, will be to render the whole sewing machine trade of the country tributary to the owners of the patent, and thus to saddle the people with a most oppressive and irksome monopoly, but little less obnoxious and gigantic than the old combination; in fact, it is advocated by, and in the interests of, the same parties. The second term ended November 12, 1871, and every Congress since that date has been besieged to give the expired patent new life; but, to their credit, thus far they have refused. It is to be hoped that the bill will meet a like fate this winter. Senator Logan revamps the Akin and Felthouser sewing machine compensation grab, which the Congresses of 1873 and 1874 rejected. Both of the above measures are presumably well known to the older members of the National Legislature, and it behooves them to keep watch that no ingenious lobbying or parliamentary sharp practice results in the passage of either of the bills. For the benefit of newly elected members, who may be unfamiliar with the tactics of the sewing machine monopolists, a brief statement of the merits, or rather demerits, of their claim may prove suggestive. A. B. Wilson's patent was granted for one of the first abortive attempts to make a sewing machine. This patent was construed to cover all styles of feeding devices in which the cloth can be turned round the needle, or in which the cloth is fed between two clamping surfaces. It was extended for seven years, and then, for the small sum of $50,000, Wilson transferred all his rights to the trustees of the Wheeler and Wilson, Grover and Baker, and Singer companies, in the hands of which corporations the patent has proved an effectual instrument for the complete monopoly of the sewing machine business. Now because Wilson got but $50,000 for his patent, he asks Congress for another term of seven years for the benefit, there is but little doubt, of the same combination. Wilson might, from other capitalists, have obtained probably twenty times the above named sum for his rights; but so large a consideration would not look so well when the next application to Congress for a second extension was to be made, so the payment of a small amount to the patentee was a necessary part of the job.

In previous years, members of the lobby have been unsparingly retained, and large sums have been spent in attempts to secure a passage of the bill. It is probable that still further and more determined efforts will be made this year. It remains, then, for every congressman who has the interests of his constituents at heart to scrutinize keenly and narrowly every move made by those who are manipulating this gigantic extortion, and to oppose its progress by his vote at every point. It remains, beside, for the people to let their representatives understand their will in this matter in a way that cannot be mistaken. As matters stand now, the patent is public property, free to all users: the door is open to fair competition, and the sewing machine, which has been somewhat reduced in price since the expiration of the patent, will be furnished to the public at a still lower price when the manufacturers outside the ring are insured, against injunctions and suits by the monopolists, by Congress rejecting the petitioner's application. Every housewife, every seamstress, every philanthropist, is interested in having all bills defeated which have for their purpose the protection of any combination of sewing machine manufacturers.

We shall watch with interest the discussion and votes on these bills when they are reported from the committees.

THE ATLANTIC FERRY.

The *Herald* has published an excellent report of the steamship lines plying between New York and Europe, with the names and tunnage of all the vessels, the number of trips made by each line, the number of passengers carried, the amount of freight, and other particulars of interest in regard to the character of the vessels, the kind of merchandise carried, quick trips, the improvements made in the different fleets, etc. We select from the report the following items of information:

The oldest line is the National, plying between New York, Liverpool, and London. It employs 12 iron steamers, full powered and among the largest in the service, having an aggregate tunnage of 51,486 tuns. These vessels made, during the year 1875, 81 regular trips, carrying 25,521 passengers and 464,709 tuns of cargo.

The Cunard Line—New York to Liverpool—employs 17 vessels, aggregating 53,200 tuns, and made 206 voyages, carrying 15,000 cabin and 27,550 steerage passengers, and 465,000 tuns of cargo. The quickest passage from Queenstown to New York was made by the Russia in 8 days and 14 hours; the quickest eastward was by the Scythia in 8 days and 10 hours.

The White Star Line—New York to Liverpool—employs 6 vessels, with an aggregate tunnage of 25,251 tuns. During the year they carried 24 100 passengers (5,174 in cabin), and 185,000 tuns of freight. They made 50 trips in all, the fastest by the Germania in August, time 7 days, 22 hours, and 8 minutes. In October the Adriatic made the run in 7 days, 22 hours, and 57 minutes.

The Anchor Line—New York to Glasgow and the Mediterranian—employs 27 vessels, with an aggregate tunnage of 57,289 tuns. They made 87 voyages from New York, 53 from Glasgow to New York, and 37 from Mediterranean ports to New York, carrying in all nearly 20,000 passengers (cabin 4,569, steerage 15,363), and 341,723 tuns of cargo.

The Inman Line—New York to Liverpool—employs 13 vessels, aggregating 42,975 tuns. They made 55 trips each way, 110 in all, and carried 300,000 tuns of cargo, and 34,389 passengers, 6,592 of them cabin passengers. The fast trips were, by the City of Richmond from Sandy Hook to Queenstown, 7 days and 18 hours; by the City of Berlin, westward, 7 days, 18 hours, and 2 minutes; eastward, 7 days, 15 hours, and 48 minutes.

The Hamburg-American Packet Company—New York to Hamburg—employs 15 vessels, which carried nearly 30,000 passengers (cabin 7,426, steerage 23,496), and 137,000 tuns of merchandise.

The North German Lloyds—New York to Bremen—employs 15 vessels, aggregating 48,710 tuns. They made last year 51 trips each way, carrying in all over 30,000 passengers (cabin 6,935, steerage 23,748), and 114,500 tuns of cargo. The best time made was 9 days and 10 hours.

The new State Line—New York to Glasgow—employs 7 vessels, aggregating 17,000 tuns. They carried 4,000 passengers and 48,900 tuns of freight from New York. Number of trips and amount of freight from Glasgow not given. Quickest trip, 9 days and 15 hours.

The Williams and Guion Line—New York and Liverpool—employs 6 vessels, aggregating 22,360 tuns. They made 38 trips each way, and carried 150,000 tuns of cargo; number of passengers not given.

The French Line—General Transatlantic Company—New York to Havre—has 6 vessels, aggregating 24,300 tuns. They made 28 trips each way, and carried 6,900 passengers.

The whole number of passengers carried by all these lines was about 225,000, and the freight over 2,000,000 tuns.

Mineral Wool.

The method of manufacture at the Krupp Works, Essen, Prussia, is as follows: The pig iron furnace is provided with a tap an inch in diameter, out of which a continual stream of slag is allowed to flow and to fall a distance of 2 feet 6 inches, at which point the falling stream of slag is met by a strong blast of cold air, the effect of which is to separate the slag into myriads of hairlike threads, as white as snow, resembling the finest wool. These fibers, like spun glass, if handled, will penetrate the skin. The mineral wool is used for packing steam pipes, boilers, etc., and is a valuable product.

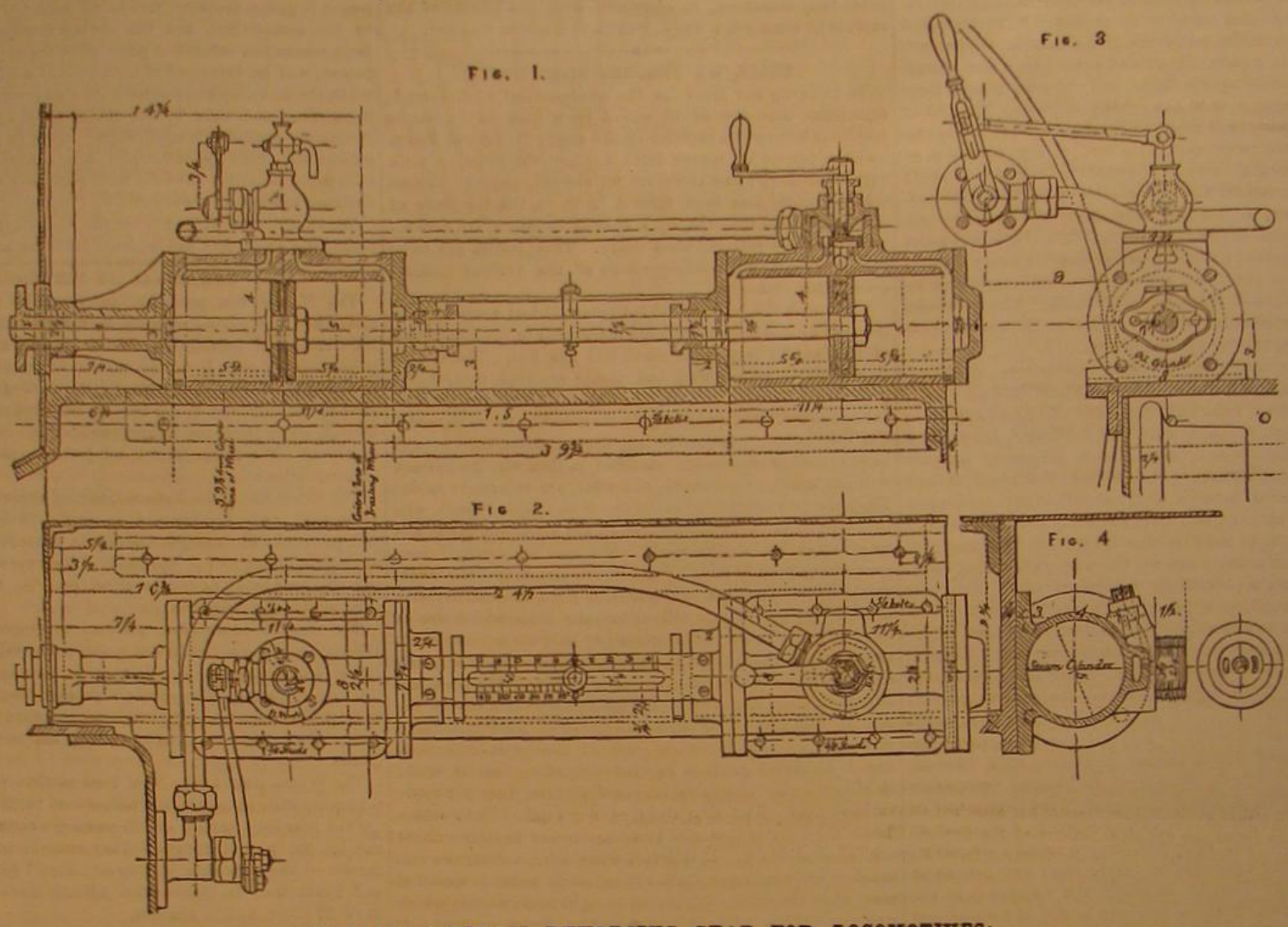
RECENT IMPROVEMENTS IN LOCOMOTIVE ENGINES.

A lively competition between three leading railroad lines carrying passengers and freight between London and Scotland has continued for some time past; and some very important improvements in locomotive construction have already been produced by the rivalry. The morning express train on the Great Northern Railway accomplishes the distance from London to Edinburgh, 399 miles, in 9¼ hours, including all stoppages, one of which is long enough to allow the passengers to take dinner, and the London and Northwestern Railway is by no means behind its competitor in speed. The authorities of the Glasgow and Southwestern line, over which passes a vast amount of traffic from London to the manufacturing districts of Scotland, have recently constructed some new locomotives, which deserve the attention of all persons interested in rapid and economical railway communication. These engines have two pairs of driving wheels, coupled outside by horizontal bars, and four leading wheels are united in a bogie in front of the engine. The cylinders are 18 inches in diameter by 26 inches stroke, and the driving wheels are 7 feet 1 inch in diameter. Each engine shows a heating surface of 1,111·8 square feet: this total, which is large for a narrow gage engine, being obtained by using boiler tubes of small diameter. Mr. James Stirling, the locomotive engineer of the line, has managed to make tubes of 1¼ inches diameter thoroughly efficient; and our locomotive friends are well aware that this is a problem of considerable importance, owing to the difficulty of cleaning such tubes. Mr. Stirling hinges the exhaust pipe on one side at the bottom, so that, by slackening a bolt, it can be turned out of the way, giving free access to the center tubes of the boiler.

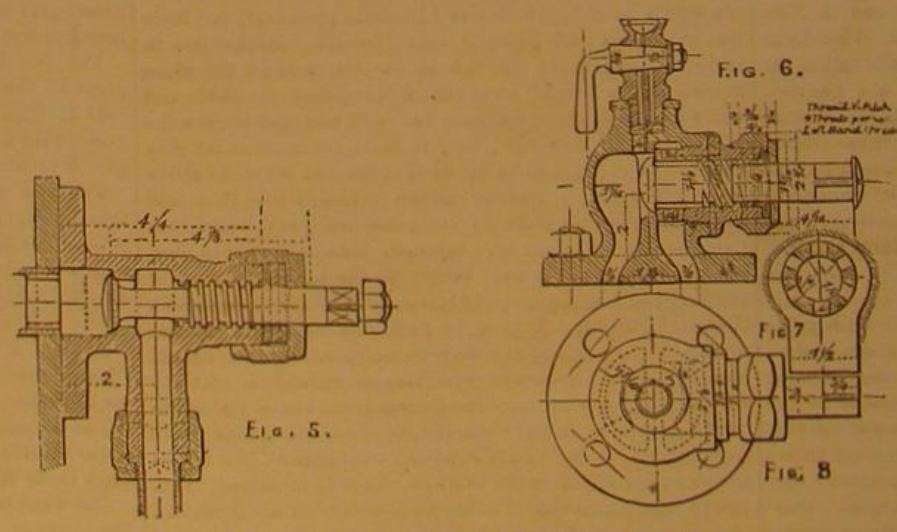
But we must now call attention to the most important improvement, which successfully solves the difficulty which locomotive engineers have hitherto found in applying steam power to the reversal of the engine: the introduction of which gives the engineer control over his engine to a degree which is found to be of the highest value when any accident happens or the signals are against him. Our readers are doubtless familiar with the ordinary reversing gear of a locomotive, constructed by attaching the ends of the rods of two eccentrics (set nearly diametrically opposite to each other) to the ends of a link, in which the die attached to the slide valve rod runs. This link regulates the cut-off of the slide valve by controlling its travel, and the position of the link is regulated by the way shaft and the reversing lever notch plate, into which the lever controlling the link is fastened. But if the engineer lifts the lever out of a notch while the steam is on, the speed of the engine and the difficulty of reversing the travel of the slide valve under steam pressure will prevent his altering the position of the link; and even when he has shut off steam, he will find great difficulty in moving the link and slide valve till the engine has considerably slackened speed. To apply steam power, therefore, to the immediate reversal of a locomotive, both when at full speed and when engaged at work which requires frequent reversal, such as shunting, is a great desideratum; and we think that our readers will find that the object has been successfully achieved in the apparatus of Mr. James Stirling, shown in Figs. 1 to 8 of the accompanying engravings.

As will be seen from the views given, the apparatus consists of a pair of cylinders (each 5 inches in diameter, and of sufficient length to accommodate a stroke of about 9 inches) bolted down to a cast iron bed plate, which forms the top of the right hand trailing wheel cover. The two cylinders are almost identical, being cast from the same pattern, but in one of them—that next the firebox—the exhaust port is omitted, there being merely two passages leading from the ends of the cylinder to the face on which the regulating valve (shown in detail by Figs. 6, 7, and 8) is fixed. The other cylinder has the usual two steam ports with the exhaust port between them, and these ports are covered by a kind of revolving slide valve which can be turned so as to place either of the cylinder passages in communication with the exhaust, the other passage being at the same time made free to receive steam through an opening in the valve itself. Thus with the valve position in which it is shown in Fig. 1, the steam would be admitted to the front end of the cylinder, and exhausted from the rear end. The cylinder of which we are now speaking is fitted with an ordinary steam piston, while the other cylinder—which we may term the cataract cylinder—is fitted with a cylinder packed by two cup leathers as shown. Both pistons are attached to one rod, which passes out through the front cover of the front cylinder, and is controlled by the piston in the front cylinder, this cylinder being completely filled with oil, which, as the piston moves, is forced from one end to the other through the regulating valve, which we have already mentioned as being fixed on the top of that cylinder. As will be seen from the detail view, Fig. 6, there is provided at the top of this valve a cock, through which oil can be supplied when required to make up any losses by leakage, and thus all slack can be kept properly taken up.

One of the leading features of the arrangement is that, when the steam cock is closed, the valve regulating the flow of the oil is closed also, and thus, when the steam is shut off, the gear is firmly locked in the position it then occupies. As will be seen from the view (Fig. 3), the steam cock and oil-regulating valve are connected so that they are opened or closed together, the connection between the two being such as to admit of all requisite adjustment of their respective movements. Altogether the arrangement is very simple, and the details are well worked out, while in practice the apparatus is found to act admirably. "We may add," says *Engineering*, to which we are indebted for the engravings, "that, as the engine cannot be reversed when out of steam, it is an established rule that all engines fitted with this steam-reversing gear should be left by the drivers in mid-gear and with the handles locked. Mr. Stirling has now worked this arrangement for upwards of a year, and has experienced no bad results from moving the engines fitted with itin either direction when cold."



STIRLING'S STEAM REVERSING GEAR FOR LOCOMOTIVES.



STEAM REVERSING GEAR FOR LOCOMOTIVES.

Peculiar Effects of Lightning on Vines

At a recent meeting of the *Société Helvétique des Sciences Naturelles*, Professor Dufour mentioned a lightning stroke which in the month of June last struck simultaneously two vineyards, distant over 360 feet apart. In one, the surface affected measured 57 feet square, and included some 330 vines. In the other the surface was about 32 feet square and about 100 vines appeared to be destroyed, while others were partially so. In August, however, those vines which appeared to be the most severely injured threw out vigorous branches, and early in September were covered with new bunches of young grapes. But on the other hand, those grapes already started, and which, had the lightning not intervened, would have formed the year's crop, ceased all development.

In his treatise on lightning, Arago cites, as remarkable facts of rare occurrence, lightning strokes apparently divided into two or three branches. Here, however, the lightning divided into two branches to strike vineyards considerably distant from each other, and then the branches must have produced 330 and 100 jets respectively in order to strike the separate vines.

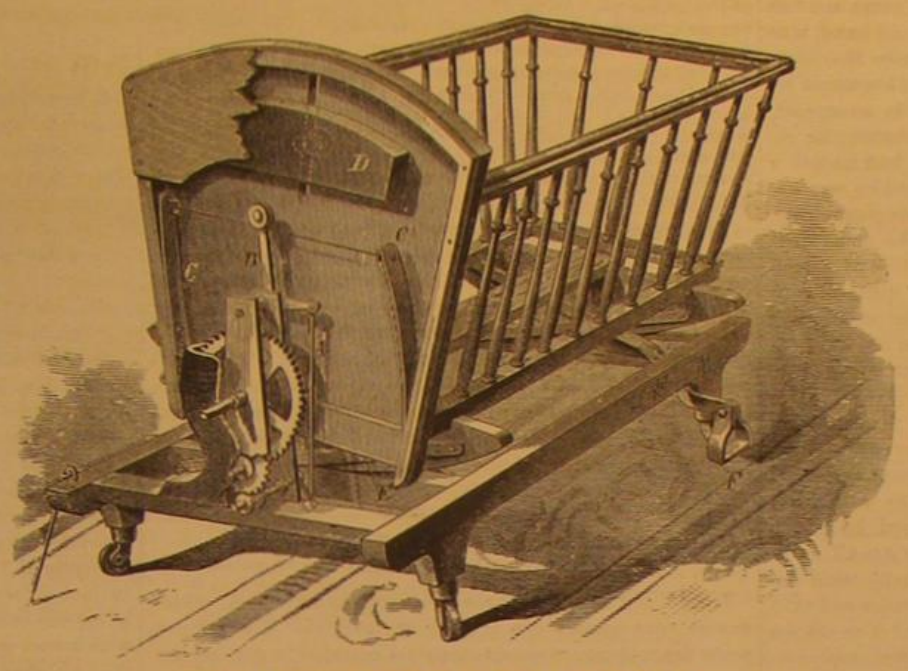
It is not a difficult matter to mend harness tugs so long as harness leather, copper rivets (¼ inch) and a good steel punch are at hand. Cut two strips of leather as wide as the tug and eight inches long; join the broken ends with a strip on each side, punch three holes each side of the break, and rivet. This makes a neat, strong job.

