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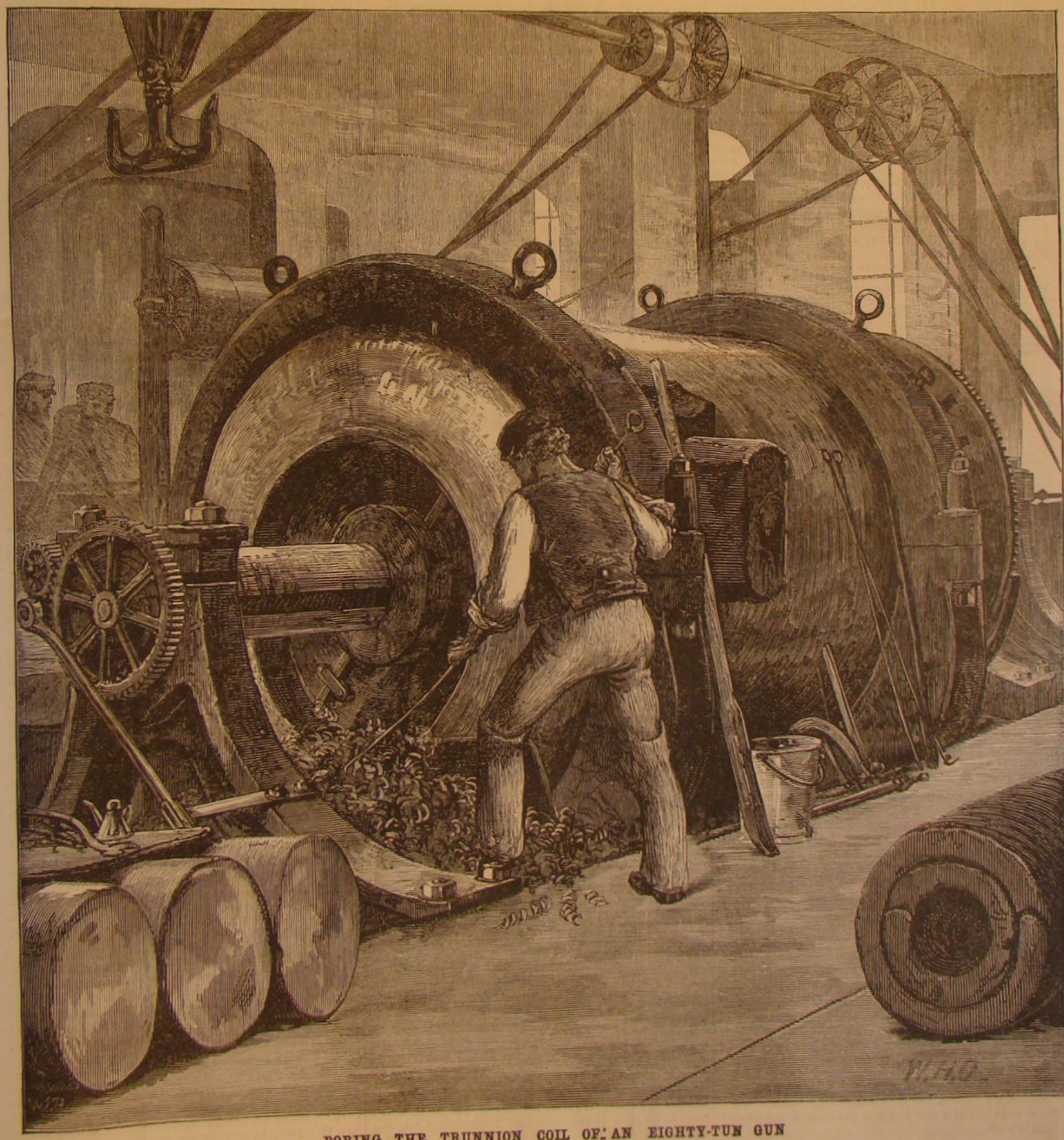
THE EIGHTY-TUN GUNS.

We have on several occasions mentioned the Fraser system of ordnance, which is now adopted in England for artillery of all sizes. The innermost part of the tube is made of steel of the finest quality, and the gun is then built up of wrought iron. The construction of the largest weapons by this means is a Cyclopean labor, and a steam hammer and anvil of unprecedented size have recently been erected at Woolwich for the purpose. The trunnions of the largest guns, each of which weighs eighty-one tuns when finished, are made in a piece with a wrought iron coil; this coil is then bored out by a gigantic apparatus, as depicted in our engraving, and shrunk on to the gun, that is, it is heated red hot and put on in its place, its shrinkage in cooling binding it on the gun with tremendous force

It will seem in our engraving, that borings of unusual magnitude are cut away by the boring bar. The thickness of the excised pieces shows that a tool of excellent form and of most tenacious material is at work.