IMPROVED AUTOMATIC CRADLE.

The accompanying engraving represents a new form of cradle, which, by means of suitable clockwork, may be caused to rock itself for periods ranging from thirty minutes to an hour and a half, according to the strength of the actuating mechanism. The cradle proper is mounted on its pedestal in a novel manner, and is so connected with the rocking device that its motion may be uniform without reference to the position of its occupant.

The clockwork, as shown in the engraving, rotates a crank shaft which, through the medium of the pitman, A, oscillates the bell crank, B. On the vertical arm of the latter is a spool, around which passes a cord, which is extended between two springs, C, attached, as represented, inside the hollow head board. The rotation of the crank shaft determines the oscillation of the bell crank, the spool of which, traveling along the extended cord, alternately depresses the ends thereof, and so communicates motion to the cradle. It will be obvious that the inclination of the cradle is compensated for the self-adjustment of the springs, C, so that these, with the cord, form an automatic regulator, by which the rocking lever is always adjusted in proper position to operate. As the child might be placed far over to one side in the cradle, thus giving the latter a prominent "list" in that direction, the utility of the above device, which causes the rocking to be always uniform, will be readily appreciated. The motion or swing of the cradle is regulated by the weight, D, within the headboard; said weight is adjustable by a screw clamp attached thereto, which works through a slot in the headboard (see dotted lines).

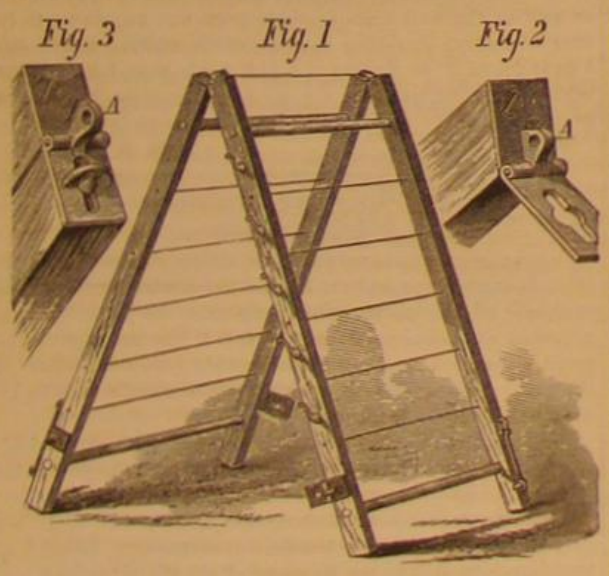
The mode of attaching the rockers to the base or pedestal consists simply in the pivoted connecting bars, E. On the rear rocker, the bar, F, is extended and terminates in a treadle, as shown, thus affording an easy means of rocking the cradle by the foot when it is not desired to use the spring. Patented November 23, 1875. For further information relative to sale of rights, royalties, etc., address the inventors, Messrs. W. V. and N. W. Vandervort, New Antioch, Clinton county, Ohio.



VANDEVORT'S AUTOMATIC CRADLE.

BROOKS' IMPROVED CLOTHES DRYER.

The new portable clothes dryer, illustrated in the annexed engraving, is so constructed as to admit of its being opened, either as shown in Fig. 1, or with its frames vertical, after the manner of an ordinary clothes horse. To adapt it to be placed in either position, the inventor has attached a novel hinge, which forms the principal feature of the device. The construction of the hinge will be understood from Figs. 2 and 3. One portion of it has apertures through which the attaching screws pass; the other has a slot to accommodate a button which, when inserted and pinned as in Fig. 3, fastens that side of the hinge. There is also a stop, A, which prevents the hinge from opening too far, and also has an aperture through which a cord is passed to afford additional accommodation for the clothes.



The location of the hinges is apparent from Fig. 1. Two at the upper extremities of the vertical pieces of the frames connect the latter together, so that they may be adjusted as shown. When it is desired to set the frames up, clothes-horse fashion, one of the upper hinges is disconnected; and the vertical bars being brought together, their lower parts are fastened by the hinges shown near the bottom.

Patented November 2, 1875. For further particulars relative to sale of State and county rights, address the inventor, Mr. G. A. Brooks, Norwich, Conn., or J. W. Heaton, Bridgeport, Conn

The Art of Skeletonising Leaves.

"The subject having excited a little interest among some horticulturist lately, owing to the exhibition of some beautifully executed examples at some of the large provincial exhibitions held in the Northern and Midland counties of England, I took the liberty of appealing to a lady friend, who has been very successful as a skeletoniser of foliage, requesting her to favor me with the *modus operandi* by which she produces her specimens with such perfect completeness.

"My informant states at the outset that the art of skeletonising leaves and flowers would be found much less difficult of accomplishment were the nature and character of the various plants thoroughly studied at first. This is, no doubt, a very important matter. For instance, it would be but a poor direction to the learner to say: "Gather the leaves on a certain day," unless proper attention be also paid to the leaves chosen. They must have reached a certain degree of maturity, neither too old nor too young; and as all leaves do not reach this point at the same time, it is obvious that care must be taken that each kind must be gathered when fit for use. The leaves of the magnolia, for instance, may be gathered when the plant is in bloom, varying in time from June till August. They will require from a month to six weeks time to be well immersed, and so be easy to dissect, as the fiber is so strong. The leaves of the ivy rank among the most difficult, and, because of the peculiar beauty of the fiber, will amply repay the trouble involved in the preparation. These may be immersed from the beginning of May to October, but should be leaves of the previous year's growth. All leaves will not answer for dissecting, but those that have been most successfully operated on are from the magnolia, ivy, pear, rose, holly, orange, poplar, willow, elm, lime, service tree, Spanish and horse chesnuts, and the oak. The leaves of the last-named should not, however, be put into the same vessel with the others, as it affects them in an undesirable manner. Seed vessels may also be dissected in an admirable manner; such are those of the stramonium, winter cherry, poppy, etc.

"To procure good specimens, put the leaves into a deep jar, and cover them with soft water, which must not be changed; the jar is then to be put into a cool place. When, upon examination, the leaves are found to be quite soft, they must be carefully brushed in a weak solution of chloride of lime for a short time, to whiten the fiber, and afterwards washed well in two or three waters, and dried carefully between sheets of blotting paper or linen; after which they are ready for mounting. To make stems for this purpose, thread, stiffened with gum, is most useful, and it has a natural appearance. The leaves may be formed into bouquets or wreaths, according to the taste of the operator, and should be placed under glass shades to preserve them from harm.

"I have seen groups of leaves so prepared, that formed most acceptable table ornaments in sitting and drawing rooms; and it suggests a pleasant employment for the fair sex, with which to fill up moments of leisure. It is evident that much nice discrimination in the selection of the right leaves is required; and a light and careful manipulation is also essential; and in the case of failure from a first attempt, no small amount of patience is needed to carry the operator through to ultimate success."—*R. D., in Land and Water.*

Compulsory Education in New York.

A recent report of the Superintendent of Truancy to the Board of Education of this city exhibits the practical working of the compulsory education law, which went in force on the 1st of Feburary, 1875. By comparing the figures showing the average attendance on the above date, and those showing the same at the close of December last, there appears an increase of 6,443 in the number of pupils registered, and of 6 515 in the daily average attendance. Including the increase of average attendance at the industrial schools also, the last mentioned figures are augmented to 7,614. In other words, in ten months and at an expense of $14,355 88 for the period, nearly 8,000 children have been induced to abandon a course of idleness and vagrancy, fitting them to becoms paupers and criminals, and to enter upon a course of industry and instruction, preparing them to be future thrifty and intelligent citizens. This is an admirable and encouraging showing for the first workings of the law, although one which we may hope to see improved upon after the lapse of another year.

Koumiss.

The foreign medical journals are giving considerable prominence to the discussion of the utility of koumiss as a remedy for that, now to all intents, incurable disease, consumption. It is to this peculiar preparation that the Tartars attribute their total immunity from the disease; and that this immunity has long since been traced to koumiss by Russian physicians is proved in the fact that the latter as frequently send consumptives to regions where koumiss is constantly used as the physicians in this country dispatch patients to the orange orchards of Florida for the winter.

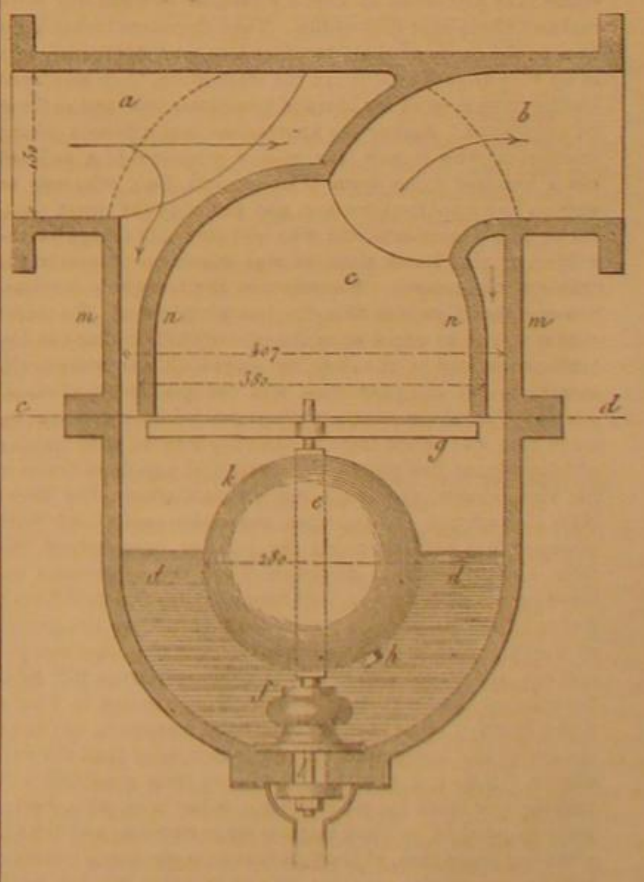
The Tartars, above all other people, excel in the manufacture. The material is an alcoholic liquor produced by the fermentation of mare's milk. A certain quantity of the latter is placed in a wooden vessel, and one sixth of its amount in water is added. A similar amount of cow's milk is next poured in, and then the receptacle is covered with a thick cloth, and either buried in the earth or subjected to a moderate heat for 24 hours. The mixture becomes sour, and thick clots form on its surface, but these last are again incorporated by brisk stirring, which is continued until the liquor becomes homogeneous. Another twenty-four hours' repose follows; the liquid is transferred to a higher and narrower vessel, and the stirring and beating operation is repeated. It is then ready for use, although the stirring has to be done over again every time the contents of the vessel are drawn upon after any period of rest.

The taste is agreeable, and of a kind of acid sweet. A dose of something less than a quart is intoxicating, even to persons habituated to its use. It appears to act on the faculties of nutrition like alcohol and raw meat, that is, it moderates the consumptive action of the disease. The patient gains in weight.

In the large cities of Europe, koumiss has, in cases where large quantities of mare's milk were unattainable, been made of cow's milk alone, or mingled with asses' milk. To use it as a medicine, it is bottled, and a tube is forced down through the stopper, as in the siphon jars so much in use by mineral water makers, said tube having a suitable faucet. The pressure of gas generated in the bottle is always sufficient to drive out the koumiss forcibly, so that it can be drawn off at pleasure, like artificial seltzer water.

A NEW STEAM TRAP.

We extract from the Belgian *Bulletin du Musée de l'Industrie* the annexed engraving of a new steam trap, for drying saturated steam during its passage from the boiler to the engine cylinder. The apparatus is composed of a cast iron chamber, *m*, which is surrounded by felting or other non-conducting material. The steam enters at the opening, *a*; and in its descending course between the sides, *m* and *n*, and in rising in the bell, *c*, it deposits the water of condensation, which, sinking to the lower portion, *d*, of the receptacle,



there accumulates. In order to allow this water to escape, a double seated valve, *f*, is placed at the bottom. On the stem, *l*, of the valve, a spherical float, *e*, is carried. The stem is fixed in a tube which traverses the sphere, and is guided above by three arms, at *g*. When the water level rises in the receptacle, the float is raised and the valve beneath lifted, allowing of an escape until the sphere falls sufficiently to close the valve. The weight of the float may be r gulated by admitting a suitable amount of water at the opening closed by the plug, *h*. The dry steam makes its exit above and is conducted to the cylinder by the pipe, *b*.

THOUSANDS of dollars are lost by farmers through neglect to shelter their farm machinery during winter. It only takes about two winters' exposure to rot the wooden portions at the joints, and to render the bolts loose and weak.

Correspondence.

Employers and Trade Unions in England.

To the Editor of the Scientific American:

As I told you in my previous communication (published in your last issue), the workman Tom continued in his course, determined to let the matter work itself out; but while he was in this state of mind, matters assumed an entirely new phase, inasmuch as the foremen began to urge the day work men to do more work, complaining that the cost of day work must be made to approximate that of piecework. Some men were reduced by being put back from the erecting pits to the fitting benches, one or two were threatened with dismissal, and apprentices just out of their time were not given the full amount of the usual rise in their wages. One old hand, who had performed some twenty years of service under that company, and nearly all of it in the same shop, had his wages reduced, and the whole shop became, as it were, in an uproar, Tom was charged with injuring his fellow workmen; he replied that he had nothing to sell but his labor, and he had a right to realize the most of it that he could; and he was answered that no man had a right to injure a whole community, that the rights (and even the privileges) of the individual were ignored by governments when the welfare of a community demanded it. He was told how the discoverer of gold in California had his lands seized by the people, and had been utterly unable to obtain any redress at the hands of the courts. Another said: "See here! I was engaged to work for this company; I have given them satisfaction for years; I am doing the same amount of work that I always did, but I no longer give satisfaction. I am given to understand that I must do no more work for the same price. I would not object to your doing what you like with your labor; but when you are set up as a standard by which I am to be measured, a standard by which we are all to be measured, to our detriment, what are we to do?" Still another said: "Do not you see that your perseverance and skill are merely taken advantage of to our detriment? You are not given any credit for any unusual ability, but our employers set you up as an average, and say that, if you can do so much work, others must do it. Doctors and lawyers have legal charges which they can enforce, the one so much a visit, the other so much for each professional service; but we have no protection whatever." Tom replied that he was not answerable for the actions of the company, and that in a matter of business he had a right to consult his own interests only. They replied that it was a matter of business to them also, and that they had a right to consult their interests only. The result of his work had been a business detriment to them, and he must thereafter expect no favor from them.

Here was an entirely new disturbance. The foremen got into difficulty, the superintendent said that it looked badly on the books for a workman to be making so much money, and also for one man's work to be done so much more cheaply than another's. The foremen were unable to get others to either take piecework at Tom's prices, or to make day work cost anywhere near that of his. They therefore looked upon Tom as the cause of their troubles also, and dealt with him in no very friendly spirit. In the meanwhile, Tom employed another man to work for him and sometimes two, and at times an apprentice. Among the apprentices was a certain young gentleman (who is now the master mechanic of a railroad not a hundred miles from Williamsport, Pa.), who was an earnest and assiduous worker, and probably the most skillful of Tom's assistants, and who will probably recognize the subject of this letter, since he was cognizant of nearly the whole of the contest. The result of the foremen's displeasure was that Tom was likely to lose his position. He learnt that it was to be urged upon the superintendent that the disturbance created in the shop by piecework was more detrimental to the company than was the piecework advantageous. The claim was probably not without foundation, since Tom was on his entry to the shop greeted with ringing of hammers on iron plates, the erection of a gallows frame in his vise, shouts, and other similar salutations, the better class of workmen looking upon these demonstrations with pleasure, but holding aloof; the inferior ones helped the folly, hoping it would intimidate Tom; the apprentices entered into it with a gusto, half from deviltry and half from a desire to become popular among the men. Then the groups of workmen and apprentices would argue the question, *pro* and *con*, and would not, as a rule, commence work till one or the other of the foremen appeared. This aroused in Tom a direct spirit of opposition; he took more piecework, cut down the prices still lower, and still he earned more than the regulation "time and a half." His work was repairing and making new work for old engines. A few men were continually engaged in building engines by piecework, and thus it often happened that, at the time that Tom was doing a certain job for one engine, another man was doing similar work from the same drawings for another, the castings being from the same patterns. Tom's price was, as the books of the company attest, never less than 25 per cent lower than that of the men referred to; and yet, because Tom earned more money, or, in other words, because he did more work, he was harassed by his employers, and came into indirect conflict with them, by reason of their insisting upon his voluntarily reducing his prices, although his rival was not even requested to reduce, and was *allowed to continue at the old price, although he did not do so much work.* He did not earn so much money, and was therefore considered to have committed no offence.

It has not been attempted, in this letter, to show the bitterness attending Tom's struggle, both with the workmen and the foremen, but merely to illustrate the difficulties of the piecework system; but Tom finally decided to go to the United States, and, wishing to have an introduction to some one there, called upon Mr. Zerah Colburn, then editor of *Engineering*, a mechanical newspaper well known to your readers. Mr. Colburn had heard of Tom, and gave him letters of recommendation to several prominent engineering gentlemen in the United States. I subjoin an exact copy of one of them:

London, 11th day of February, 1867.

MY DEAR SIR:

Mr. ———, who will hand you this, has been engaged for some years at the ——— railway works. He has taken by piecework almost every part of the finished work of locomotives, and I believe he has succeeded very well at moderate prices. Indeed he has brought down the displeasure of the union men, with whom the workshops of this country are unfortunately overrun, for having been more industrious and therefore more prosperous than their regulations allow of. He has determined to go to America; and I trust that, if you cannot find a place for him, you may be able to recommend him, as I think you may with confidence as a hard-working, capable, and valuable man. In this latter case, will you kindly return to him this letter, and endorse it to any of our mutual acquaintances whom you think likely to further his wishes? ZERAH COLBURN.

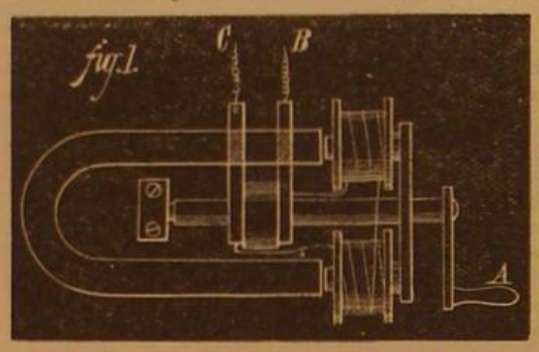
Tom came here, found immediate employment, and in a very few weeks was working piecework; but in less than two years he found that "so much work for so much money," as illustrated by the piecework system, is (as a means of advancement) a delusion and a snare, since his value as a workman was sufficient to render his employment in a higher position questionable in a money point of view. Tom, however, still believes that piecework, carried out with a desire on the part of both employer and workman to be reasonable and just, would be a decided advantage to both.

New York city. PIECEWORK.

Some Further Electric Experiments.

To the Editor of the Scientific American:

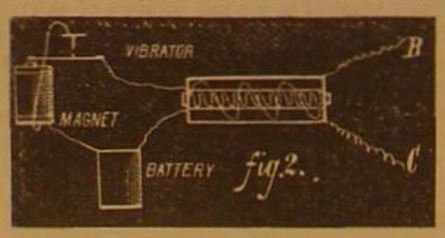
I send you notes of three electrical experiments, which any of your readers can try for themselves. Fig. 1 represents the common magneto-electrical machine in general use



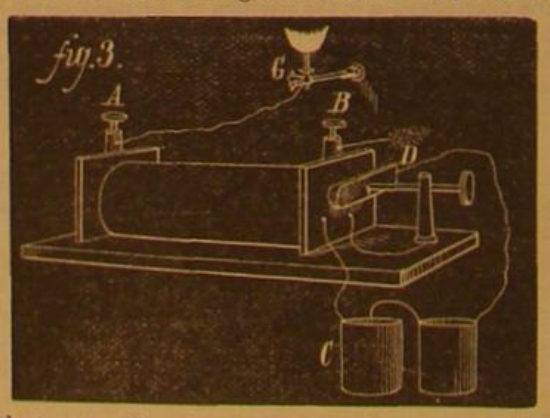
By turning the crank, A, sparks can be obtained either at B or C. These sparks can be obtained at the free or open end of a conductor, by proper connection.

Fig. 2 represents common voltaic induction, and the sparks can be obtained either at B or C, and transmitted the same as by the magneto electrical machine, but with better results.

Fig. 3 represents the Ruhmkorff induction coil. C is the battery, D the vibrator, and A and B the ends of the fine wire



or second coil. Sparks can be obtained at either A or B, by touching the knob with a wire or piece of metal. A physiological effect can be obtained by slightly touching the free or open end of the wire leading, from either A or B, to the end



of the tongue. It makes no difference from which, A or B, you lead the wire, the spark will appear; and of course, by touching A and B together, you have the common result of the coil. Connecting A to the gas pipe, G, thereby grounding the whole coil, does not affect the sparks or physiological effect at B, or their transmission through conductors. The sparks can be made to produce mechanical effects in this form, and they can be made to produce mechanical effects similar to those obtained by Mr. Edison. M. B.

A Freak of Nature.

To the Editor of the Scientific American:

In a forest in the vicinity of this place, there are two trees of the variety known as red oak, which, at about 12 feet from the earth, are united by a limb growing from one to the other. The trees are about 2 feet 6 inches apart. The one from which the limb extends is 44 inches in circumference near the earth, 41 below the limb and 36 above. The other is 26 inches in circumference at the stump, and 24 below and 33 above the junction with the limb, which is 22 inches around. In the large tree, the trunk is healthy below the limb, but the top evinces signs of decay. The top of the small one is healthy and flourishing, while its trunk is nearly dead, and has scarcely grown an inch in several years. The large tree is about 30 feet high, and the small one over 40.

If any museum would like to obtain the specimen, it will be put on the cars at Farley, addressed to any person who may give me necessary directions.

Farley, Iowa. W. J. MCGEE.

Wells of Mineral Water.

To the Editor of the Scientific American:

It is well known that mineral water in wells, by reason of its greater specific gravity, sinks to the bottom, while water which contains little or no mineral floats to the surface. Hence it is impossible to obtain pure water by the use of the common pump: for since the pump draws from the bottom, it must of course draw the mineral water first, leaving the pure water in the well. To remedy this, I suggest the following:

Provide a piece of ⅞ inch oak plank about 15 inches square, and boil it well in clean water to remove the sap. Procure a piece of rubber hose about 1¼ or 1½ inches in diameter, and of sufficient length to reach from the bottom of the well to the surface of the water when at its highest point. Split one end of the hose in halves to the length of 3 inches, open the mouth thus formed about 2 or 2½ inches, and join it to the center of the square plank by means of tacks through the edges of the lips, the slots on the two opposite sides being distended at least 1 inch. Attach the other end of the hose to a spile of 1½ inch bore inserted in the pump stock about 10 inches from the bottom, stopping up all other water inlets below the surface. The hose may be lashed on the spile with a well waxed cord. Introduce the pump, with the hose thus attached, into the well, allowing the plank supporting the upper end of the hose to flat on the surface, and the pump is ready for use.

The advantages of this plan are that, as no water can enter the pump but through the slots in the hose under the plank, all the pure surface water will be drawn off before the mineral water is reached, and no *débris* or sediment of whatever kind can enter the pump from below, nor floating foreign bodies from above. And the floating plank will rise and fall with the varying hight of water, so that none but surface water, the purest in the well, can be drawn.

Alma, Ohio. J. TAYLOR.

Value of the Scientific American.

To the Editor of the Scientific American:

In your issue of January 15, current volume, is an extract headed: "Make a Note of It!" My advice to everybody is, instead of keeping a notebook and pencil always ready, and looking very much like a city local reporter, subscribe, like a sensible man, to the SCIENTIFIC AMERICAN, read it carefully and then lay it away. I can assure you that, if anything worth making a note of is published, it will be sure to come out in its volumes; and by looking over back numbers, as well as the new ones as they come out, any one will be sure of finding anything that is worth making a note of. I have found it so during the few years that I have been taking your journal, and for my small business it has been as good as a large cash capital. "Knowledge is power."

Wilson, N. C. H. B. BENTON.

Electricity as an Executioner.

To the Editor of the Scientific American:

In your paper of January 8 is an article on the above subject. It is very suggestive. Should the electric fluid be used to shuffle off the mortal coil of criminals, the judge in pronouncing sentence would have to say: "The sentence of the court is that you be taken to the county jail, and thence to the place of execution, where you will be struck with lightning until you are dead, dead, dead!"

We might go still further with improved methods of dealing with culprits. Experiments could be made to determine whether human beings could be frozen in such a manner that life would return when the body was thawed out, as is the case with fish and other animals. If successful, instead of long imprisonment at the expense of the State for food and clothing, and the risk of escape, criminals could be securely incased in blocks of ice, and stored away in refrigerators during their allotted term. Had Tweed been thus immured, there would now be less anxiety about him. Then, again, any one dissatisfied with the hard times could step into the machine, and request a friend to block him up in ice until specie payment was resumed.

The length of this kind of improvement would add years, but not age, to the prisoner. With proper care, we should be immortal. A hundred years would be as one day. Troublesome mothers-in-law could be disposed of for a time, care being taken not to break them in two in the act of storing. S. BROWN.

Philadelphia, Pa.

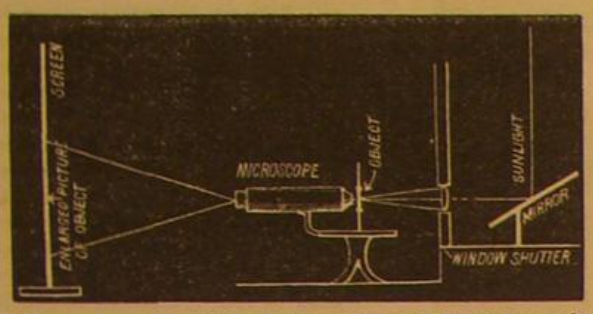
Enlarged Images Projected on a Screen with a Microscope.

To the Editor of the Scientific American:

In your issue of December 18 (Notes and Queries, No. 43) you say that a person cannot throw an enlarged image on a screen with a compound microscope. It had been my good fortune to listen to a course of lectures, by Professor Bolles

on the microscope, in which he stated that he produced some of his images on the screen in that way. To confirm my impression, I wrote to him and received the following:

"The answer in the SCIENTIFIC AMERICAN is only true in one way. It is true that you cannot use the microscope to project objects to any size on the screen, if you use the ordinary illumination employed for viewing objects, because the light (a gas jet, a candle, ordinary daylight, a kerosene lamp) is not intense enough to give a bright picture when diffused so much as it must be on the screen. But if you increase your illumination, you can project the smallest objects which the microscope can show. The enlarged objects which I showed in New Bedford were projected from a microscope placed in front of the calcium light. Dr. J. J. Woodward, of the Army Medical Museum in Washington, has done the finest work of this kind. He uses sunlight, thus:



You can see the object on the screen; and if a photographic plate be substituted for it, a negative can be taken. In this way Dr. Woodward has photographed the most difficult things, such as Nobert's 19th band, five-lined diatoms, etc. His results, published by the government, are the best in this way in the world. A great deal of this sort of thing has been done, and almost any book on the microscope has something about it. Any microscope and any lens can be used if there is a light intense enough. I often photograph microscopic objects direct from the lantern. E. C. BOLLES."

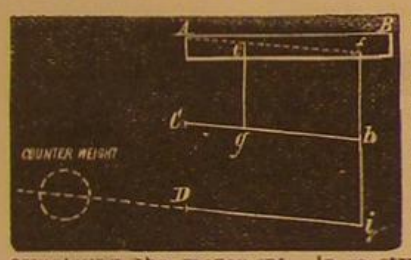
I believe this will be interesting to your many readers.

New Bedford, Mass. D. W. C.

To Describe a Circular Motion Around an Inaccessible Center.

To the Editor of the Scientific American:

The following problem recently came up in practice. It became necessary to tip the leaf of a bench or table about an axis which was inaccessible for using a hinge or trunnion. Sliding arcs as guides were also inadmissible, and nothing should project above the surface of the table. The device shown in the engraving accomplishes the object.



A B is the leaf to be raised or lowered about the corner, A. C and D are pivots upon a fixed frame. C *h*, D *i*, and *i f* form the well known parallel motion. Upon C *h* is erected the connecting link, *g e*, completing the movement. In construction, A *f*, C *h*, and D *i*, should be equal, *g e*=*h f*, and *g h*=*e f*.

Smithville, N. J. JOHN SALTAR, Jr.

Mr. Edison's New Force.

To the Editor of the Scientific American:

I notice in your SUPPLEMENT No. 5 an article upon the "phenomenon of induction," by Professor Houston of Philadelphia, copied from the *Journal of the Franklin Institute*, in which he claims that etheric force is nothing but inductive electricity, and that he observed the same phenomenon in 1871. He attributes my failure, to obtain indications with the test instruments used, to the fact that the positive and negative currents from the vibrator followed each other with great rapidity, and thus prevented the instruments from responding. In reply, allow me to state the gentleman is entirely wrong in his conclusions, and that he cannot be familiar with the extra currents of low resistance magnets; otherwise he would have known that, upon connecting the battery, the extra current is provided with a circuit in which it may pass, consisting of the battery, connecting wires, and electromagnet. Under the conditions by which I obtain etheric force, no spark should theoretically be obtained, even if it were due to extra current upon closing the circuit; and in all my experiments none has ever been obtained. Neither is the brilliancy of the spark reduced by replacing the iron core of the electromagnet (used in one form of experiment) with a copper one, which should be the case were the spark due to extra current.

In regard to the Professor's claim of priority, I have on every occasion stated that the spark has been observed by electricians for many years, and attributed by them to inductive electricity; and all that I can lay claim to is that perhaps (if that is not too strong a word) I was the first to discover that it was not due to electricity.

In conclusion, I suggest that, as I have freely laid myself open to criticism by presuming to believe in the capacity of Nature to supply a new form of energy, which presumption rests upon experiment, it is but fair that my critics should also back up their assertions by experiment, and give me an equal chance as a critic. T. A. EDISON.

Newark, N. J.

The Nature of the Phenomena Discovered by Mr. Edison.

To the Editor of the Scientific American:

Allow me to correct a slight typographical error in the last paragraph of my article on page 39 of your current volume, where it said: "Another argument that this force is not electricity itself, and is only related to electricity," etc. This makes me say the reverse of what I wished to convey. It should read: "Another argument that this force, if not electricity itself, is related to electricity only, and not to heat," etc.

New York city. P. H. VANDER WEYDE, M.D.

Sixty Quails in Sixty Days.

We wonder if there is anything epidemic in the desire to eat thirty quails. Two or three weeks ago we found a story about some one in Indiana accomplishing that most nauseous of gastronomic operations, and transferred the recital to these columns. Now come two Frenchmen in Louisville, Ky., who have been trying their hands, or their stomachs rather, at the same proceeding, and they also have succeeded. We are beginning to lose faith after all in the assertion that the task is difficult: at all events, it is one which has been mastered, apparently, by the indomitable will of the Gallic gourmands.

But this is not all. One of the twain, after smacking his lips over quail No. 30, sighed, Alexander-like, for more quails to conquer. Thirty quails had glanced harmlessly from that flinty stomach, and the hero of the astonishing organ felt justified in beginning on quail No. 31. He continued until five birds had been engorged, and then outraged nature rebelled; but with a burst of that gigantic will, which, in Napoleon, surmounted the rocky barriers of the Alps, the intrepid eater hurled himself upon the seventh bird, and, in his own words, "chewed him up, bones and all." Like the old guard at Waterloo, that stomach, "which dies, but never surrenders," withstood the onslaught of bird after bird, until finally, after the thirtieth quail, its heroic owner quaffed off a goblet of wine, and announced that for the last ten meals he had enjoyed his repast. After this, these columns will be rigidly closed to any further stories about the impossibility of eating quails.

Patent Proceedings in Congress.

The following is an abstract of patent measures brought before Congress, up to the period of the going to press of this issue.

HOUSE OF REPRESENTATIVES.

Mr. Dobbins, of New Jersey, January 11, presented the petition of A. B. Wilson for extension of his patent on sewing machines. Referred to Committee on Patents.

Mr. Hartzell, of Illinois, January 12, introduced a bill to amend section 4,898 of Revised Statutes relating to patents. This bill was reported from the Committee on January 26, with the recommendation that it pass. It was accordingly read a third time, and passed. Mr. Hartzell also introduced, on January 18, a bill relating to sections 4 910 and 4,916. Referred to Committee on Patents, and ordered to be printed.

Mr. Foster, of Ohio, January 18, introduced a bill authorizing extension of Horace Woodman's patent for a card-stripping machine. Same disposition as preceding bill.

Mr. Hoar, of Massachusetts, January 14, offered petition of Samuel A. Knox for extension of his patent on plows. Referred to Committee on Patents.

Mr. Vance, of North Carolina, January 13, reported a resolution "that the chairman of the Committee on Patents, and the acting chairman of any sub-committee thereof, be authorized and empowered to administer oaths when deemed by them necessary in any and all investigations before them." Adopted.

Mr. Seelye, of Massachusetts, January 24, offered a petition for the renewal of Thomas A. Weston's patent. Referred to Committee on Patents.

Mr. Whitehouse, of New York, January 24, introduced a bill for extending Reynolds' patent for brake for power looms. Same disposition as the preceding.

Mr. Warren, of Massachusetts, January 24, presented a bill relative to copyrighting patterns for castings. Referred to Committee on Manufactures.

Mr. Caldwell, of Alabama, January 24, introduced a bill to enable Charles A. Fondé to make application to the Commissioner of Patents, for the extension of his letters patent for a dredging machine. Referred to Committee on Patents.

The bills amending sections 4,898, 4,910, and 4916 of the Revised Statutes, referred to in our abstract, are designed to give to the assignment of patents and interests in patents the same solemnity and formality that attach to conveyances of real estate. They authorize officers commissioned to take acknowledgments of deeds to take acknowledgments of assignments of patents, which assignments are of effect from date of record in the Patent Office.

Mr. Douglas, of Virginia, on January 26, reported from the Committee on Patents a bill which is aimed at a custom, said to be prevalent among clerks at the Patent Office, of searching the records and procuring information for claimants at a distance. The bill makes the acceptance of money or any valuable thing, other than his salary, by any officer, clerk, or employee of the Patent Office, for work pertaining to the Patent Office, a misdemeanor punishable by fine and imprisonment. It extends to the Patent Office the provisions of section 190 of the Revised Statutes, which declares that no officer, clerk, or employee in any department or bureau of the government should act as counsel, attorney, or agent in prosecuting any claim pending in his bureau or department while in the government service. It also forbids his acting in such capacity within two years after leaving the public employment.

SENATE.

Senator Hamlin, of Maine, January 13, introduced a bill of the same tenor as that of Mr. Foster, of Ohio, in the House, above noted. Referred to Committee on Patents, and ordered to be printed.

Senator Logan, of Illinois, January 21, presented the petition of W. H. Akins and Jacob D. Felthouser, praying compensation for inventing new and useful improvements in sewing machines. Referred to the Committee on Patents.

Senator Eaton, of Connecticut, January 21, introduced a bill of same tenor as that of Mr. Seelye of Massachusetts in the House, above noted. Referred to Committee on Patents, and ordered to be printed.

Artificial Vanillin.

The details of Haarmann and Tiemann's process (mentioned on page 37 of our volume XXXI) for the manufacture of vanillin, are given as follows in the *Deutsche Industrie Zeitung:* Dissolve 10 parts of coniferin in hot water. Conduct this concentrated solution in a fine steam into a moderately warm mixture of 10 parts bichromate of potash, 15 parts sulphuric acid, and 80 parts water; then heat to boiling for three hours. The vanillin formed is either extracted by ether, or isolated by distilling in steam.

The Supposed New Cereal.

M. B. says: "In a recent issue of your paper I see an article concerning a new grain found in the crop of a wild goose. I discovered this identical grain in 1850, where civilized man had never before trod the soil; it was growing as an aboriginal product, in a gulch in the Utah Mountains. The location is northwest of Salt Lake. The grain was ripe, and resembled rye more than any other distinct type."

Incombustible Wood.

The invention of Mr. A. F. Richard, of Dax, France, relates to the preservation and incombustibility of wood by the aid of crystallized chloride of sodium in solution in water at between 6° and 24° by Baumé's aerometer, and of a solution of chloride of sodium and alum at between 4° and 27°, either mixed in variable proportions or employed separately.

What the Preacher Said.

A lady, residing at Joliet, Ill., writes to a friend in this city that, at church, the other day, the minister said that one very sure way of discriminating, between a good young man and one of frivolous habits, was by watching them as they went to the news stand for a paper. When a youth was seen to select the SCIENTIFIC AMERICAN instead of a daily or an illustrated story paper, the observer might feel pretty confident of that young man's future.

Business of the Canadian Patent Office.