The news of the completion of the large gun has arrived. The original design has been somewhat departed from, and the dimensions of the finished weapon are: Length 33 feet, external diameter, 2 feet at the muzzle and about 6 feet at the breech. Internally the bore measures 27 feet, and in its present state will just admit a projectile 14¼ inches in thickness. It is, however, proposed to enlarge this bore, after the proper caliber has been found by experiments, and it is not unlikely that the gun will eventually have a bore of 16 inches. It is rifled in eleven grooves, and the spiral increases as the shot travels along the gun, commencing with nothing in the powder chamber and leaving the muzzle with a twist of 1 in 35. The shot will therefore turn scarcely once on its axis inside the gun, but this has been proved ample to give



BORING THE TRUNNION COIL OF AN EIGHTY-TUN GUN

it the necessary rotation to the end of its journey. The weight of the gun is a trifle over eighty-one tuns; but it is to be known in the service as the 80-tun gun. It has been constructed of eight separate wrought iron coils, fitted and shrunk one into the other on the Fraser system.

The projectiles with which it will be proved correspond in size, but not in shape, with the shot and shell with which it will be fired on service. They have been cast in the shell foundery of the Royal Laboratory, and are great bolts of solid iron, each weighing 1,300 lbs. They are flat-headed, and filled with a great number of studs to fit the grooves of the rifling. Special rammers, sponges, and other apparatus have been provided for the proof of the gun, a truck has been constructed to carry the shot, with a special contrivance for lifting it to the mouth of the gun, and the government manufacturers of gunpowder have even provided a special powder. The powder, in its way, is as remarkable as the gun. Each grain of it is a cube an inch and a half in diameter, and the cartridge, which will be 250 lbs. of this powder, will be a large bolster, about the size of an ordinary man. It is proposed to increase the powder charge, if necessary, to 300 lbs.; but this, like the caliber of the gun and the weight of the shot, will abide the result of experiments.

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VOLUME XXXIII., No. 16. [NEW SERIES.] *Thirtieth Year.*

NEW YORK, SATURDAY, OCTOBER 16, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

THE FALL RIVER STRIKE.

During the middle of last summer, the proprietors of the great cotton mills at Fall River, Mass., finding that they had a large accumulation of stock on hand, and seeing that through the general depression of values and reigning dullness in trade, it would be impossible to continue operations as heretofore, notified their working people that either a reduction of wages must be made or the mills would have to stop. The proposed reduction amounted to one ninth the price then paid for piece work. The operatives in answer declined to agree to such retrenchments, but, not wishing to precipitate any open conflict with their employers, compromised matters by taking a "vacation." The mills accordingly ceased work, and the employees have waited in idleness for the arrival of better times The vacation has now expired. The prices of the large quantities of goods woven before have not advanced, nor does there seem any likelihood of their so doing, while a loss of a million dollars is estimated to have accrued to the city of Fall River through the cessation of work. The mill owners not only, therefore, are unable to go back to old wages, but several declare heavy losses, and advocate closing of the factories for a still longer period.

The workmen, toward the close of their vacation, during which time they or the majority of them had drawn support from the unions, began to realize that, by their self-enforced idleness, they had actually lost a greater proportion of their wages than would have been the case had they accepted the reduced pay. They further saw that winter was approaching, and that the union funds were getting low, and consequently the three classes of which they were composed, the weavers, the carders, and the spinners, met together to settle on some rate of wages at which they would agree to return to work.

But when the workmen came to the factories and announced their intention of coming back to work, the employers, to their astonishment, not only declined to pay more than the reduced wages, but produced an agreement for the workman to sign preliminary to being hired, which provides: 1, that he will not belong to, or be influenced by the action of, any association which assumes to govern the rights of any person to labor for whom and for what he pleases, and 2, that, in case of his desiring to leave employment, he will give ten days' notice. In connection with this, we may mention that there is already a law in Massachusetts which holds manufacturers liable in case of the discharge of an employee without notice, except for incapacity or misconduct The operatives regarded the proposed agreement as a great injustice, and made riotous demonstrations At one time troops were under arms, threats to burn the mills were freely circulated, and strong police reinforcements were sent to Fall River from Boston. The number of operatives involved, from 12,000 to 15,000 people, added to the gravity of the crisis.