According to the Canadian Patent Office *Record* for December, 1875, there were issued in Canada, from October 20 to November 24, 1875, inclusive, 127 patents, of which 81 were granted to citizens of the United States, 39 to Canadians, 6 to subjects of Great Britain, and 1 to a citizen of France. It will be understood from the above that nearly two thirds of all the fees paid to the Canadian Patent Office are furnished by American inventors.

The Conviction of L. W. Pond.

Mr. L. W. Pond, the once well known machine tool builder of Worcester, Mass., was captured some time ago in San Francisco, Cal., and brought back to Worcester for trial for the forgeries he had committed. Some thirty-two indictments were found against him; but on being arraigned, he plead guilty to three. Without considering the other charges, the court sentenced him to fifteen years in the State prison.

Passage of the Centennial Appropriation Bill.

The bill appropriating $1,500 000 for the purposes of the Centennial Exhibition has passed the House of Representatives by the close vote of 146 to 130. A few amendments were added, mainly with reference to the filing of bonds by those accountable for disbursements, and for regulating the payment of the sum from the Treasury.

Useful Recipes for the Shop, the Household, and the Farm.

To make cider: Take good sound apples (the sweeter the apples, the sweeter the cider) late in the fall, the later the better before the first frost. Early apples and windfalls may do for vinegar, but will not make cider that will keep for any length of time. Fill the barrel full, put in the cellar, take out the plug, and let the cider foam out for about ten days, keeping the barrel full with cider made at the same time. After the cider has worked about ten days, take a long slim bag that, when filled, will go in at the bung hole, put in about 1 lb. of English mustard for every 20 gallons, and drop into the cider; then cork the barrel airtight, and let it stand about three weeks, then draw off into another barrel.

A precaution relative to the care of carriages, which is often overlooked, is to prevent rust of the spring plates where they are joined together and not covered with paint. The joints should be lubricated; and the best material for this purpose, where dark colors are used in painting, is composed of 2 parts each of pure beef and mutton tallow to 1 part blacklead, well mixed, applied warm and in small quantities. When light colors are used in painting, diminish the quantity of graphite.

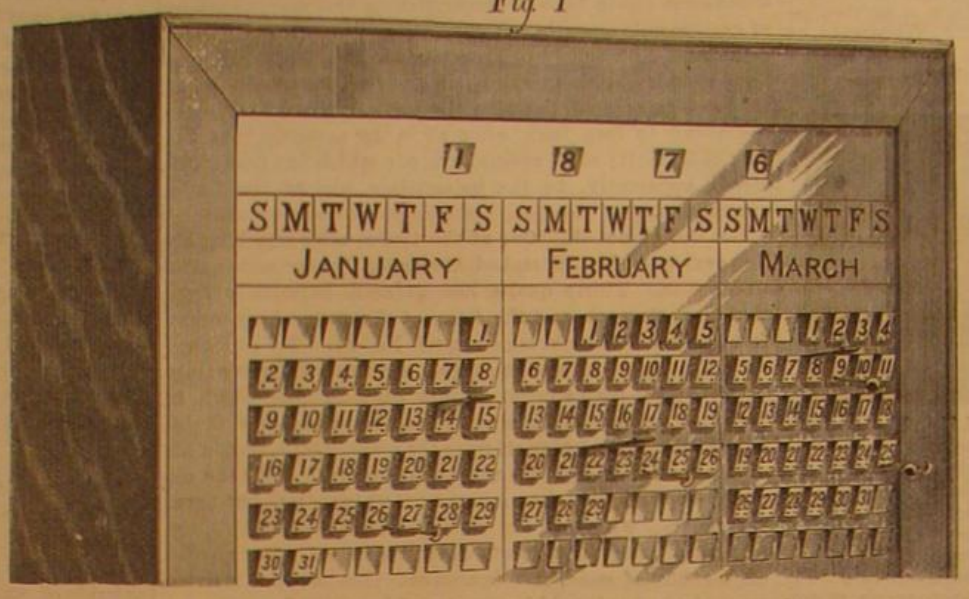
It is said that leather may be affixed to metal, so that it will split before it can be torn off, by means of the following composition: A quantity of nut galls reduced to powder is dissolved in 8 parts of distilled water, and after remaining for 6 hours is filtered through a cloth. This decoction is to be applied to the leather. Then take a similar quantity of water and add to it 1 part (by weight) of glue, which is to be held in solution for 24 hours, and then applied to the metals, which should first be roughened and heated. The leather is then laid upon the metal and dried under pressure.

IMPROVED ADJUSTABLE ALMANAC.

We illustrate herewith a new almanac, which, by a simple rearrangement of marked pegs inserted in cavities in a block, may be adapted for any year. In the annexed engraving, Fig. 1, a portion of the device (three months) is shown. The pegs are placed in columns in the month divisions of the wooden block. Each of said divisions, for the sake of uniformity, contains 42 pegs, and on these pegs are figures to denote the days of the month, so that, of course, as many blank pegs appear as the total number exceeds that of the days in the month.

The pegs are alike in size, and therefore are interchangeable in the block orifices. On the under side of each, at the same end as the figure marked, is inscribed the day of the year. The opposite extremity of the peg is blank, so that, according as it is inserted in the block, it shows either the plain or numbered end. To use the calendar, all the pegs are inserted so as properly to indicate the days of the month, but are pushed into the block to their full length. As each day arrives, its corresponding peg is drawn out until the number denoting the year day, on the under side of said peg, appears. Thus, for every day expired, a drawn peg will be shown, while those days yet to come are indicated by the untouched pegs, so that the last drawn peg points out the current day.

Fig. 1

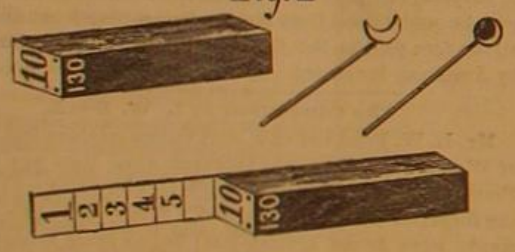


MILLER'S ADJUSTABLE ALMANAC.

The year in progress is shown at the top by similar movable pegs, which are also interchangeable with those already described. Those pegs not in use for indicating the year are inserted, rear end out, in the blank month spaces, and thus are conveniently stored until needed.

Each peg, as shown in Fig. 2, has a movable metal slide on its upper side. On this slide are figures, and, as the slide is moved out or in on the peg, said figures are shown in succession. This is called a "reminder," and the object is to denote that as many different matters are to be attended to, on the day shown by the peg, as are indicated by the last figure appearing on the slide. Another device may be used to symbolize events. In the engravings, pins are represented

Fig. 2



inserted in orifices in the pegs, to indicate the occurrence of full moons and eclipses—the former being denoted by a crescent-shaped head on the pin, and the latter by a head representing an eclipsed orb. Of course the peg shows the day on which these events are to take place.

Patented August 17, 1875. Canadian patent now pending. For further information relative to proposals for manufacturing on royalty, etc., address the inventor, Mr. David J. Miller, Santa Fé, New Mexico.

IMPROVED JUMP SEAT FOR CARRIAGES.

The accompanying engravings represent a novel construction for jump seats of carriages, which admits of both front and rear seats being brought together so as to occupy the space required for but one, and also of the front seat being altogether removed when desired. This arrangement tends considerably to economize room in the vehicle, and at the same time affords an easily adjustable and strong method of attaching the seat.

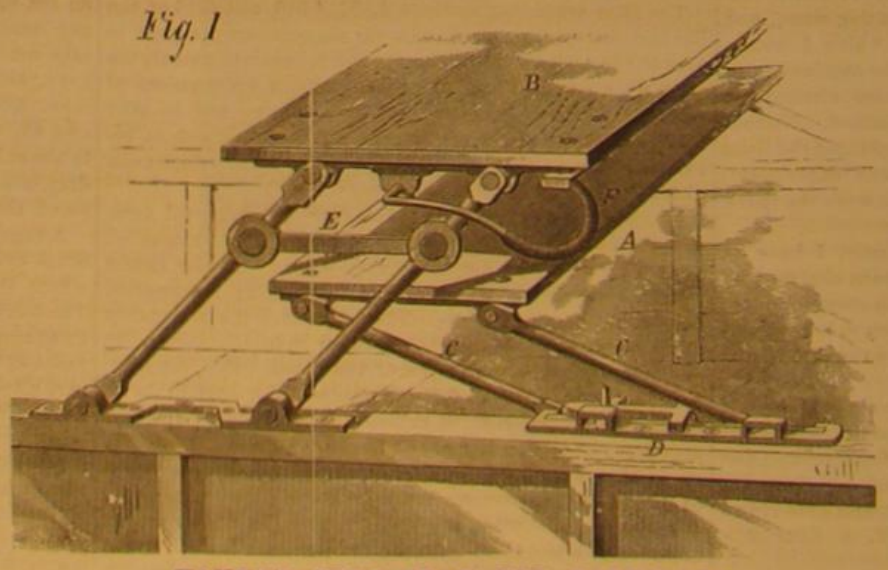
In Fig. 1, A is the front and B the rear seat. The uprights, C, of the front seat are pivoted to the seat support and also to an inside plate not shown, which enters a recess in the plate, D, which is secured to the side piece of the wagon. The inside plate may easily be lifted out of the recess, so that the mode of attaching or detaching the front seat from the wagon is obviously simple. On plate, D, is a pivoted double latch, having two opposite horizontal projections and a vertical thumbpiece. This serves to fasten the two plates together, when the inner one is inserted, while one of its projections always enters one of the loops shown on plate, D, thus causing the latch to furnish a support to the uprights of the front seat frame in whatever position the latter may be placed.

The arrangement of the rear seat is shown in Fig. 2 and also in Fig. 1. The uprights are pivoted directly to the wagon plate, and are provided with a connecting piece, which equalizes the strain on them. Here is also a handle, F, for convenience in adjusting the seat.

As shown in the illustration, the seats are brought together, but it will be readily understood how they can be swung apart. When it is desired to dispense with one seat, the front one is altogether removed and the rear thrown forward on its pivots. The construction is simple and strong, the supports being made of one half inch round iron, and there being no lateral play in the journals.

Patented through the Scientific American Patent Agency, May 5, 1874. For further particulars relative to sale of patent, with patterns, &c., or relative to sale of rights, address Messrs. Hanna & Brother, carriage makers, Bel Air, Harford county, Md.

Fig. 1



HANNA'S JUMP SEAT FOR CARRIAGES.

The Chinese Railroad.

We mentioned recently the undertaking of the first railroad in China, the material for which is already *en route* to the last mentioned country from England. We learn that the line, which is to extend between Shanghai and Woosung a distance of 9½ miles, will be completed by July next. There is in China an excessively strong prejudice against railroads, which it is hoped this new enterprise will aid greatly in overcoming. It was only recently that several newspapers, published in some of the principal Chinese cities, and edited by natives in other respects intelligent and well informed, published bitter articles against the introduction of the locomotive, and even went so far as to assert that even in America and Europe the number of casualties, due to swift trains rushing about the country, was so excessive that people never used the cars as means of conveyance except when forced to do so by lack of time or similar necessity.

We hardly share in the sanguine anticipations, of the promoters of the Chinese railroad, that, if the inhabitants of the Flowery Kingdom once get used to seeing traffic conducted on a short line, they will speedily abandon their present obstinate opposition. The Chinaman, say those who are familiar with the peculiar notions of his race, does not object to the railroad because of the dangers thereof, as above intimated, but purely on religious scruples. Every one knows how extremely solicitous the Chinese are as to the ultimate disposition of their dead. In San Francisco there are special companies who insure their compatriots burial in the ground of their native land, and who make it their business to convey back to China the remains of emigrants who die in this country. So also, when coolies are hired to go abroad, there is always a stipulation in the contract that the bodies of such as die shall be shipped back to the Chinese territory. China in fact has been described as one huge burial ground, and it is asserted that her soil is fairly packed with the dust of the countless number of generations which have formed her dense population during the long period of her national existence. This of course is more figurative than literal, but the circumstance nevertheless remains that it is particularly impossible for railroads to run, through the thickly settled districts, without in some measure approaching, and thus (in Chinese belief) profaning, the very hallowed resting places of the dead. Such, it seems, is the objection to railroads; and as long as it exists we imagine that the missionaries will have better success in counteracting it than the party of engineers and workmen who, it is expected, are to demonstrate, before the oblique ocular organs and to the equally oblique intellect of John Chinaman, the immense practical value of the iron horse.

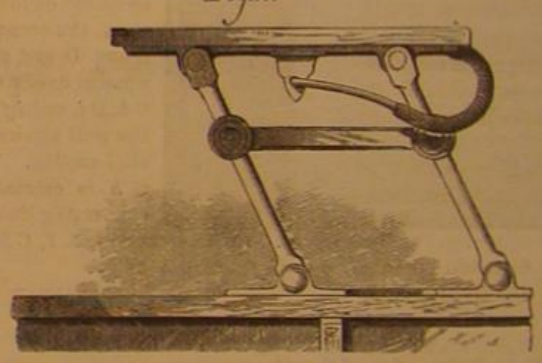
New Blasting Powder.

The new blasting agent *lignose* invented by Baron von Trutzschler Falkenstein, and apparently made of woody fiber prepared with nitroglycerin, has been recently tested (we learn from *Deutsche Industrie Zeitung*) in various mines in Upper Silesia. The results were on the whole not unfavorable, but the action was not always regular. The substance has not (as was at first claimed for it by the inventor) five times the force of an equal weight of ordinary black blasting powder, and even four times was doubtful; but a threefold force may be readily conceded. The price fixed by von Trutzschler is $33.75 per cwt., or three and a half times cheaper than the price of 3 cwt. of powder. The advantages of the new agent are less danger, as it does not explode on contact with open fire, and is but difficultly exploded by friction or concussion: and the fact that, to effect its explosion in a blast hole, the strand match may be used. The powder is very light, and in the loose state burns very slowly. A manufactory for the new agent has been established at Kieltsch.

Utilizing Tin Plate Scrap.

The invention of Mr. F. G. Morton, of Lynton street, London, England, has for its object a simple, economical, and efficient means of separating the tin from the iron of tin plate scraps, and generally for separating, from iron or other metal, tin, solder, zinc, or mixtures thereof which may be attached thereto in the form of a coating. The tin plate

Fig. 2.



HANNA'S JUMP SEAT FOR CARRIAGES.

scraps or other combination of metals to be operated upon are submitted to the action of a blast or current of highly heated air in an encased or jacketed vessel or chamber, provided with a perforated false bottom or grating, in such a manner as to melt the coating of tin, solder, zinc, or mixture of these, causing it to leave the iron or other metal and pass off through the false bottom or grating. The blast of air is caused to pass through or over a suitable furnace, and conducted into the jacket of the melting chamber, the internal shell of which is perforated to admit the heated air into the melting chamber, where it is diffused and caused to act upon the tin plate scraps or other substances to be operated upon as aforesaid, which substances are simultaneously agitated.

New Method of Preparing Vaccine Virus.

The following method has been recommended and used by one of our correspondents:

On the eighth day, or thereabouts, after vaccination, the calf being placed in a convenient position, the lymph from the vesicles is caused to flow into shallow dishes, and evaporated to dryness; then it is pulverized and put into tubes and hermetically sealed; and it is then ready for use.

The advantages of this mode of obtaining lymph are, first, you obtain a pure lymph free from all the contaminating matter which bovine virus is liable to, such as hair, cuticle, *pus*, *fæces* of the animal, dust, etc. Second, the lymph preserves its integrity very much longer than under the modes of preparation and preservation in ordinary use. Third, it is much easier for physicians to manipulate when vaccinating than the quills, ivory points, or liquid lymph in tubes.

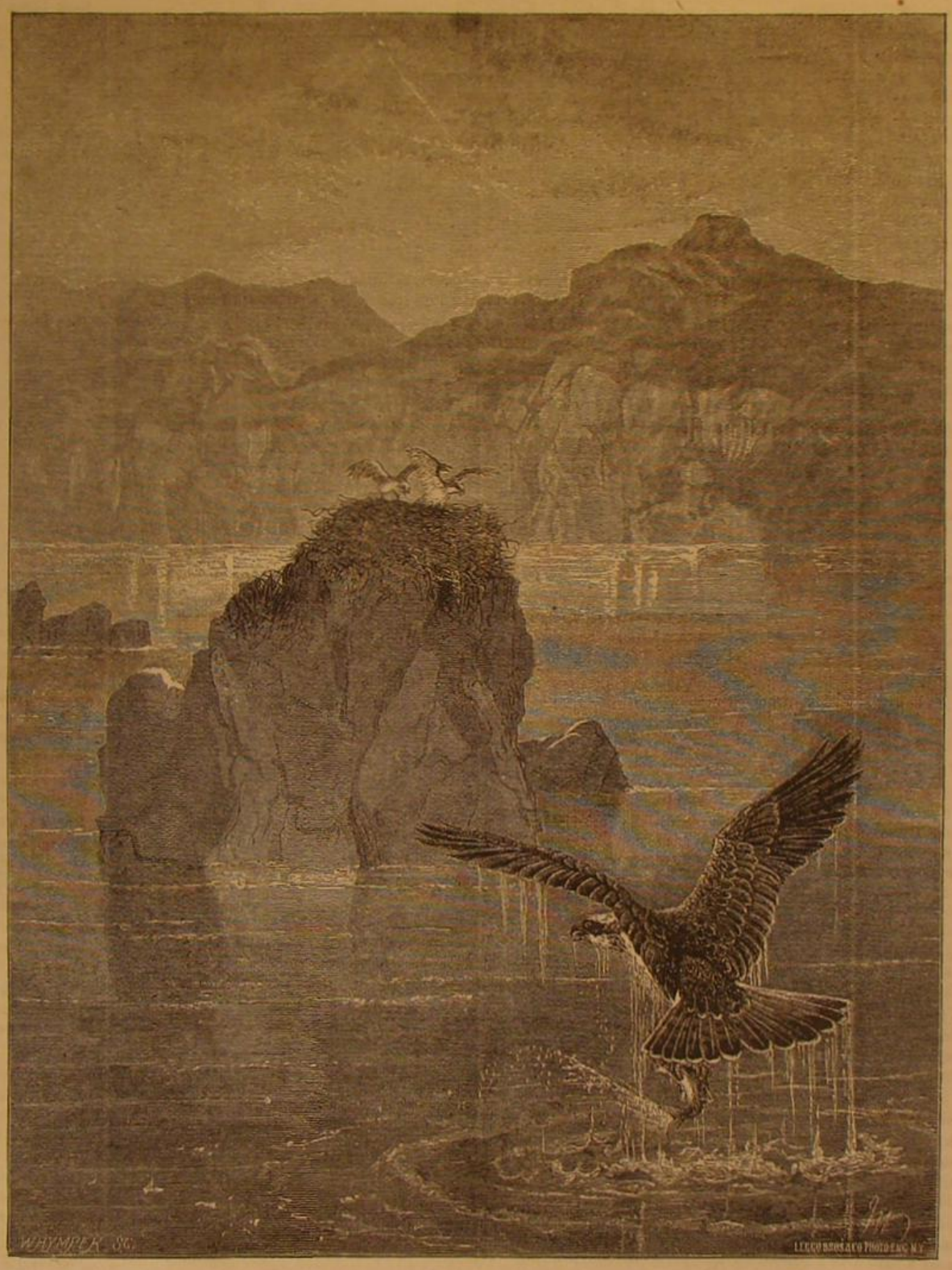
A good brown oak stain is produced by preparing the wood with a solution of 1 oz. catechu, boiled in 1¼ pints of water. When dry, brush over a solution of bichromate of potash 1 oz. to 1¼ pints of water.