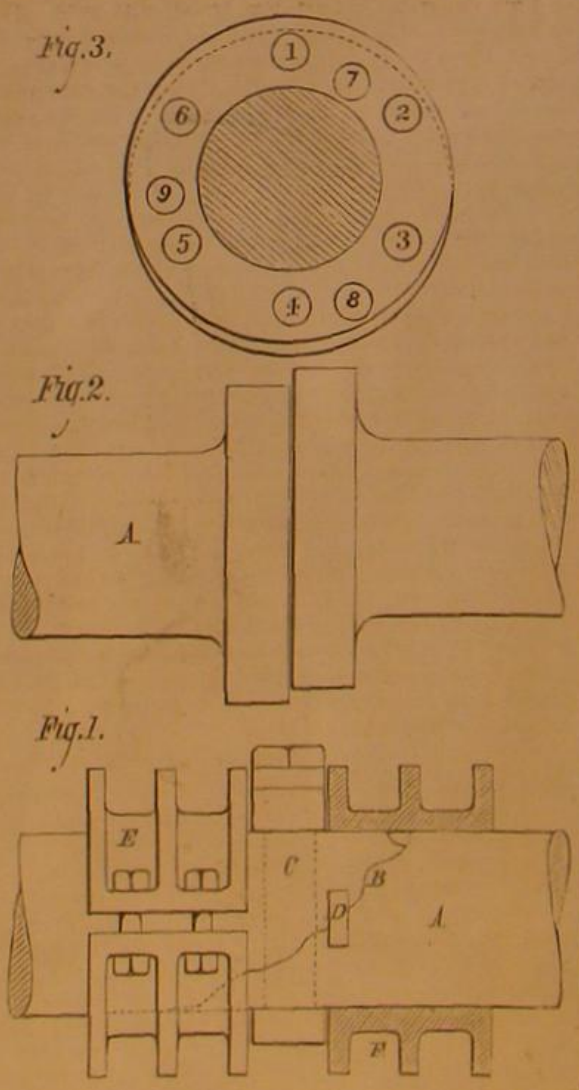
The whole difficulty hinged on the trade union question. By the discordant element which, it appears, rules in these societies, the idleness of the summer was precipitated, and by them the recent difficulties were fomented, since all accounts agree in stating that hundreds of men were ready and willing to accept the terms of the employers, but were withheld by sheer menace and personal intimidation. That for any manufacturer to refuse to employ union men is a harsh proceeding, we cannot agree. Such is already the rule in some of our largest iron and steel working establishments, and no one is injured thereby.

While we hope that the law will be vigorously enforced against all rioters, we cannot but feel a genuine sympathy for the workmen who have allowed themselves to be led into the difficulty. Their losses will be heavy and severe, and their chances of bettering themselves are palpably hopeless, for it is asserted that mills closed or mills working make little difference to the proprietors during the present state of trade, and while such large stocks are already on hand.

The strike is now over, and all, or very nearly all, the mills have their full complements of workers, who have accepted employment under the conditions above noted. The 15,000 laborers who took part in the uprising have, through their two months "vacation," lost over a million of dollars. Such are the results of the strike.

MENDING A FIFTEEN-INCH SHAFT AT SEA.

An excellent piece of mechanical work was recently accomplished aboard the steamer Ethiopia, of the Anchor line, in



the course of that vessel's last voyage to this port. After a heavy gale, and when 1,500 miles from Queenstown, the 15-inch propeller shaft broke in a diagonal fracture. Owing to the confined space of the alley through which the shaft runs, it was very difficult to get at the break, and utterly impossible to use cranes or tackles for handling the immense weight. How the work was accomplished is represented in the annexed engraving (drawn on a scale of ¾ of an inch to 1 foot), in which A is the shaft, and B, the line of fracture. The broken parts were raised by a jackscrew, the edges smoothed, and a four inch hole bored through the opposing portions, and into the aperture a bolt, C, was tightly fitted. Four steel drivers, D, four inches long and one and a quarter inches broad, and three quarters of an inch thick, were sunk into the shaft, flush with its surface, just across the line of fracture, serving to bind the parts more closely together. Large clamps, E, were then bolted on the shaft, holding the steel drivers in place, binding the whole together tightly. A still worse difficulty presented itself in the springing or bending of the shaft. Three men, with all the power they could get out of a jackscrew, were not able to reduce the part, which was bent more than a quarter of an inch. So badly bent was the length of shaft behind the break that it was found impossible to couple them together as before, the faces of the coupling refusing to coincide, as shown in Fig. 2, by about 2¼ inches. The shaft, therefore, had to be bolted in this position; and as the old holes, Nos. 1, 2, 3, 4, 5, and 6, in Fig. 3, in the couplings would not correspond, one of the couplings had to be turned around, and three new holes, Nos. 7, 8, and 9, three inches in diameter and five inches through, had to be bored. Two of the bearings and plummer blocks under the shaft were broken, and a new support had to be devised. The work was carried on night and day and after eight and a half days, the job was complete.