THE FISH HAWKS.

The hawks are a family of birds containing members of varying characteristics, but the similarity of the branches is sufficiently obvious to show their relationship. The vultures, eagles, owls, and almost all other birds of prey are entitled to share in the attributes of speed, courage, and endurance with which we are accustomed to endow the hawks; and the beautiful specimen shown in our engraving, the osprey, embodies these characteristics thoroughly. It belongs to the sub family *aquilina* or eagles, of the family *falconidæ* or hawks, and Savigny further distinguishes as a separate genus, *pandion*. It is characterized by a short bill, curved from the base to the acute-hooked tip, and compressed laterally with slightly festooned margins; the wings extend to the tip of the tail. The general form of the bird is heavier and less adapted for rapid and vigorous flight than that of the eagles: the *tarsi* are short, and the toes are very rough underneath, long, and united at the base, and the claws are long, curved, and sharp. Three different species of osprey or fish hawk are known, inhabiting respectively America, Europe and Asia, and Australia. They all belong to the temperate regions, living in the vicinity of arms of the sea, lakes, and rivers; but they are sometimes found some hundreds of miles from land, especially in stormy weather. They usually keep at a moderate hight in the air, watching the surface of the water; upon the appearance of a fish within reach, the hawk closes its wings and plunges headlong, sometimes going entirely beneath the surface, but seldom failing to catch its fish. The rise of the bird with its prey is singularly characteristic and majestic; and the eminent naturalist and artist, Mr. Joseph Wolf, has seized the occasion, at this instant, to portray one of the most vigorous and delicate pictures of animal life which have come under our notice.

The scene is one of the highland lochs of Scotland, and the sky and distance, together with the rocks and water, are drawn with remarkable accuracy and delicacy of effect. The solitary rock with its roughly built nest, from which two hungry young ones are peering, is an effective center to the picture.

The fish hawk in this country, however, finds a formidable foe in the American or bald eagle, who disdains fishing on his own account, but has a great talent for obtaining that procured by the courage and industry of other birds. He usually watches the fish hawk till he thinks he has an opportunity, and then overcomes him by superior weight and strength, and carries away the prize.



THE OSPREY AND ITS PREY.

We select this beautiful engraving from the pages of a handsome volume of drawings by Mr. Joseph Wolf, which have been engraved by the celebrated brothers Whymper, and printed by one of the fraternity. Mr. Edward Whymper adds to his great artistic genius an undaunted spirit in scientific research; and he has gained great renown as a traveler in many almost inaccessible countries and as a member of the Alpine Club, of London. We shall, as occasion may arise, make some further selections from this volume, which is published by Mr. Alexander Macmillan, of London, England.

The Industries of Hartford, Conn.

While the statistics of the manufactures of Hartford, Conn., for the year 1875, are not on the whole encouraging, some of the companies manufacturing articles protected by patents seem to have been very successful, for instance: The Woven Wire Mattress Company has paid the largest percentage of return upon its capital. It divided $21,000 on a capital of $60,000, or at the rate of 40 per cent. The National Screw Company, which has since been absorbed by the American Screw Company of Providence, paid 22 per cent. The Willimantic Linen Company (which makes cotton thread), the Hartford Carpet Company, and the Gatling Revolving Gun Company declared each 20 per cent.

The Proposed New Croton Aqueduct for New York City.

The Commissioner of Public Works of this city has lately published a report relative to the proposed new aqueduct which is to bring in a sufficient supply of Croton water, the present aqueduct being, as is well known, altogether too small to meet the full requirements of the population. Surveys for this work have been in progress for the last five months. The city reservoirs, says the report, contain a supply for ten days only; and in case of an accident to the present aqueduct which would require repairs occupying more than ten days, the supply would entirely cease. It is appalling to contemplate the consequences of such a contingency. Even now the aqueduct requires repairs which are postponed because the water cannot be shut off long enough to make them. With two aqueducts, all necessary repairs to the one could be thoroughly made, while the other would be sufficient to supply the immediate demands. The Croton River drains an area of about three hundred and fifty square miles. From careful observations by the engineers of this department, extending over a period of many years, it is ascertained that an average daily quantity of 300,000,000 gallons of water flows over the Croton dam, nearly all of which could be brought to this city if we had sufficient storage and aqueduct facilities. The plans now presented contemplate the building of a dam on the Croton River, about one fourth of a mile above the head of Croton Lake, to an elevation of thirty feet above the top of the present dam, forming a settling basin of about 800 acres in extent, and a capacity of 1,180,000,000 gallons. Thence a tunnel is to be cut through the hills south of the Croton River, through which the water will be conveyed to the head of the aqueduct. The aqueduct is to be built on one of the two routes described—the Bronx River route, 36 8 100 miles in length, or the Saw Mill River route, 36 53-100 miles in length—to High Bridge. The masonry aqueduct will not be continued beyond a point in the vicinity of Jerome Park, in the newly annexed territory, where it is proposed to build a receiving reservoir of a capacity of 550,000,000 or 600,000,000 gallons. The *niveau* of this reservoir will be 42 feet above that of the Central Park reservoirs, and from there the water can be carried in iron pipes, the ground falling off abruptly towards the Harlem River, and rendering a masonry aqueduct impracticable. These pipes may cross the Harlem River either on High Bridge, which can readily be arranged for that purpose, or under the sidewalks of tunnels which the Department of Parks proposes to build under the Harlem River. In either case the expense would be comparatively small, and the pipes could be laid from time to time, as necessity demands. The new aqueduct is to have a capacity to deliver 150,000,000 gallons of water daily, thus increasing the supply by the two aqueducts to 250,000,000 gallons per day, with the additional and inestimable advantage of the elevation of head of the new supply of 42 feet above that of the park reservoirs, furnishing abundant water to the highest elevations in the city. The estimated cost of the new aqueduct is $10,000,000.

Fireproofing Fabrics and Wood.

In nearly all the recipes published for rendering ladies' dresses or woodwork uninflammable, the chief ingredient has been tungstate of soda; and although this salt has been proved to be very competent for that duty, its scarcity and the consequent expense puts it out of the reach of many. The following formulæ of Patera have been recently subjected to careful experiment at Vienna, and have been found most excellent.

1. A mixture of borax and sulphate of magnesia (Epsom salts) is prepared by dissolving 3 parts by weight of borax and 2¼ parts of Epsom salts in 20 parts of water. The efficiency of this mixture is due to the formation, upon the fiber of the cloth or the tissues of the wood, of the borate of magnesia, which is alike insoluble in hot and cold water; and the fiber being enveloped by it, the evolution of combustible gases is very difficult, and the flame is prevented from seizing upon them.

2. Another excellent material for fireproofing is a mixture of sulphate of ammonia and sulphate of lime or gypsum, in different proportions, according as it is to be used upon fine or coarse goods. The sulphate of lime seems to form, with the ammonia salt, a double sulphate which does not (or only in a very slight degree) possess the disagreeable properties of that salt. The action of this mixture of salts, which is capable of extensive use on account of its cheapness, depends, on one hand on its enveloping the fiber, and on the other on the volatility of the ammonia salt at a high temperature, whereby the flame is smothered; 1 part of sulphate to 2 parts of gypsum may be employed, and woodwork simply painted over with a concentrated solution of the salt is sufficiently protected from fire. The wood is not, indeed, incombustible, but it takes fire much less easily, gives but little flame, and ceases to burn of itself as soon as the igniting body is removed. Since roofs thus impregnated would lose this property because of the salt washing out, Patera sought to protect it by a coat of tar, oil paint, or oil varnish, and found that the fireproof quality suffered but little. If it were allowed to thoroughly penetrate the wood, as is done in protecting timber from rot, the effect would be increased; but no experiments have been made under those conditions. Patera also tried Fuchs' proposed method of mixing water glass with an insoluble substance, like elutriated chalk, bone ash, clay, glass, etc., and decided that his process was the best for wood.

Universal Nature.

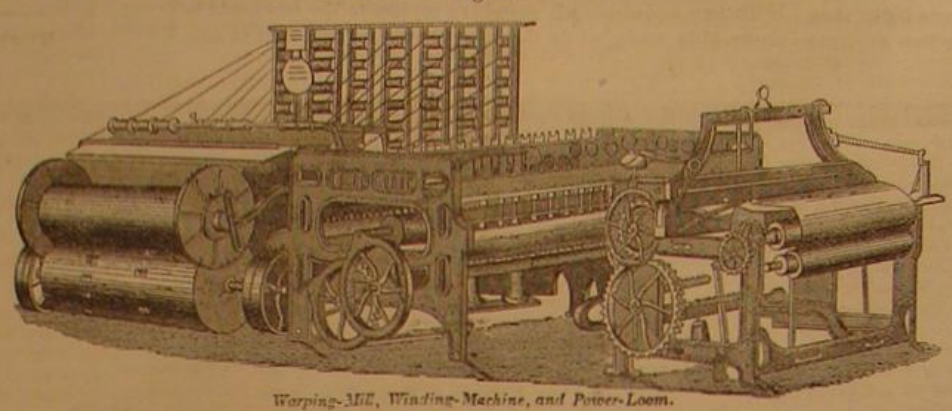
Nature has always had the credit of adapting her means to ends. The tenderness of her provision for the wants of the humblest of her creatures is illustrated by Mr. Darwin, who says that male grasshoppers use their hind legs to fiddle on the edge of their wings, and that the best fiddler first succeeds in fascinating the females. Behold how the industrious spider spins her web, and then sucks the blood of her husband and flings his carcass out in the back yard. Thus it is that the harmonies of life swell the grand diapason of the Universe, as it were.

POWER LOOMS.

We publish herewith engravings of two forms of power loom, selected from Knight's "Mechanical Dictionary,"* one of which is adapted for weaving patterned fabrics.

The first practical power loom was made by Dr. Edmund Cartwright, a clergyman totally unacquainted with mechanics, and his attention was directed to the subject by some one dropping the casual remark that when Arkwright's patents expired so many persons would go into the spinning business that no hands would be found to weave the cotton. Cartwright's first effort was a very rude affair. In his account of it, he says: "The warp was placed perpendicularly, the reed fell with the weight of at least half a hundred weight, and the springs which threw the shuttle were strong enough to have thrown a Congreve rocket." Two men were required to work the machine. It was novel, however, and he obtained a patent for it in 1785. Curiously enough, he then went for the first time to see how other people wove, and returned disgusted with the clumsiness of his own contrivance. His efforts to improve his machine, however, continued uninterruptedly, and he spent over $150,000 in perfecting his various devices. Steam was applied to his looms in 1807, and in 1828 he died, at the age of eighty-eight years. Five distinct actions are now performed in the power loom by steam: 1st. Raising and lowering alternately the two sets of warp threads. 2d. Throwing the shuttle. 3d. Driving up each weft thread after the shuttle is thrown. 4. Unwinding the warp from the beam. 5 Winding the cloth on the cloth roller. An arrangement is introduced for stopping the loom when a thread breaks, when the shuttle sticks in its passage, or when the yarn on the cop contained in the shuttle is run out.

Fig. 1.



Warping-Mill, Winding-Machine, and Power-Loom.

In Fig. 1 is shown the power loom with a warping and winding machine, designed for the manufacture of light and medium cotton goods. With this loom the cost at Manchester, England, of weaving a piece of cotton cloth, 25 inches wide, 29 yards long, and 11 picks per quarter inch, is estimated at 10¼ cents. One person can attend to two or three looms, and each loom produces 26 pieces of such cloth per day. On the old hand loom of 1800, one man would attend to one loom, and produce 4 pieces per day at a cost of 66 cents each. The adaptation of the

POWER LOOM FOR FANCY WEAVING

is shown in Fig. 2. The pattern chains, *d*, are mounted in a frame at the top of the loom; and in their movement, their pins act on vertical hooked wires or jacks, *c*, connected with a series of coupled levers, *e*, connected in turn with the harness frames, *f*. A rocking frame, *a*, at the top of the loom, provided at its opposite ends with cross or griff knives or bars, *b*, engages the hooked wires selected by the pins of the pattern chains, and raises the harness frames necessary to produce the pattern. Plain and fancy twills, spots, satin checks, etc., may thus be produced.

Fig. 2.

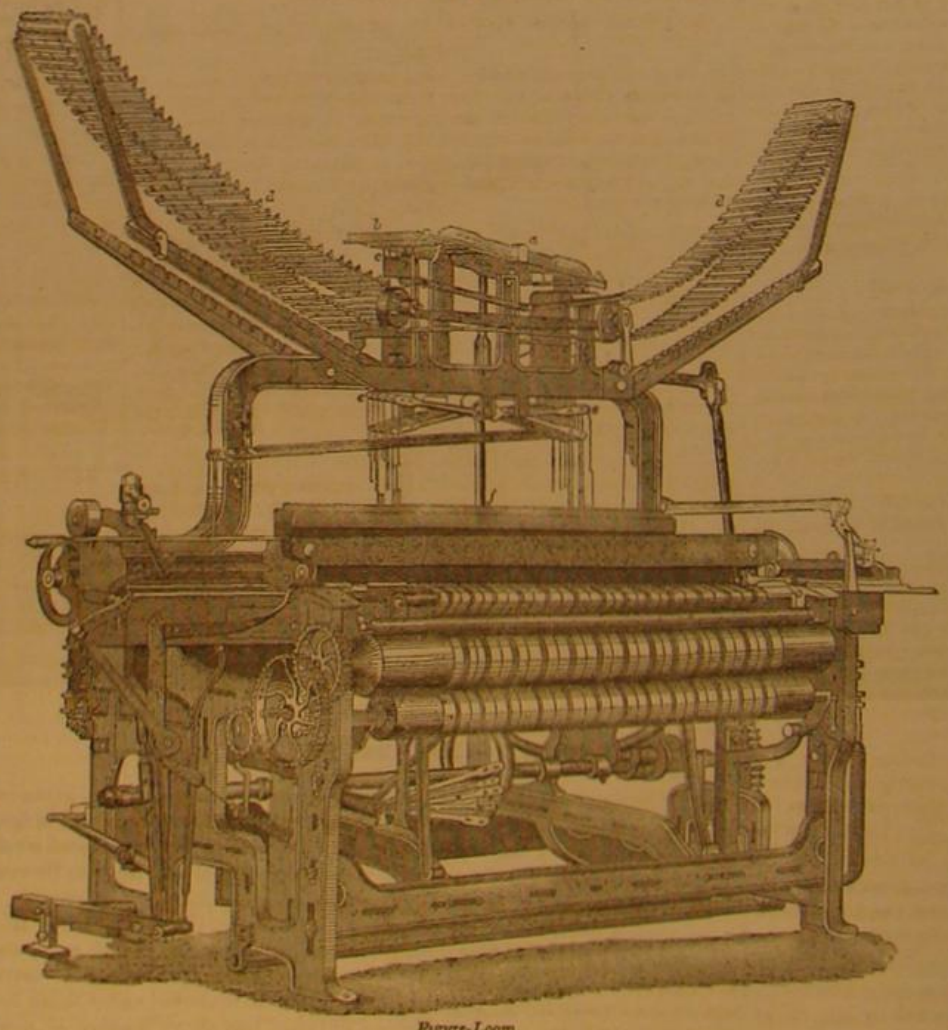


Figure-Loom.

* Published in numbers by Messrs. Hurd & Houghton, New York city.

Formation of Ultramarine during the Incineration of Bread.

"I do not find any note of the fact that, at a certain stage in the incineration (burning) of bread, the beautiful ultramarine blue is formed. This occurs under circumstances which I have not yet sufficiently studied to enable me to reproduce it with certainty; but if the heat be raised to very bright redness, or be prolonged after complete incineration of the bread, the blue passes into a beautiful turquoise color, then becomes green, then passes on into a rusty color, and finally comes out as a pale fawn-colored lining to the botrycidal mass of ash. This is not further affected, even by a prolonged white heat. The tints are so suggestive of the presence of copper that only by very careful examination did I satisfy myself of the absence of that metal; and I find that the colors occur in the purest and finest bread, as well as in inferior samples. I should be grateful if other analysts would favor me with any observations which they may have made upon this point, and I hope soon to be in a position to submit for myself some further account.

"It is curious that copper should appear in all the text books as one of the agents ordinarily used for adulterating bread, and the question arises whether the supposed use of copper may not sometimes have been erroneously inferred from the occurrence in bread ash of these beautiful colors."—*James Edmunds, M. D., in Chemical News.*

What is Life?

At the recent session of the American Dental Convention, in the course of some remarks upon microscopic investigation, Dr. Atkinson said: "We shall never know anything about life until we go to the bottom of the matter of function. There is a substratum denominated 'atom,' which is the least manifestation of life that we know of. Atoms are endowed with life—they can't be killed. We have been told that the molecular life of our food is killed. A statement like that is either a *lapsus linguæ*, or it shows an utter misapprehension of the subject. Atoms coalesce and manufacture molecules; plasma is an aggregation of molecules. Something must die that something else may live throughout the range of organic life. We have crystalline life, and below that granular life, molecular life, and atomic life. A crystal is regularly arranged granules that are regularly arranged molecules that are regularly arranged atoms.

"The doctrine of inorganic or azoic existence will not do in this day. If we wish to know the origin of life, we must define the territory we are speaking of; when the conscious life has left the body, we have organic, cellular, and molecular life left, and that is the food which we delight to suck from the beefsteak. It is simply a polarization and depolarization of atoms that constitutes molecular mass. We cannot disrupt molecules without reducing to ultimate atoms; there is no such thing as death. Matter means mother. Every one who has followed me knows I have given as complete an answer to the question we are discussing, as that two and two are four. When the blessed love of the Father of light comes in and illumines us, we are endowed with the capability to perceive. The doctrine that *omne vivum ex ovo* is pretty old, as old as Harvey. If the protoplastic mass is an egg, that is true; there are no bricks without mud, there is no loaf without dough. What do Bastian's investigations prove? Only that these points are so small as not to have been detected before; they do not prove that the germs are not essentially eggs. What is an atom? It is in size about the two hundred millionth of an inch. If one side of it is warm and the other cold, there is polarization and depolarization, and that brings it to a point where freezing begins, and that is crystallization. When we have investigated deep enough, we shall be prepared to understand the processes, and they will be as plain as the freezing of water."

A Brave and Modest Engineer.