To Chief Engineer Murray, of the Ethiopia, through whose skill and ingenuity the very difficult operation was accomplished, the credit of the same is due. So thoroughly was the work done that it has been deemed safe to dispatch the vessel on her return trip to Glasgow without any material alterations in the shaft and its fastening.

A DISASTROUS CYCLONE.

One of the most disastrous storms that has ever visited our coast recently swept over a portion of Texas and Southwestern Louisiana, destroying hundreds of lives and an immense amount of property. The hurricane took its rise in the Bahama Islands, and, crossing the Gulf of Mexico in a parabolic track, struck the Texan coast, curved back, and finally emerged from the Gulf at Key West, and passed off to the east in the direction of the Gulf Stream. The city of Indianola, situated about 120 miles southwest of Galveston and built on a sandy waste which slopes slightly to the water's edge, was almost totally destroyed, but five houses being left standing. In Matagorda, forty miles eastward, four houses only now remain. Velasco in Brazoria county was utterly swept away. San Bernard was completely submerged by the tremendous floods. The towns of Cedar Lake and Saliena were washed away with all their inhabitants. Morgan's Flat met a like fate. Of Lynchburg and San Jacinto but little remains; and in Galveston, enormous damages, though less than those inflicted on the other towns, were caused by the floods, which rolled over the island on which the city is located. The total loss of life is unknown, and doubtless will so remain; but the lowest estimates place it at from three to four hundred persons

Little has been positively determined regarding the cause of these cyclones. From actual observation, it appears that they may originate wherever a lower stratum of warm, moist air is rapidly elevated above the sea level. In this moist air an immense mechanical power is stored up; and when condensation caused by its elevation occurs, its moist vapor turns into rain, hail, or snow, and an influx of air from all sides rushes in to fill the partial vacuum thus formed. It has been proved that this influx toward a central region is immediately followed by the formation of a whirl, the subsequent development of which is due to further supplies of moist air. The cyclone then moves towards the quarter in which, for the longest time, the warmest and moistest air has been rising and producing the heaviest cloud and rainfall, and its tendency as a whole is to travel away from the equator: hence the parabolic course so plainly shown in the recent case. Applying known theories to the circumstances of the latter, there is no difficulty in accounting for the storm. The weather reports published, for the two days preceding that on which the fury of the cyclone broke upon Indianola, show warm rainy weather in the Gulf and a prevalence of strong northerly and northeasterly winds on the south Atlantic seaboard. Hurricanes have repeatedly been known to originate in Florida when a cold wind from the north has swept into the warm, moist air there prevalent, and this one is without doubt due to the same cause. The cold air elevated the warm atmosphere; and probably other circumstances being favorable, the cyclone was generated and took the course already specified. The Signal Bureau reports that the lowest barometer noted was 28·99 inches, with the maximum velocity of wind of 86 miles per hour, at the same period. The terrible effect of the hurricane may be judged from the fact that the prairies south of Indianola are literally strewn with thousands of drowned cattle, deposited by the subsidence of the floods which swept them away. Several light coasting steamers have also been found ten miles inland, left high and dry by the receding waters.

THE POSTAL LAWS—AMENDMENTS NEEDED.

Owing to increase of postage on newspapers and other transient matter by the enactment of a change in our postal laws at the end of our last Congress, it is no longer feasible for publishers to advertise their publications by mailing and prepaying postage on copies of their papers as specimens, and sending them to non-subscribers.

Last autumn we mailed several tuns in weight of the SCIENTIFIC AMERICAN to persons throughout the country, on which we paid over $5,000 postage. The circulation of the same number this year would cost for postage $7,500. We have concluded not to print an edition for gratuitous circulation this year, in consequence of this increase of postage charges.

The Post Office Department, in consequence, loses $5,000, which it would have received but for the change in the rate. This is but a small item, to be sure, to so large a department as the General Post Office, but be it remembered that this loss is from only one concern, while there are probably others who will do the same to a greater or less extent: which in the aggregate is likely to reduce the Post Office revenue very largely. It is hoped that, on the convening of our next Congress, one of its first acts will be to amend the postal law, so that the tax upon publishers and the public shall not be more oppressive than it was under the old law.

Newspaper and other publishers should commence early to agitate a reform in this matter. It will not do to take a retrograde step in the matter of cheap postage. Persons who have been in the habit of advertising in our usual special edition, referred to, are advised to avail themselves of the advertising pages of our regular edition to announce their fall business. The circulation of the SCIENTIFIC AMERICAN has never been so large at this season of the year as now, by several thousands. The number of regular subscribers at this time exceeds that of last year by over four thousand, making an aggregate issue of not less than 44,000 every week, and it frequently reaches as high as 50,000.

CONSERVATISM VERSUS PROGRESS.