Mr. George Walter Roche, naval engineer on the Saugus, writing from Pensacola Bay, Florida, under date of December 17, says: "Last night we had a thunder and lightning storm, and afterwards a heavy blow from the N. E. It rained for a while furiously. About a quarter of 1 o'clock I thought I would look out and see what sort of a night we were to have, and then retire. This, of course, was on board. As it was raining at the time, I walked under the lee of the smoke pipe, on the hurricane deck, when immediately I thought I heard, from the midst of the gloom, calls for help. To reassure myself, I called the man on watch to listen, when a man's voice could be heard, though not what he said. I immediately had a boat lowered, and with two firemen and two seamen, went in search of the poor fellow, following the direction of the sound of the voice. After about fifteen minutes' pull against wind and tide, I came up with two men in a skiff, who had been dumped overboard from a sloop that had capsized about four miles up the bay away from us. One of the men was in the greatest distress about his brother, who, at the time of the accident, was asleep in the cabin of the vessel. He and the man with him had returned in the skiff and called his brother, but got no answer, and they concluded to go away from the vessel and trust to the skiff to procure help. I took them aboard of the Saugus; but not feeling satisfied about the fate of the other brother, I went to the forward part of our deck and listened. To my great satisfaction, I heard the indistinct calls of some one in distress, and immediately got the men into the boat again and pulled for the voice. After three quarters of an hour, or perhaps more, we rescued him from the bottom of his sloop, which had turned turtle. He was very cold and wet. He was in the cabin when his brother called his name, but could not make him cognizant of the fact. When we started the last time, the brother I had taken on board asked as a favor to be allowed to go with us, and I told him to get into the boat. The meeting of these two poor fellows was truly affecting, each thinking that the other was dead. I took the party aboard the Saugus and had a fire made to dry their clothes and warm them; the men meanwhile provided them with dry working clothes. Now it seemed almost providential, for I was just going to turn in, but thought I would take a look around before doing so."

Occluded Hydrogen in Explosive Antimony.

When the officinal chloride of antimony, made according to the directions of the German pharmacopœia, is decomposed by a single cell of a Bunsen battery with a resistance of about 800 feet of copper wire (the positive electrode being formed of a massive piece of cast antimony, and the negative electrode of one or more fine platinum wires), in three or four days the platinum wires will be covered with a metallic film with a silver luster. The slightest scratch, or a spark from an induction machine, will cause it to explode with a loud noise and flash, and the evolution of a great quantity of white vapors. This was first observed by Gore, and it was supposed that the film consisted entirely of pure antimony in a peculiar allotropic state. Some years ago Professor Böttger proved experimentally that the apparently metallic film on the platinum wire did not, by any means, consist of pure antimony, but beside antimony there was in it no inconsiderable quantity of chloride of antimony, which could be proven by throwing a little distilled water on the disrupted mass while glowing; a copious white precipitate of basic chloride of antimony was formed, which could not occur if the said film consisted only of metallic antimony.

The most recent observation of Professor Böttger on this remarkable electrolytic product is the discovery therein of occluded hydrogen, possessed of the same reducing properties as that contained in Graham's alloy of palladium and hydrogenium. If a platinum wire, freshly coated with the so-called explosive antimony, is placed for ten or fifteen minutes in a very white aqueous solution of ferricyanide of potassium, the latter will be partially converted into ferrocyanide of potassium, a property which chemically pure antimony, free from arsenic, does not possess.

Since the *liquor stibii chloratis* consists, as we know, of a solution of chloride of antimony in hydrochloric acid, we should expect that, in addition to metallic antimony, gaseous hydrogen would be evolved at the cathode during electrolysis. This, however, is not the case, as not the slightest trace of liberated hydrogen can be detected at the negative platinum electrode. That the chlorine liberated in a nascent state at the positive electrode should unite with the metallic antimony acting as anode, dissolving it, shows nothing contrary to theory; but that the electro-negative chlorine should appear at the negative electrode at the same time that the metal is deposited, and unite with it without yielding a trace of hydrogen in gaseous form, is so very striking a phenomenon, opposed to all theory, that it seems desirable to see other metallic chlorides subjected to similar electrolytic tests in this direction.

EGG SPOONS get tarnished by the sulphur in the egg uniting with the silver. This tarnish is a sulphuret of silver, and may be removed by rubbing with wet salt or ammonia.

NEW BOOKS AND PUBLICATIONS.

THE INVENTION OF PRINTING. By T. L. De Vinne. Part I. To be Published in Five Parts, price $1 each. New York city: Francis Hart & Co., 14 College Place.

Here is a book which even the most advanced bibliomaniac can certainly find no fault with. It is really a curious and beautiful imitation of old style typography in every detail, this being the author's peculiar fancy, in order that the appearance of the book might be in harmony with its title and the quaint lore of its contents. We have a faint suspicion, too, that the volume has no typographical errors in it. The author by no means asserts that fact; but we have met with no printer's mistakes in the part of the work now before us. We have not the slightest doubt, however, but that some errors have escaped us, and would in fact baffle the scrutiny of the keenest eyes, for the reason that every known attempt which has hitherto been made to produce a perfect book has signally failed. Not that almost perfect books do not exist; in fact, we presume that some editions of the Bible, printed by the Universities or by the Queen's printers in England, are as near perfection as human work can arrive; but these have been corrected and recorrected, in edition after edition, for decades. We know of two instances where attempts were made to produce perfect specimens of book typography. The first was that of Dom. José Souza, a Portuguese nobleman, who literally lavished money in order to print an absolutely perfect edition of *Os Lusiadas*, by Camoens. Assisted by Didot, and by a large gathering of skilled talent, Souza had the pages read and re-read by different scholastic persons until he was assured beyond all doubt that everything was absolutely correct. But when the copies came from the press, after all an error was found—the letters in the word *Lusitano* had become misplaced. The type had, as is very commonly the case, been drawn out in the passage through the machine, and the pressman, with that sublime indifference to sense which is peculiar to his race, and which revels in returning dropped type upside down (as we know, to our weekly exasperation), had mixed the characters around to please his somewhat erratic fancy. The second case, and it was one in which even greater care was taken, was that of an edition of the classics publishe by the celebrated Foulises of Glasgow. Six experienced proof readers were employed, who devoted hours to the reading of each page. After each leaf was thought to be perfect, it was posted in the hall of the University, with a notification that a reward of fifty pounds would be paid to any person who could discover an error. Each page was suffered to remain two weeks in the place where it had been posted before the work was printed, and the printers thought that they had attained the object for which they had been striving. When the work was issued, it was discovered that several errors had been committed, one of which was in the first line of the first page. There are other instances, which a little research will quickly reveal, all showing that the "best laid plans of mice and men," as Burns sings, "gang aft agley." We remember now that Sir Sterndale Bennett, the celebrated English composer, not long since deceased, worked for years at the editing of Bach's Passion Music, and supposed his work perfect when it was published; and then he discovered to his dismay, an error in the second chord of the very first bar of the immortal composition. The title of the volume is the "Invention of Printing;" and it is a complete storehouse of curious lore regarding the rise of the "art preservative." The illustrations are copious and fine; and the author, Mr. T. L. De Vinne, of the firm of Francis Hart & Co., to whom the credit of the excellence of the typography is due, writes in a pleasant, readable way, sure to enlist popular interest.

MAGNETISM AND ELECTRICITY. By Frederick Guthrie, Professor of Physics at the Royal School of Mines, London, England. Price $1.50. New York city: G. P. Putnam's Sons, Fourth Avenue and 23d street.

The literature of electrical science certainly keeps pace with the discoveries; and as the practical applications of electricity become more and more numerous, the demand for books on the subject spreads with rapidity. Mr. Guthrie's claims to labor in this wide field are based upon experimental knowledge and aptitude for teaching; and he has now given the world a *resume* of some courses of lectures delivered by him at the institution of which he is a professor. The book gives a proper and, we may add, an unusual amount of attention to frictional electricity, a branch of the science which is not yet fully explored, having been eclipsed by the brilliancy of recent discoveries in the field of galvanism. We are able to award Mr. Guthrie the highest commendation for the clearness, accuracy, and practical value of his treatise, which is published in Messrs. Putnam's Advanced Science Series.

THE AMERICAN ARCHITECT AND BUILDING NEWS, a Weekly Journal of Constructive and Decorative Art. Subscription price, $5 a year, in advance. Boston, Mass.: James R. Osgood & Co., 131 Franklin street.

We are glad to see that a new architectural journal, edited and printed in a manner worthy of the subject, commenced on January 1 of this year. We abrogate nothing of its excellence in saying that it has much resemblance to the *Building News*, of London; and we are able to pay it the compliment of saying that, like that very successful journal, it is edited by men of thorough practical knowledge and high artistic tastes, united with a proper sense of the dignity and importance of their profession. It also has its illustrations, which are admirably executed, printed on separate sheets of paper, by the photo-lithographic process. We wish Messrs Osgood & Co. a continued success in their new enterprise.

THE AMERICAN STATE AND AMERICAN STATESMEN. By William Giles Dix. Price $1.50. Boston, Mass.: Estes & Lauriat, 301 Washington street.

This book is a valuable contribution to our political literature, which needs at once pruning and purifying. Although our pages are filled with matters which we and our readers consider more important than the intrigues and chicanery which make up the greater part of contemporary politics, we are glad to be able to commend a sincere, vigorous, and able champion of truth and justice, two abstract qualities which are perhaps in danger of becoming merely abstractions. A wide diffusion of the author's spirit and enthusiasm would do much to remedy many evils in our body politic, which are in danger of becoming insupportable.

THE PRINCIPLES OF COAL MINING. By J. H. Collins, F.G.S., Author of "Handbook to the Mineralogy of Cornwall and Devon," etc., and Honorary Secretary to the Miners' Association of Cornwall and Devon. With 139 Illustrations. Price 75 cents. New York city: G. P. Putnam's Sons, Fourth Avenue and 23d street.

This little book is an excellent treatise on a subject of which little is known except by those immediately connected with coal mines. The writing is at once concise and explanatory, and it is the work of an unquestionable authority. It forms one number of Messrs. Putnam's Elementary Science Series.

HOW TO BUILD SHIPS: an Essay upon the Weakness of Large Iron Steamships, with Recommendations for Making them Strong. By a Seaman. Price 75 cents. New York city: D. Van Nostrand, 23 Murray and 27 Warren streets.

This treatise is a collection of ideas as to the weak points of iron ships, many of which are new and original. It is free from technicality, and contains some interesting information. It is the work of Mr. S. P. Griffin.

THE METHODIST ALMANAC. Cincinnati, Ohio: Hitchcock & Walden, 150 West Fourth street.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From December 31 to January 6, 1876, inclusive.

AXLE BOX, ETC.—J. N. Smith, Jersey City, N. J.
CAR WHEEL.—S. N. Allen *et al*, Hudson, N. Y.
CIGAR-MAKING MACHINERY.—C. M. Mann, Chicago, Ill.
EYE CUP.—P. J. Stephens, New York city.
FLOCKING CLOTH.—H. N. Slater, Massachusetts.
HANGING DOORS, ETC.—T. Morton, New York city.
MIXING SOAP, ETC.—F. M. Weiler, New York city.
SCOURING HIDES, ETC.—C. Rose, New York city.
SEWING MACHINE, ETC.—S. W. Wardwell, Jr., St. Louis, Mo.
SEWING MACHINE.—J. Folk, Brooklyn, N. Y.
SEWING MACHINE.—J. Keith, Rhode Island.

Recent American and Foreign Patents.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED MITERING MACHINE.

Robert A. Williams, Galion, O.—In this device there is a square frame having guide flanges for supporting the moldings, said flanges being so located as to allow of placing the moldings on the frame for mitering. A diagonal piece connects the angles of the frame, and has a guide recess for the introduction of the mitering frame and frame-setting device, both of which last are adjustable so as to admit of the accurate mitering and setting of the moldings.

IMPROVED ROTARY ENGINE.

Thomas Swinburn, Charleston, W. Va.—In this rotary engine, the cylinder is provided with a concentric groove arranged obliquely in its end, and the piston works from a fixed center concentric with said groove. Drawings are necessary to convey a clear idea of the working parts; but the general arrangement is both novel and apparently practical.

IMPROVED CAR AXLE.

George W. Miltimore, Janesville, Wis.—This invention consists of a steel ring, which is placed on the stationary axle in front of the journal box of the revolving outer axle, and retained thereon by a stationary sleeve of the pedestal box. A double clamping ring, with spring-acted interior ring, revolves with the sleeve, by a connecting diaphragm secured on the sleeve. The diaphragm creates an oil chamber around the end of the journal box, and excludes impurities. The oil is supplied by grooves of the stationary sleeve and the steel ring from an annular oil reservoir of the pedestal box, which is again connected by an inclined channel with a cavity, into which the oil is filled through a top hole, closed by a conical spring plug, sliding on the vertical pin connecting the axle and pedestal box.

IMPROVED SEWING MACHINE.

Josiah Glines and Noel W. Stiles, Postville, Iowa.—This invention consists in devices for giving circular motion to the shuttle without twisting the thread. The face plate, against which the shuttle runs, is connected to the vertically-moving race, so as to move up to the position for guiding the shuttle properly, when the nose is to enter the loop, and it has a notch to mesh with a stationary needle-backing plate. The shuttle carrier has a point guard, projecting forward of the point of the shuttle, to prevent the thread from throwing over the latter when it reverses at the back part of its course, and the shuttle is contrived for the thread to pass out at the rear end for the same purpose.

IMPROVED CLOTH SHEARING MACHINE.

Isaac L. Holmes, Saco, Me.—This inventor now improves certain parts of a cloth-shearing machine for which a patent was granted to him March 16, 1875. An automatic contrivance is added whereby the revolving cutters are stopped by a seam when it approaches the cutters, and are again automatically set in motion after the seam has passed the cutters, to prevent the seam from being unduly cut. An elastic disk is also provided in the friction clutch, by which the rotary cutters are started and stopped.

IMPROVED HORSE POWER OR DERRICK FOR DRILLING WELLS.

George A. Newman, Crowder, Neb., assignor to himself and James L. Newman, Chicago, Ill.—This is an improved hollow revolving horse power or derrick for sinking wells. It combines four novel mechanical devices, so constructed as to operate the auger and raise it without stopping the horse or changing his direction, to operate and rotate a drill, and to guide the tube and hammer when sinking a drive well.

IMPROVED MACHINE FOR SHEARING BOILER PLATES.

Ebenezer Fisher, Kincardine, Canada.—This device consists of a stationary and a movable shear for clipping boiler plates. The stationary shear is arranged in a plane so inclined to the movable shear that the edge of the plate, being cut, is beveled suitably for calking, and at the same time the machine is so inclined that the plate lies flat or horizontally on the stationary cutter. The cam which works the lever of the movable cutter is contrived to allow the cutter to remain as long as possible when raised, to facilitate the adjusting of the plate.

IMPROVED TREADLE.

Carl Brandtner, Reading, Pa.—This is a centrally pivoted and laterally swinging treadle, that is connected by a rigidly attached rod and crank rod with the crank shaft of the fly wheel, the crank shaft imparting, by friction wheels, motion to the driving shaft. The inventor claims that rocking of the treadle on its pivots may be readily kept up without fatigue for any length of time, as it requires hardly any effort.

IMPROVED CAR REPLACER.

Jesse F. Bridge, Warwick, Mass., and Arthur R. Blakeslee, Birmingham, Conn.—This improved switch is so constructed as to enable a train, a part of a train, or a single car to be shunted, whenever desired, upon a temporary or permanent section of track, and again replaced upon the main track. It may be easily and quickly put down and taken up without disturbing the rails or interfering with the traffic of the road. It is an arrangement of forked and grooved blocks attached to the rails in connection with a bridge, the mode of adjustment depending upon the circumstances under which it is used.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED FISHING TACKLE.

Julio T. Buel, Whitehall, N. Y.—All fishermen are already under so large a debt of gratitude to Mr. Buel, that we hardly see how the same can be increased, even by such ingenious devices as those which form the subjects of the two new patents below described. Mr. Buel, than whom, we believe, no more ardent disciple of old Izaak Walton exists, is the original inventor of the trolling spoon—that ingenious substitute for bait which neither pickerel nor blue fish, nor any other water cannibal, is able to distinguish from the small fry which form its food. How many million fish have fallen victims to its glittering allurements, or how many unfortunate minnows have been spared the torture of impaling, it is impossible to estimate; but Mr. Buel is determined to show that he has not by any means exhausted all the capabilities of his invention, and therefore he now produces some new and ingenious applications of it, which will doubtless meet with general welcome. The first is a new device whereby two fish may be caught on the same line, and the hooks be so connected after fishing that the entangling is avoided and a smaller space taken up by the same. A V-shaped wire spring frame has snap hooks at the ends, to which separate hooks with spoons are applied. The latter act as separate baits when the legs of the spring frame are spread out, and the legs of the frame are locked by the snap hooks after fishing to take up less space. In the second patent we find a reliable adjustable device for attaching minnows or other bait of different size, and also for applying as many additional hooks as may be required for the size of the bait without the use of thread, gimp, or gut strings. It consists of a spring hook that is attached to a sliding wire ferrule, and adjusted along the connecting shank of the tackle to set bait thereon. A gang of two or more hooks, according to the size of the bait, is employed and connected by means of a central wire extension with snap hook engaging an eye at the shank of the next adjoining hook.

IMPROVED WATER TRAP SUPPLY AND VENTILATION.

John H. Morrell, New York city.—Mr. Morrell has recently patented a large number of useful inventions of the same general nature as the present one, with several of which our readers are familiar through the illustrated descriptions published in back issues of this journal. The object of the device now patented is to improve on one heretofore patented by Mr. Morrell (October 5, 1875), and to provide for ventilation during the downflow of water through the pipes; also, to provide for the water supply, and also the ventilation of the traps and their adjuncts when the orifice of the supply pipe mentioned in said patent is obstructed by ice, or even when water cannot be obtained from the roof or eaves of the building, or when from any cause it is desirable not to use such water. It consists in the combination, with the reservoir B (see engraving on page 335, volume XXXIII), of an additional water supply pipe; also, of a ventilating pipe within some portion of the water pipe, or extending through the interior of the whole length of the same, applied to said pipe.

NEW AGRICULTURAL INVENTIONS.

IMPROVED HAY LOADER.

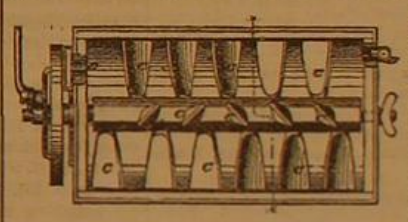
John A. Bower, Eureka, Kas.—This is an improved machine for collecting hay as it is spread upon the ground, and loading it upon a hay wagon. The wheels, turned by the advance of the machine, actuate an endless belt, teeth on which take the hay from the gathering rake. By means of the belt the hay is raised up and discharged in the wagon. Suitable devices are added to hold the teeth of the gathering rake out of action when required.

IMPROVED HAND CORN PLANTER.