Extreme opposing parties of conservatives and progressists are found in the field of Science, as well as in politics and religion. Their continual strife is mutually beneficial, each serving as a check on the other. Without conservatism, the world would certainly rush into all kinds of new theories, such as those in which men of a progressive turn of mind are very apt to indulge; while without men of progress and improvement, the world would stand still, and no advance would be possible. It is doubtful which of the two would be the more deplorable state of society.

History abounds with records of this strife between conservatism and progress: but in no field has the latter been so successful as in that of Science, for the simple reason that its triumphs, which are only to be achieved by the labor of research, are based on positive facts, which no opposition of conservatism can upset; and the benefit of this opposition consists only in the prevention of a too rash acceptance of theories, before they are sufficiently based on such facts as make them incontrovertible.

We will take a few illustrations from the fields of astronomy and geology, and remind the reader that there was a time when the whole human race considered our earth to be flat, and to consist of three connected continents--Europe, Asia, and Africa—with some islands in the inland seas, and many others surrounding the continents, all being situated in a boundless ocean, the limits of which were unknown, and their investigation seriously dreaded. The ancient astronomers who announced the rotundity of the earth were not believed, especially when contradicted by the theological priests, who then, as well as later, arrogated to themselves the enforcement of any peculiar doctrines which best suited their self-interest. But ultimately progressive Science prevailed, and conservative theology had to acknowledge that it had been in the wrong.

Next came the doctrine of the motion of the earth. The history of the persecution of the great Galileo is of so comparatively recent a date that, looking at the progress of the present day, it is almost incredible that only two centuries ago the everlasting and important truth of the earth's motion was denied, and condemned as ungodly, by the whole Christian priesthood, Protestant as well as Roman Catholic. But notwithstanding that this good man was compelled, when weakened by age and persecution, to swear to the falsehoods of the priests, the truth has been demonstrated, and progressive Science was again victorious over conservative theology.

Afterwards—toward the end of the eighteenth and beginning of the nineteenth century—came the doctrine of the great antiquity of the earth; while the accumulating evidences of its existence for millions of years, gathered by the then young science of geology, compelled all clear-minded and well informed persons to reject the popular idea, which we inherited from the Mosaic theology, that the whole earth was scarcely 6,000 years old, and was made in six days. As the evidence of the rocks proved that millions upon millions of years have elapsed during its transformation from a highly heated globe to its present condition, the better informed theologians did not combat the scientific conclusion; but the less informed priests, not worthy of the name of theologians, attempted some show of resistance to this phase of progress. But the time of persecution had passed, and priestly influence had been curtailed; so that this opposition was comparatively feeble, and utterly unable to stay the diffusion of the truth.

Still the idea that at least the human race was only about 6,000 years old was adhered to, and theologians made a kind of armistice, surrendering the theory of the six days of creation, and admitting the possibility of a creation and development lasting for millions of years, while still maintaining that 6,000 years was the antiquity of the human race. Unfortunately for them, about fifty years ago facts commenced to accumulate, proving that man has existed at least 100,000 years. The discovery that a glacial epoch took place at this time, and the relation of this grand and important event to the human race, and the accumulating proofs of man's existence immediately after, and even perhaps during or before the glacial period, are sufficient to settle this point; and society no longer heeds the opinions of any theologians who deny these demonstrated facts.

But the most serious blow to Jewish and Christian orthodox conservatism is the modern theory concerning the primitive condition of man. All the geological records found tend to show, more and more, that the first existing men, instead of having fallen from a perfect condition, had improved from the lowest state, and that the first man was a perfect savage, such as we find nowadays in some of the isolated islands of the Australian archipelago, where, for want of conflict, there was no cause for progress, the inferior men not being exterminated by the superior, a destructive process to which much human improvement is due. Progressive Science teaches that the modern civilized and enlightened society has slowly been developed from a primitive savage and ignorant condition.

The final strife of the present day, closely allied to the last mentioned theory of the continual improvement of mankind, is the evolution theory, now carried to its furthest extent. It ascribes the origin of man not only to an inferior human race, but to still lower types, now extinguished: nay, even ascribes the origin of all living beings to a single original type or even cell. It does not teach that man descends from a monkey, as the enemies of progress falsely accuse the evolutionists of maintaining, but that man is closely allied to the whole animal creation, as proved by comparative anatomy, by embryology, by the geological record, and even by psychological and ontological researches, and studies of the mind and instinct of animals, coming thus to the conclusion that the past man may have as well been evolved from a lower prototype as have been created out of dirt. Human pride is perhaps generally at the bottom of the opposition to this doctrine, as the proof of man's origin among lower beings tends, in a certain sense, to abate his arrogance; but on the other hand, man may be proud of what his race has accomplished in a short period of time, if in the beginning he sprang from a condition so low.

THE FAIR OF THE AMERICAN INSTITUTE.

To any one unconversant with machinery, we can readily imagine that the performances of an apparatus which throws out bundles of

KINDLING WOOD,

neatly tied, at the rate of 400 per hour, must be a source of considerable astonishment; and hence the expression of wonder, which comes over the face of the throng which is constantly gathered about the machine, while amusing to contemplate, is quite to be expected. To gather an idea of this curious device, the reader must imagine four horizontal bars arranged as spokes, placed equidistant about a rotating hub. Each bar has at its extremity a circular vertical frame, of a depth equal to the length of a stick of kindling wood. In each frame or cylinder works a follower, moving outward. An immense hopper filled with the sticks is provided with three openings, at each of which a boy is stationed. Boy No. 1 fills the frame nearest him loosely with wood. The bars then rotate so as to bring that frame opposite boy No. 2, whose business it is to pack in more sticks, so as to make the bundle a little tighter; then boy No. 3, when the same frame reaches him, shoves in the little sticks which complete and wedge the bundle tight. Of course, as fast as one frame departs from each operator another takes its place, and the operations above described are repeated. After leaving boy No. 3, the frame comes opposite a rod controlled by mechanism from the center, which pushes the bundle out of the frame and between a pair of vertical semi-circular jaws which come together, tightly compressing the bundle. Then a piece of annealed iron wire is led from a reel through a pair of small vertical clamps, and pushed from underneath up into the jaws, the inner periphery of which it follows, thus encircling the bundle. The end comes back to the clamp, between which a central piece then rises, grasps the wire, twists the ends together, and a knife at the same time cuts the wire off. By this time another bundle has arrived, which pushes the now tied bundle out of the opening jaws, and takes its place to undergo the same fastening. The machine is really a study for the mechanic. One gear wheel in particular, which communicates motion to the frame bars and at the same time operates the knife cam and the wire-twisting device, is a remarkable example of adaptive ingenuity. The inventor, Mr. F. Myers of this city, tells us that the apparatus easily accomplishes the work of fifteen boys, and runs ordinarily at the rate of 4,000 bundles per day of ten hours.

Another novel machine is one for

MAKING WIRE FENCE,

an inexpensive and excellent form of enclosure, which deserves to be popular among farmers. The wire, led from a series of reels, is brought up and under two sets of vertical hammers, the latter actuated, one set at a time, by cam mechanism. The uprights which support the wire are of wood, and are laid, one at a time, on the projections of endless bands, which carry them under the wire and beneath the hammers. Under the first row of hammers are guides which conduct copper staples, one at a time, over each intersection of wire and post. Then the first hammers fall and drive the staples partially in, and the second hammers, as the fence is carried along, deliver their blow and complete the insertion. There are six wires, and the pickets are four feet in length. The fence can be made with 15 or 30 pickets to the rod, and is usually formed in sections of ten rods each. It appears to be very strong. It is portable, and can be rolled and secured as easily as so much carpet. Farmers who use it might thus readily, on moving from one residence to another, take up their fences and transport them with their other farm appurtenances. Mr. A. C. Betts is the inventor, and he says that the machine will make 400 rods of fence per day.

AN ELECTRICAL COPYING MACHINE,

the invention of Mr. T. A. Edison, the well known electrician, is a novelty in apparatus of this description. A small battery of considerable intensity transmits its current to a pair of miniature electro-magnets mounted on the end of a pointed metal rod, which serves as a writing instrument. The magnets cause the rotation of a bit of iron, the motion of which is regulated by a minute fly wheel, and the result of the rapid interruption of the current is a series of sparks from the end of the instrument, which penetrate the paper written upon, and so convert the latter into a stencil plate of the characters inscribed. It only remains to put clean paper under that marked, and pass a roller charged with a prepared ink over the latter, to make as many copies of the writing as is desired, the ink passing through the holes made by the passage of the spark.

We have had sewing machines without number, buttonhole and knitting machines of all descriptions, but now something entirely new is added to the mechanical part of the sewing room in the shape of

A DARNING MACHINE.