Milton Pollock Noel, St. Cloud, Minn.—This improved corn planter is so constructed that the operator can operate it and plant the corn as rapidly as he can walk over the ground with a cane. The new feature consists in applying a loop to serve in conjunction with the handle to facilitate manipulation, and in a side handle that is used in connection with the jointed handle. An illustrated description of this device was published on page 86 of our current volume.

IMPROVED CHURN.

James L. Sprague, Hermon, N. Y.—This invention consists of spiral or propeller shaped paddles on a horizontal shaft, pitched so as to draw the cream from each end toward the center, in combination with an air inlet at each end and an outlet at the middle: whereby the paddles draw air in at each end and eject it at the center after acting on the cream, thus increasing the efficiency of the air, which is an element of considerable importance in the churning process. The operation is further facilitated by the insertion, in the churn box, of concave corner pieces, which are placed in the angles formed by the flat top and vertical sides; and these corner pieces prevent the clogging of the cream in those angles, a difficulty which is common in churns of this form. In the engraving, A is the horizontal cream box, having a round bottom and flat top. B is the paddle shaft, C C are the paddles, D D the air inlets, and E the outlet, F F being the corner pieces in the angles. The illustration clearly shows the construction and action of the apparatus, which seems to be thoroughly efficient for all the purposes above described. For further particulars, address the inventor as above.



IMPROVED COLTER.

Andrew Muir, Sparta, Ill.—The invention is an improvement in that class of rotary colters which are attached to plow beams by such devices as enable them to be adjusted and secured in any adjustment higher or lower, or at different points along the beam. The colter has its bearings in a plate which is provided with parallel vertical slots, whose opposite edges are notched to engage with the edges of bolts, which secure the said plate to the plow beam.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED BOLT FOR WINDOW FASTENING, ETC.

Herbert Seymour, Brooklyn, N. Y.—This is a simple bolt having a pin at right angles to its end. A slot in the keeper permits of the passage through of the pin, and when the bolt is turned, the pin, taking against the solid part of the keeper, prevents its slipping out.

IMPROVED SASH HOLDER AND FASTENER.

Joseph R Payson, Chicago, Ill.—The object of the first of these two inventions is to improve the construction of the sash supporter, patented to the same inventor November 5, 1867. The invention consists in forming upon the back of the friction plate a thin projection, inclined at an angle of 40° or thereabout, which enters an elongated slot in the box, where it bears upon and traverses a roller pivoted in the box, its single point of bearing upon the face of the roller being below the center of axis of the roller, by which means the movements of the sash are made smoother. The invention further consists in a bed box, having formed in its upper end an elongated slot, in which the roller is pivoted, the sides of which serve as a guide to the thin edge of inclined projection; and at its lower end a bed for the spring, with sides cut away, to decrease its width and weight. A thumb screw is inserted in the upper end of the box, with the point of the screw working upon the inclined surface of a recess formed in the friction plate, in order to force the friction plate against the window casing in an upward direction, and to force the edge of the inclined projection upward and outward upon the face of the roller, thus wedging the friction plate tightly. The same inventor has also patented a new fastener for the meeting rails of sashes, in which the operation of turning the arm in fastening the window will draw the lower sash up or the upper sash down, should they not be fully closed, without its being necessary to fully close said sashes with the hand before operating the lock.

IMPROVED MODE OF DRESSING ENAMELED MOLDINGS.

Albert C. White, Brooklyn, N. Y.—For the purpose of cutting off the moldings from their connecting wood base or backing in a rapid accurate, and very reliable manner by the use of a power planer and for dispensing with the hand planing and sandpapering, this invention passes the moldings through the planer by placing them in a bed piece with corresponding grooves and of equal length and width, and feeding them to the cutter set to the exact thickness of wood required to be cut.

Business and Personal.

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

Notes & Queries

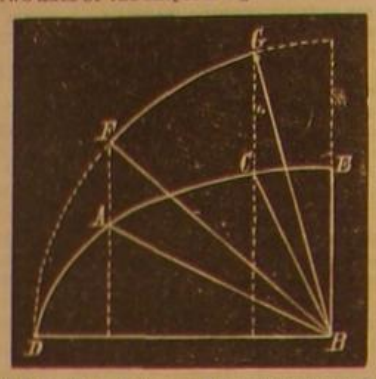
W. W. W.'s queries would, with the answers, occupy too much of our space. Consult a papermaker.—J. F. D. will find that the polishing material described on p. 57, vol. 34, will do well for cleaning silver.—H. J. P. will find an illustrated description of a freezing process on p. 82, vol. 33. We have never heard of one being used for condensing in a steam engine.—R. and others will find an illustrated description of Gramme's electric machine on p. 351, vol. 29.—M. L. H. will find directions for cleaning nickel-plated surfaces and brass on p. 57, vol. 34.—W. F. W. will find directions for tanning sheepskins with the wool on on p. 233, vol. 26.—J. H. can fasten metals to wood with the preparation described on p. 287, vol. 34. See answer to W. F. W., above, as to swan skins.—G. P. A. can calculate the speed of pulleys by the rule given on pp. 26, 73, vol. 25.—R. G. O. will find a recipe for liquid glue on p. 90, vol. 32.—L. J. C. is informed that his method of lacing belts is very old.—C. H. will find good directions for browning gun barrels on p. 11, vol. 32. Directions for casehardening gun work are given in this issue.—D. H. will find on p. 234, vol. 30, full directions for making fulminate for percussion caps.—H. W. will find a recipe for a cement for glass on p. 379, vol. 31.—G. P. will find a description of phosphor bronze on p. 315, vol. 30.—C. E. F. will find directions for annealing lamp chimneys on p. 42, vol. 26.—E. L. will find directions for making erasive soap on p. 181, vol. 31.—R. will find full information as to burning coal dust on p. 379, vol. 31.—E. C. W. will find directions for setting the eccentrics of a locomotive on p. 212, vol. 32.—P. T. N. will find directions for making vinegar on p. 68, vol. 29.—T. E. M. will find a good recipe for aquarium cement on p. 43, vol. 33.—C. W. J. will find directions for making patent leather on p. 122, vol. 27.—J. W. T. will find an answer to his query as to a ball dropping through the earth on pp. 158, 250, vol. 31.—C. B. will find directions for making phosphor bronze on p. 315, vol. 30.—H. E. B. will find directions for soldering cast iron on p. 251, vol. 28.—R. T. will find directions for polishing marble on p. 283, vol. 30.—H. B. Jr. will find a recipe for artificial meerschaum on p. 193, vol. 26.—H. F. W. will find directions for removing tattoo marks from the skin on p. 331, vol. 30.—J. E. M. will find an explanation of his difficulty as to the distance at which an object is visible on p. 20, vol. 34.—M. T. will find, on p. 119, vol. 30, a recipe for restoring rancid butter.—A. F. will find directions for polishing precious stones on p. 138, vol. 30.—E. B. A. will find directions for soldering of all kinds on p. 251, vol. 28.—R. J. will find a description of mica on p. 88, vol. 25.—J. C. W. will find a recipe for indelible ink on p. 112, vol. 27.—F. C. will find particulars of the New York State canal boat award on p. 81, vol. 30.—J. C. will find directions for washing flannel and other woolen fabrics on p. 267, vol. 30.—F. W. will find a recipe for harness blacking on p. 218, vol. 28.—R. J. C. will find a description of M. Coignet's artificial stone on p. 124, vol. 22.—R. T. can coat his pills with sugar by the process described on p. 59, vol. 32.—W. W. will find details of the manufacture of plaster of Paris on p. 399, vol. 29.—J. N. will find particulars as to the lifting power of hydrogen on p. 74, vol. 31.—F. O. can cement whalebone to wood with the preparation described on p. 90, vol. 30.—R. F. will find a formula for the proportions of a safety valve on p. 107, vol. 31.—W. T. will find directions for stuffing and mounting birds and other small animals on p. 350, vol. 30.—M. N. will find a recipe for preparing muriate of ammonia for inhalation on p. 315, vol. 31.—S. T. will find a description of the process for condensing milk on p. 343, vol. 30.—N. J. will find formulæ relating to the strength and thickness of boilers on p. 155, vol. 32.—N. K. R. will find directions for making an æolian harp on p. 330, vol. 26. Imitation meerschaum is described on p. 193, vol. 26.—M. B. T. and others are informed that the pretensions of the mineral rod men are humbug.

(1) W. S. asks: How can I gild white metal without a battery? A. Take 8 parts gold and 1 part mercury; make the gold into thin plates and put them in the mercury while the latter is boiling. Dissolve ½ oz. of this mixture in 1 oz. nitromuriatic acid. Add 2 ozs. alcohol, and apply the mixture, when the article is clean, with a soft brush. Rinse and dry in sawdust, and polish with chamois leather.

(2) F. H. D. asks: Why is it that a steel shod sled will draw harder on bare ground than a sled shod with iron? A. Some kinds of cast iron become, by friction and wear, casehardened to a high degree: and sled shoes made of it acquire smoother surfaces than those made of steel.

(3) H. M. asks: In plating small articles, does the current of electricity need to be strong enough to give a shock? A. No. A single cell is sufficient.

(4) L. M. asks: How can I find the area of a sector of an ellipse, namely, that part of an ellipse inclosed by the arc and two radius vectors, when the angle subtended by the two radii and the two axes of the ellipse are given? A. Let B D



and B E be the semi-axes of the ellipse, and B A C the sector. Draw an arc, D F G, with B D as a radius, and through A and C draw lines parallel to B E. Join the points, F and G, in which these lines cut the circular arc, with the center, B. Then

$$BD : BE :: \left\{\begin{array}{c}\text{area of}\\ \text{circular}\\ \text{sector B F G}\end{array}\right\} : \left\{\begin{array}{c}\text{area of}\\ \text{elliptical}\\ \text{sector B A C.}\end{array}\right\}$$

(5) W. E. P. asks: 1. Upon what does the stability of magnetism in a horseshoe magnet depend? A. The purity of the steel. 2. How should a magnet be tempered? A. As hard as possible. 3. Is the power of a compound magnet of 4 parts, each of equal magnetic strength when separate, equal to four times the power of one part? A. Yes.

(6) H. K. F. says: I am trying to heat a wire of about the size of Stubs' No. 70 by electricity, but so far have not succeeded. I have an ordinary Smee battery, but the zinc is not amalgamated, and so far I have only used copper wire. Will you be kind enough to tell me how to proceed? A. Use the large sized Bunsen battery.

(7) E. K. M. says: 1. Please give me directions for putting up an electric bell, to be operated by an ordinary eight day clock, that the bell may sound the hours to correspond with the striking of the clock. The bell is to be placed about 100 feet distant from the clock. Will the Meidinger battery answer my purpose? A. The Meidinger, Daniel, gravity, or Léclanché battery will answer. 2. Will a copper wire, wound closely with cotton yarn and then coated with beeswax, be an insulated wire suitable for the apparatus? A. No. 24 copper wire 100 feet long would answer. It is not necessary to cover it with beeswax. A covering of cotton thread is sufficient.

(8) G. C. H. says: I intend to put up a telegraph line of about one half mile in length, and would like to know how much battery (Daniell cells) it would take with one wire and a ground return. A. Twelve cells.

(9) C. F. S. says: I do not think I have a correct conception of the meaning of the expression "electromotive force." Is it the chemical energy at the surface of the negative metal, or is it the power of the battery to overcome resistance? Are the numbers used, in connection with it, proportional or comparative values; or can the force be definitely and independently expressed in ohms? A. The electromotive force of a galvanic element is the power it possesses of overcoming resistance. This force is proportional to the number of cells in a battery connected up in series $+-+-+-$, etc. The unit of electromotive force is called a volt, after Volta, while the unit of resistance is called an ohm after the German scientist Ohm. The electromotive force of a Daniell cell is about equal to a volt, and may be practically regarded as a unit of force.

(10) G. H. C. says: I have made a magnet, and put upon it 1,050 feet of cotton-covered magnet wire No. 32. I connected it with a battery that is used to run a telegraph with fewer coils and coarser wire than mine. My magnet will not lift a shingle nail. What is the cause? A. For lifting purposes, you should have used thick copper wire about 100 feet in length.

(11) J. W. C. asks: What are the lowest, mean, and greatest velocities of electricity through a suspended copper wire? What is the mean velocity of electricity through a buried wire, an overhead telegraph wire, and the Atlantic cable, respectively? A. Electricity has no defined velocity, but differs with the circumstances under which it travels, the size of the wire, length of the wire, and distance of the wire from the ground. The velocity of the current on the Western Union telegraph wires varies from 15,000 to 75,000 miles per second. On the Atlantic cable, for about two tenths of a second after contact is made with the battery, no effect is perceptible on the opposite side of the ocean. After four tenths of a second the received current is about 7 per cent of the maximum current. One second after contact the current will reach about half its final strength, and after about three seconds its full strength.

(12) E. T. D. asks: How many cells would it take to heat an iron wire of the size of common thread, hot enough to light a lamp? A. A dozen Grove cells would heat such a wire red hot. 2. How would I make an electric lamp lighter? A. You cannot light lamps with electricity unless the wick is surrounded with gas.

(13) E. W. P. says: 1. I wish to make a very small telegraph sounder to put into a watch case. The coils cannot be over an inch long nor more than ⅝ in diameter; with what size of wire shall I wind them? A. No. 28. 2. On an open circuit telegraph line, can an operator at one of the middle stations work all the instruments on the line, as in the closed circuit plan? A. Yes. 3. In running a small electro-motor, wound with coarse wire, which will work best, a quantity or intensity battery? A. A quantity battery. 4. What is the effect if the zinc plate in a Callaud battery becomes partly coated with a copper deposit? A. The current is weakened. 5. Is there any way that a house telegraph, having 5 or 6 instruments in the circuit, could be worked on the open circuit with one battery? A. Yes.

(14) A. S. G. asks: On p. 19 of your current volume is an extract from the *Journal of the Telegraph*, headed "The New Force." In the second paragraph occurs the following: "Upon an insulated table, place an ordinary Morse key and an electro-magnet, the coils of which are so wound that no magnetism is produced in its cores by the passage of an electric current." How an electro-magnet can be such without magnetism is beyond my comprehension, and how coils can be wound so as to neutralize each other I do not know. Can you explain? A. If the two helices are so joined that the current traverses one in an opposite direction from the other, no magnetism will be developed. 2. Is the cadmium armature attracted by the peculiar magnet, and what office does the armature fill in the experiment, as nothing more is said of it? A. The so-called etheric force accumulates upon the cadmium. A soft iron armature upon an ordinary sounder is as good as anything else to observe this extra current, or "etheric force," with.

(15) L. F. A. asks: What is the best method of constructing a meat cooler, large enough to put in two oxen in warm weather? A. Make a frame of 1½ by 4 inches uprights, set edgewise; cover it on the exterior with narrow tongued and grooved boards, and in the interior with narrow rough boards with the edges neatly fitted together; line the interior with sheet zinc, and fill in the frame with dry sawdust. A covered top is better than doors on the side; have the doors double in thickness and also filled in with sawdust. Have a slight opening for ventilation, protected with fine gauze wire cloth, and a small pipe for drainage If your meat box had been placed under your ice house, it would have been better.

(16) J. S. M. asks: What size of opening does it require to keep life in 100 men, supposing them to be shut up in a close room? A. Supposing the room to be large, a much greater opening would be required at the top than if placed at the bottom, as the carbonic acid gas, which would accumulate by being thrown from the lungs of the occupants of the room, is heavier than the atmosphere, and would rest upon the floor. The most favorable arrangement to ventilate the room would be that in which an opening would be provided at the floor and another at the ceiling, and in this case the size of the openings might be at the minimum, the fresh air entering at top and being discharged at the bottom, except where the temperature may be so much increased as to induce a current in the contrary direction. An authority says: "The proportion of oxygen gas in the atmosphere is about 22 per cent, but after it has visited the lungs it is reduced to 16 per cent." There is, therefore, a loss of about 30 per cent of the oxygen of the air at each respiration; and the opening should be large enough to renew about ⅓ of the air contained in the room in every 5 seconds. How large such an opening, or openings, should be will depend upon the velocity of the current entering, whether forced by mechanical power or not, and should be determined by experiment.

(17) E. B. G. asks: How much water should be evaporated in a room 14 feet square, to keep it in a healthy condition? A. It is not desirable that the air should be entirely saturated with water. Fevers are sometimes generated in consequence of a too humid state of the atmosphere. An English admiral once banished the yellow fever from his fleet on a West Indian station by keeping his lower decks dry with stoves in the summer season. A vessel holding about 2 gallons of water placed in the air chamber of the furnace would give you all the moisture you want for the whole house.

(18) A. B. asks: Is there any kind of acid or salts that I can put in a sulphate of copper telegraph battery to keep it from freezing? A. No, not without impairing it.

(19) T. W. C. asks: 1. For two engines 7 by 12 inches, and an upright boiler 8 feet high by 5 feet diameter, which you recommend for a boat 50 feet long by 18 feet wide by 3½ feet deep, what steam and water pipes do I require? The inspectors do not allow upright boilers on steamboats here, as the law forbids them. Will a boiler 3½ feet in diameter and 10 feet long, with return flue, do instead of the one you recommend? A. Make the steam pipe 2½ or 3 inches in diameter, and the feed pipe from 1¼ to 1½ inches. We think the boiler will answer. We would like to see the section of the law that forbids the use of vertical boilers. The only thing that we can find in the revised regulations, bearing on the subject, is the following paragraph: "Inspectors shall not hereafter allow the use of donkey boilers of the vertical tubular kind on steamers navigating the waters flowing into the Gulf of Mexico." It is possible that we may have overlooked some other paragraph in relation to the matter; and if so, we would be glad to have our attention directed to it.

(20) W. E. S. says: I have been trying an experiment in burning coal dust. The first week in October I carefully weighed all the coal burnt in 62 hours, when using only the natural draft. I used no steam whatever for heating purposes. The amount used was 3,118 lbs. of Lehigh nut coal, which, at $7 per tun, would cost about $9.75; steam averaged 45 lbs. to the inch. The second week in December I weighed the coal dust used, and then I used plenty of live steam for 26 hours out of 61 hours to heat 4 stories of the shop with 1,000 feet of 3 inch pipe. I used the exhaust all the time for heating. The amount of dust burned was 5,236 lbs. at $2 per tun. Steam pressure averaged 50 lbs.

to the inch. The boiler is horizontal, with 24 three inch iron tubes; and it is 10 feet in length by 3 feet in diameter, and well bricked up. Steam pipes, etc., are well covered with asbestos. When burning coal dust, I use a blower running about 3,000 revolutions per minute. About half an hour before shutting down (at 4 o'clock in the afternoon) I rake over my fire and get a good solid bed of fire on the grate: when I stop, I cover lightly with fresh dust, and shut all drafts, and at 6 o'clock the next morning I have from 30 to 40 lbs. steam; and then all I have to do is start the blower, and in half an hour I can have a good fire and plenty of steam. A. You make a very favorable showing. If you can contrive to measure the amount of water evaporated in a given time with each kind of fuel, you will be able to make an accurate comparison. If you do this, we would be glad to know the result.