Imagine, ye mothers of large families, who ruefully contemplate dilapidated socks by the dozen, after the week's washing, with visions of strained eyes and tired backs floating across your minds: imagine a little apparatus infinitely more simple than the sewing machine, which repairs the hugest darn in much less time than we can describe the operation, and far more neatly than you can do it with all your years of practice. This is what it is. Two small plates, one stationary and the other movable, are placed one above the other. The faces are corrugated, and between them the "holy" portion of the stocking is laid. Twelve long eye pointed needles are arranged side by side in a frame, which last is carried forward so that the needles penetrate opposite edges of the hole, passing in the corrugations between the plates. Hinged just in front of the plate is an upright bar, and on this is a crosspiece carrying twelve knobs. The yarn is secured to an end knob, and then, with a bit of flat wire, pushed through the needle eyes. Then the loop between each needle is caught by the hand and hooked over the opposite knob, so that each needle carries really two threads. Now the needles are carried back to their first position, and, in so doing, they draw the threads, which slip off the knobs through the edges of the fabric. A little push forward again brings the sharp rear edges of the needle eye against the threads, cutting all at once. This is repeated until the darn is finished, and beautifully finished it is. The inventor is Mr. O. S. Hosmer of Boston, and we predict for him the blessings of the entire feminine community. The cost of the machine is but ten dollars.

A NEW ELECTRIC MOTOR,

the invention of Mr. C. A. Hussey of this city, is at work driving a sewing machine. The engine, which is quite small, is operated by five Bunsen cells, and its movements are controlled by a simple device by connecting or disconnecting a greater or less number of elements. The machine is driven at the rate of 500 stitches per minute. Mr. Hussey's engine combines several new and excellent improvements, mention of which lack of space just at present compels us to defer to another issue.

SCIENTIFIC AND PRACTICAL INFORMATION.

AMERICAN COMPETITION.

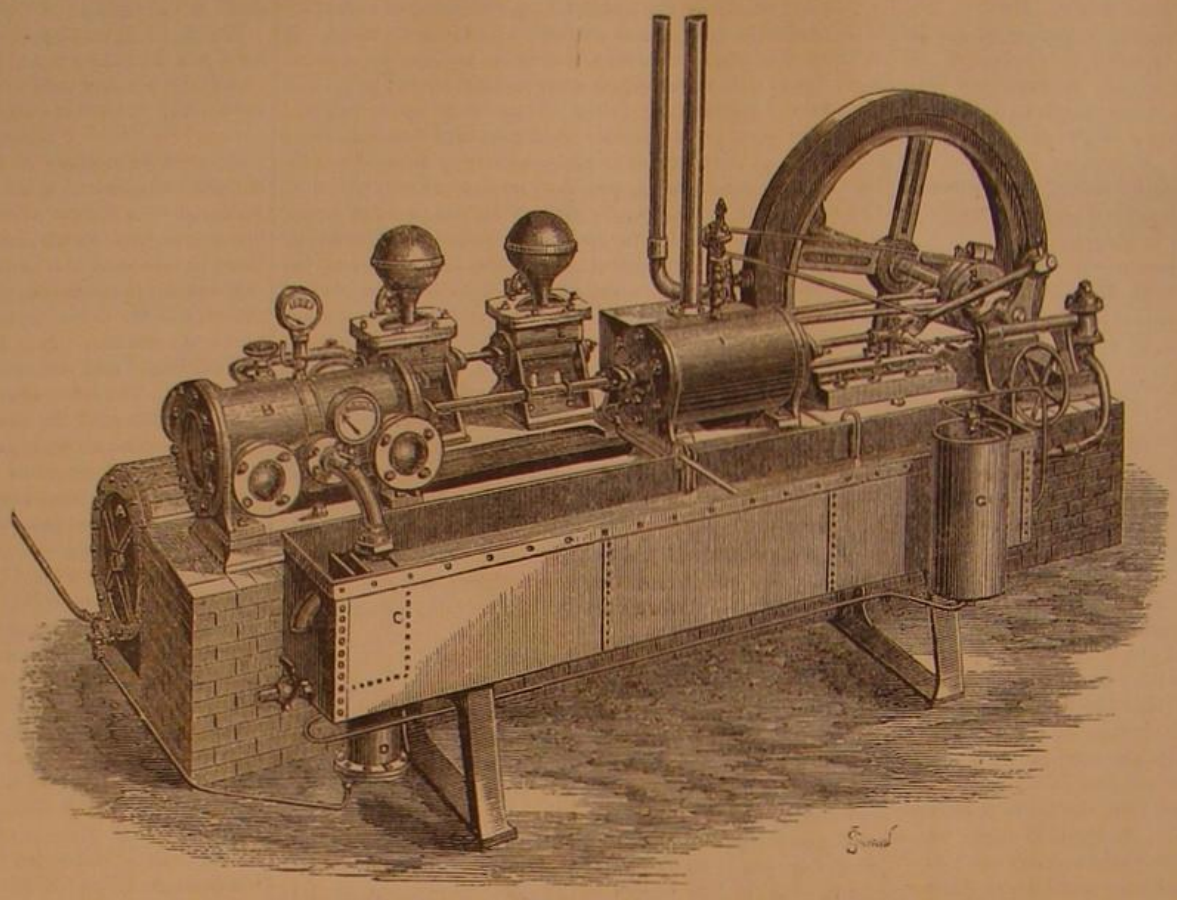
United States hardware producers do not seem inclined to limit their competition with English manufacturers either in this country or in foreign markets by offering American made goods. When these cannot be sold in England at a good profit, current action of individual firms seem to point to the probability of United States makers starting manufactories upon our own shores. Messrs. Hussey, Binns, and Co., of Pittsburgh, have during the past twelve months been making —but only since last spring been selling—what they term a "plain black solid cast steel shovel." Their patent consists mainly in combining the iron straps with the pan of the shovel when the steel is run into the mold. Shaping and shearing, and even hardening, is done mostly under the drop hammer, to the exclusion of all but a minimum of manual labor. The result is a good tool produced at a cost that leaves a profit with which even American manufacturers ought to be satisfied; but large as these profits are, they will be increased when the existing facilities of the makers are supplemented by a 24-pot Siemens furnace which is being laid down. On behalf of Messrs. Hussey, inquiries are now being made in our own hardware districts by a gentleman who has recently come to England. His report will determine the American firm whether they shall start a works in England, or offer here their process upon royalty or purchase. The inquiries are conclusive that the process can be carried on in this country at a cost greatly under that entailed in the States; and that both throughout the export and also the home market the common iron and iron-steeled goods are giving way before those made wholly of steel. The Americans have furnished our agriculturists with some excellent forks, and their axes are unrivaled; yet the English makers of edge tools keep mostly well employed. If under these circumstances, our transatlantic cousins will, at an equally moderate price, put into the hands of our navvies, our miners, and our farm laborers a shovel which shall be equally good, they have our best wishes for their success in every legitimate effort which on this side they may put forth.—*The Engineer.*