(21) C. H. A. says: After reading Mr. Edison's experiments on the "etheric force," I tried his method of producing it with a printer: and found that, by forcing the press up against the type wheel (first cutting out the main battery) and breaking the circuit between the instrument and battery on the negative wire, it would cause a most beautiful and intense spark, and give a very heavy shock. I find that, on connecting it with the stove, as Mr. Edison did, it produces similar effects, giving off a spark when touched by a metallic substance. I am more interested in the phenomenon of the shock, as Mr. Edison says nothing about it. I am somewhat inclined to believe that, in this particular, it resembles inductive electricity; and it being somewhat new to me, I write to ask if this mode of producing electricity to give a shock is new to electricians? A. The so-called "etheric force" is nothing more than the extra or induced currents which are produced when the battery circuit is opened and closed: some facts connected with it, however, led to doubts on the subject at first. Electricians are well acquainted with this method of producing shocks.

(22) A. F. O. asks: What must I do with the fluid of the Grenet battery after it is played out? Can it by dilution, or by the addition of more of the salts, be restored, or must it be thrown away? A. Throw it away.

(23) R. asks: 1. I have a pair of polished skates, recently nickel plated, and I find on using them that the nickel begins to flake off. Can I prevent this in any way? Can I have the plating removed from the whole skate or any part of it? A. Yes; have the nickel removed and the skates replated with more care.

(24) C. H. N. says: You state that the earth received its motion during its formation, and you compared it to the velocity of a railroad train running half a mile after the steam is shut off. That being true, is it not the cause of the remarkable difference between the age of man in the days of the deluge and at the present time? The earth must in olden times have revolved faster and made the days and nights shorter. A. The period of 4,000 years is nothing when compared with the age of the earth. Millions upon millions of centuries ago, she obtained her motion; untold centuries went on during the different periods of change, as revealed by geological researches, until at last, some 150,000 or 200,000 years ago, man appeared. The oldest records of man go only back some 4,000 to 6,000 years; but we know that during this time the velocity of the earth's rotation has not changed an appreciable fraction of a second. In regard to the reported age of the patriarchs, we must consider that, at a time when people had no chronology nor almanacs, they did not count the years as correctly as we do, and could not know themselves how old they were. We may add to this the veneration in which the oldest people were held, which led every old man to boast of his great age, and so they probably made themselves out to be older than they really were.

(25) B. B. asks: Will it damage flax straw for manufacturing purposes to thrash it with a common spiked cylinder thrashing machine? A. Yes, it very nearly spoils it. Treading out the seed with animals is better, but the rollers are the best.

(26) A. D. says: It is generally conceded that the orbit of the earth is not necessarily a fixed pathway, and that the plane of the orbit, which has an obliquity of 23° 28′ to the plane of the sun's equator, probably at one period had a still greater obliquity, which would extend the warmer zones into higher latitudes. And again, the orbit of the earth will eventually become circular, and the earth will revolve on the plane of the sun's equator; and the intimation that the orbit of the earth is gradually assuming a circular form, if true, would be the best evidence that this change is now in progress. Then the poles of the earth will be perpendicular to the plane of the orbit, with the sun vertical over the equator only, and there would be no change of seasons. Are these suppositions probable? A. You confound the pathway of the earth in her yearly revolution with the inclination of her axis on the ecliptic; this inclination may change, while the pathway or plane in which she moves remains essentially the same. Some astronomers have supposed that, at some time in the far future, the inclination will become less and the intensity of the seasons diminish, and at last disappear. But this time is so remote that the earth will then have cooled, and the internal heat have become so dissipated that the interior of the earth's crust will no more possess heat appreciable on the surface, and the latter will be unfit for vegetation, and consequently also for animal life. The earth will then be as the moon is now—dead.

(27) W. H. S. says: You state that the moon rotates on its axis and in its orbit in the same time. What is that time? A. 27 days, 7 hours, 43 minutes, 42 seconds.

(28) T. P. M. asks: 1. Will zinc do instead of copper as a plate for a ground wire connection of a telegraph? A. Yes, but it will not last nearly so long. 2. What size of plate is necessary for a line one quarter of a mile long? A. For a line of that length you will get better results by using a return wire. Plates four or five feet square will answer if it is not desirable to run an additional wire.

(29) M. M. asks: How many feet of common illuminating gas made from coal can I compress in an iron tank or gas holder of 50 cubic feet capacity, carrying the compression to 100 lbs. to the inch? A. About 333 feet.

(30) R. K. asks: How can I tell how many lbs. weight are necessary to produce a given velocity, as described in Z. D.'s query as to the tension of a cord over a pulley? A. To calculate the weight required to produce this velocity, assume a time or distance in which it is to be attained, and make the proper substitutions in the formulas below. It will be easy for any one to see what assumption is necessary for the tension of 1,550 lbs., and the formulas also show how different values can be obtained, and yet be correct. Our readers will doubtless observe, further, that these formulas are the same that are employed for calculations connected with the use of Atwood's machine, and that the case proposed by Z. D. is similar to problems that are solved with the above apparatus. Let x=weight required to give the weight of 1,000 lbs. a velocity of 10 feet per second. S=distance in feet in which this velocity is acquired. t=time in seconds in which this velocity is acquired. g=acceleration due to gravity. f=acceleration due to the weight. Then $f=g\times\frac{x-1000}{x+1000}$; $S=\frac{50}{f}$; and $f\times t=10$. This also answers M. B.

(31) A. H. T. asks: 1. How is the heat calculated which is generated by compressing air? A. See p. 123 (14), vol. 33. 2. Why is it that there is such a great loss of power by compressing air to high densities? A. The principal source of loss, in general, is due to the fact that the power required to compress the air is not afterwards given out by allowing the air to expand as much as it was formerly compressed. 3. Do hyperbolic logarithms hold good in calculating the mean pressure in an air cylinder, or would it be correct to represent the initial and terminal pressures as a right-angled triangle, and calculate the area of it? A. The formula with hyperbolic logarithms is only applicable in case the temperature of the air in the cylinder is constant throughout the stroke.

(32) J. G. B. asks: At what rate is the water falling over Niagara Falls wearing the rock away yearly? A. The action is not uniform, the rock being detached in large masses from time to time. It is estimated, however, that, for long periods, the average wearing away has been about a foot a year.

(33) Z. D. says: In reply to my query as to tension of a cord over a pulley, you give the answer 1,550 lbs. A mathematician answers me that the tension of the cord is exactly the same, namely, 4,000 lbs., whether the weight is raised at the uniform velocity of 10 feet per second *or* whether it is motionless. He acknowledges that the tension is above 1,000 lbs. when the first pull is given, before the weight attains its uniform speed. Another gives as his answer a number somewhat over 1,300 lbs. By what method did you find that 1,550 lbs.? A. Our answer was possibly misleading, from the fact that all the data upon which it depended were not stated. Really, the tension of the cord, required to give the weight a velocity of 10 feet a second, can have an infinite number of values, subject to the following conditions: 1. It must be greater than 1,000 lbs. 2. The time and distance in which the weight attains the required velocity must be less and greater, respectively, than the time and distance in which a heavy body falling freely under the influence of gravity would acquire the same velocity. As soon as the weight acquires the given velocity, it will continue to move uniformly with that velocity, under a tension of 1,000 lbs., if there is no friction or other prejudicial resistance. See answer to R. K., on this page.

(34) G. B. K. says, in reply to T. D., who asks how to obtain the index of an engine lathe: If you will note what thread the lathe will cut when two given gears are in place, you can easily construct a table that will show you just what thread any two gears will cause the lathe to cut. Suppose that two 63's cause 12 threads to the inch. Then place 12 in the space, A, in the diagram below:

Stud.

Screw.	28	33	35	42	49	56	63	70	77	84	91	98	105	112
28														
33														
35														
42														
49					*b*									
56						*a* B	C A E	D *c*						
63														
70														
77									*d*					
84														
91														
98														
105														
112														

Now, 63 : 56 :: A : C } (direct proportion).
63 : 70 :: A : E }
Also, 56 : 63 :: A : B } (inverse proportion).
70 : 63 :: A : D }

The spaces may all be filled except a, b, c, d, etc., which it is useless to fill, as only your 63 gear is duplicated. A half day's time will be sufficient for a good mathematician to fill out the table.

(35) J. H. says, in reply to D. C. B.'s query as to his hydraulic ram difficulty: The air, becoming exhausted in the air chamber, prevents the water from entering the chamber, when the impetus valve closes, and the result of the working is only the dead beat of the valve in closing. All well regulated rams have inserted in the lower casting (a head of the opening to the air chamber) a small screw, called the sniffle. It is made taper, and a small groove is filed lengthwise in it; and it is so adjusted as, when put in, to allow of water escaping when the impetus valve closes. Upon the reaction of said valve, a portion of air is drawn in through the screw, which passes upward to the disk valve, opening to the air chamber; and at the next pulsation of the ram the air is passed to the chamber, thus keeping the chamber fully replenished with air, during which time the valve gives the lively click, which he describes, when working well. Care must be taken not to allow the water to back upon the sniffle, or the ram will again cease to work well.

(36) J. W. writes us from Switzerland that he has tried to produce electricity there by shuffling the feet over the carpet, but without success; he has often done it in this country, but it will not work there. He wants to learn the reason; also wants us to corroborate the fact that electrical sparks can be produced as mentioned, in this country. In reply we state that in this city, in winter, in well warmed, dry houses, strong electrical sparks may be produced by walking on or rubbing the feet on the carpet. Loud snaps are produced by touching another person with the finger: while a common home amusement for the young folks is to light the gas by electricity, by rubbing the feet on carpet and then touching the open gas burner with the finger. In Europe the climate is more moist, and hence probably the phenomenon is unknown there. Possibly in a well warmed house on a very cold day, upon a rug in front of a good coal fire, our correspondent could produce the electrical sparks in Switzerland.

(37) J. B. J. says, in answer to C. E. B.'s query as to a force on an inclined plane: Let W=weight (=112 lbs. in this case), A=angle between plane and horizon (=30°—), w=force with which W presses against the plane, L=force pressing in the direction of the plane. Then F=W *sin.* A=112×0·5=56 lbs. w=W cos. A=112×0·86602 =97 lbs.

(38) J. B. J. says, in answer to J. A. R., who desires to know the contents of a cylinder with hemispherical ends: l=length of cylindrical part, r=radius of hemispherical ends, h=hight or depth of liquid, x=area of immersed cross section of cylinder, C=contents of cylindrical part, and c=contents of hemisphere ends. π=3·1416. Then $C=x\times l=l\,x$. Then $c=\pi h^2\,(r-\frac{1}{3}h)$. C+$c$= content required. If the above dimensions are in feet, multiply the result by 7·4762, which will reduce it to gallons. Compute content for every foot (and fractional part) of depth, and arrange a table, when the contents will be seen at a glance. The comuntation may be made for half the tank or vessel, and doubled to find the whole contents.

(39) S. W. G. says, in reply to J. G. S.'s query for a remedy for cracked fingers: Into equal parts of glycerin and cologne spirits, put ten grains salicylic acid, shake until well mixed, and apply in the same manner as glycerin.

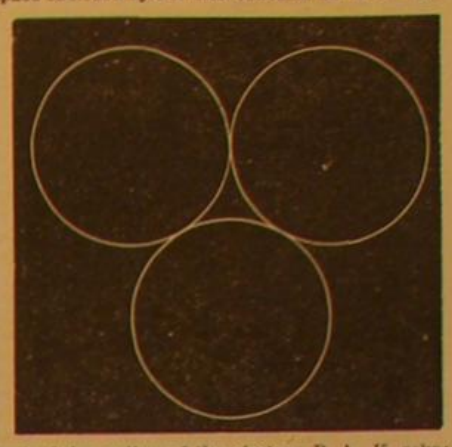
(40) C. C. says, in reply to W. T. W.'s query as to setting boilers: Take 6 or 8 inches of brick work away at sides and top, and 2 feet at back end, regardless of the water line. Do not let brick touch the boiler except at front and on dome. Excavate not less than four feet under the whole length, leaving the mud drum (if there be one) exposed to the heat. Set the grates 4 feet from the lowest part of the shells. Build a bridge wall 10 inches (just enough to hold the fuel) above the grates. With coal for fuel, you will sooner think of disposing of one boiler instead of adding to the three you now have. You can get all the steam you want without skillful firing, constant hard work, and waste of fuel, if you burn your fuel instead of sending it up chimney. The above described radical change in setting of steam boilers was made with excellent results. My boiler making and repair bills are beautifully less; and while I increased the production of the mills, the fuel bills are less than before.

(41) J. S. F. says, in reply to C. B. H.'s query as to how to give a locomotive her full speed: Unless she be drawing a heavy load or running with a very light pressure, she cannot attain her full speed with the throttle wide open and at full stroke, because of the contracted area of the exhaust nozzle and high state of expansion of the steam, which cause her to choke when more than a certain quantity of steam is admitted to the cylinder at each stroke of the piston. To prevent choking, the quantity of steam admitted to the cylinder should be regulated by the position of the reverse lever, or, to state it more properly, by the travel of the valve.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. S. B.—It is granular quartz.—D. R. McM.—The thickness can be told by examination of the outcrop at suitable points. In some localities, the thickness of these sandstone strata is several thousand feet. Your chance of getting water is slight. No. 1 is iron pyrites. No. 2 is steatite. No. 3 is indigo carmine.—A. M.—You are correct in taking it to be a sandstone containing a hydrocarbon of an asphaltic nature. The bituminous schists made use of in France are somewhat different.—S. N. F.—It consists chiefly of lead, with a small percentage of alloy.—P. L. S.—It is lead.—W. M. N.—It is one of the alloys of tin and lead, the former being in preponderance.—G. F. P.—It is a piece of furnace slag.—J. A. H.—It contains no uranium.—R. P.—The base of the composition is hard rubber.—J. H. E.—It is iron pyrites.—C. T. A.—It contains no silver, but scales of mica.—The specimen in box marked "Washburn" is graphite in quartz rock.—H. M.—No. 1 is mica in quartz. No. 2 is serpentine. No. 3 is iron pyrites.—S. W. M.—The good specimen contains the substances mentioned in the recipe, and there is no reason why it should not act well. Try again.

W. C. S. says: The following is a geometrical nut for some of your readers to crack: The space enclosed by 3 circles contains an acre. Required the radius of the circles.—P. A. K. asks: Who invented the first railroad sleeping car, and put it into practical use?—J. D. says: I have a valuable mare, 8 years old, which has been but little worked. Last summer she had the thrush in her fore feet, but was soon cured, and her feet looked well and were free from contraction. I commenced driving her this winter; and her feet were at once inflamed, and quite sore for a day or two. She flinches when she puts her frog on anything hard. What can I do for her?



COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Working Men at the Centennial. By M. M.
On Spiritualism. By J. A. C.
On Pulling and Pushing. By R. B. S.
On the Moon. By C. J. L. C.
On Safe Savings. By —.
On a Remarkable Machine. By C. E. F.
On Magnetic Attraction. By A. A. A.
On the Oldest Inhabitant. By N. V. C.
On the Universal Force. By J. E. H.
On Momentum. By J. A.
On the New Nebular Theory. By C. E. M.

Also inquiries and answers from the following:

I. H.—M. M.—P. S.—G. A. R.—T.—L. O.—W. T. Jr—H.—Y.—J. H. P.—G. P. B.—J. T. H.—R. S. M.—W. L.—C. H. P.—J. W. R.—S. T. W.—B. F. U.—D. B. K.—F. W. M.—A. D.—N. C. G.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who makes the best dynamometers? Where can three inch objectives for telescopes be obtained? Who makes electric belts for medical purposes? Where is there a firm that undertakes well-boring? Where are there any works where nickel ore can be smelted? Where can walrus leather be obtained? Who sells shoe peg machinery? Who sells machinery for making friction matches? Who sells alarm clocks? Who makes stocks, to secure the feet of restive horses, while being shod? Who makes diving apparatus?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

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8,889.—TYPE.—G. G. Bailey, Jr., *et al*., Boston, Mass.
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CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, January 10, 1873.

5,571.—P. Rodier, Detroit, Mich., U. S. Skate. Jan. 10, 1876.
5,572.—W. F. Lamb *et al*., Wilbraham, Mass., U. S. Book-keeping game board. Jan. 10, 1876.
5,573.—E. J. Duff *et al*., Pittsburgh, Pa., U. S. Wash board. Jan. 10, 1876.
5,574.—A. E. Edholm, Lake City, Minn., U. S. Safety extinguisher for lamps. Jan. 10, 1876.
5,575.—B. Silliman, New Haven, Conn., U. S., *et al*. Imparting resonance to metallic alloys. Jan. 10, 1876.
5,576.—H. W. Hutchins, Livermore Falls, Me., U. S. Box-making machine, etc. Jan. 10, 1876.
5,577.—J. R. McPherson, Jersey City, N. J., U. S. Stock car. Jan. 10, 1876.
5,578.—S. B. Morrell, Kenosha, Wis., U. S. Shirt bocom ironing board, etc. Jan. 10, 1876.
5,579.—W. E. Sawyer, New York city, U. S. Copying or autographic telegraph. Jan. 10, 1876.
5,580.—A. Payette, Montreal, P. Q. Axle box and axle. Jan. 10, 1876.
5,581.—D. Brennan, Elkhart, Ind., U. S. Pinch spike or claw bar. Jan. 10, 1876.
5,582.—J. B. Atwood, Wilbraham, Mass., U. S. Lock nut. Jan. 10, 1875.
5,583.—P. De La Neuville, Thompsonville, Conn., U. S. Water filter and purifier. Jan. 10, 1876.

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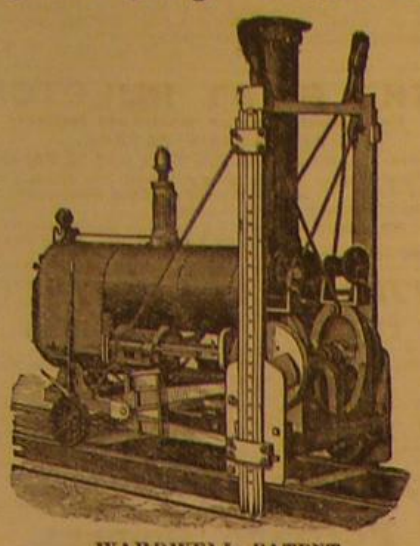

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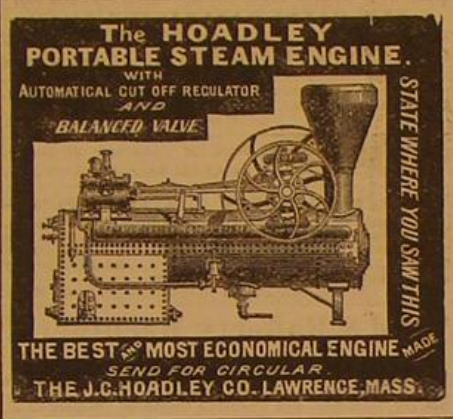

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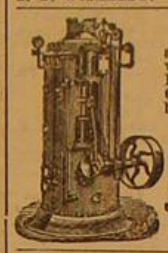

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