INTERNAL PARASITES OF THE HOUSE FLY.

A correspondent of *Nature* writes that he saw a small, decrepit house fly making its way across a sheet of paper, when three minute, active animals, apparently beetles, tumbled out of it; they were light brown in color and resembled *aphides* in shape, and were of about the size of a medium pin hole.

IMPROVED ICE-MAKING MACHINE.

The following is an explanation of the mode of working this machine, which will be readily understood on referring to the illustration: The refrigerator, A, a copper tubular vessel, is charged with the requisite supply of liquid ether, which, by the action of the vacuum pump, B, is evaporated, drawn away in the form of vapor, and passed into the copper tubular condenser, C, where, under a slight pressure and by the aid of a stream of water, it is again reduced to its liquid state, and then returned through the ether meter, D, to the refrigerator, A, to be re-evaporated. Thus the same ether is used continuously, with inappreciable loss. The ether meter, D, regulates the flow of the liquid ether to the refrigerator, rendering the machine self-acting. The hand pump, F, and condenser, G, in connection with it, are valuable in economizing ether to the utmost degree, as without them much would be blown into the air and wasted. No machine is complete without these adjuncts. To utilize the cold produced by the evaporation of the ether for the purpose of making ice, an uncongelable liquid, such as very strong brine, is forced by the pump, E, through the tubes of the refrigerator, A, parting with its heat to the ether vapor on its passage, and leaving that vessel at a temperature many degrees below freezing point, to be used in the freezing tanks as described below. For the manufacture of pure transparent ice in large blocks the machine is provided with a large tank —or several tanks, according to the size of machine—which is filled with the pure water to be frozen. In this tank a number of hollow metal cells or slabs are fitted, and connected to each other and to the refrigerator of the machine, A. Through these cells the cold brine, after leaving the refrigerator at a temperature of from 14° to 20° Fah., is continually circulated, causing the pure water in the tank to congeal on each of their surfaces until a sufficient thickness of ice has been obtained, when the blocks are readily removed by a very simple arrangement. To make perfectly clear ice, it is imperative that the fixed air contained in the water be allowed to escape freely during the freezing process, and to attain this end the tank is fitted with moving arms or agitators, which are caused to move slowly up and down or to and fro between the cells in the pure water, keeping it constantly agitated, and so facilitating the expulsion of the air. By this process perfectly transparent ice is produced in any quantity and in any climate, in blocks about 4 feet x 3 feet, and 4 inches to 12 inches thick. It is found that, after attaining a thickness of 4 inches, the ice does not form so quickly, and therefore the production of the machines is somewhat less when the thickness of the blocks is increased; but this is overcome and the efficiency of the machine maintained by a simple arrangement, by which two blocks are frozen together after a thickness of 4 inches to 6 inches has been attained, and a block of transparent ice 8 or 12 inches thick is produced in half the time required by any other process.



SIDDELEY AND MACKAY'S ICE-MAKING MACHINE.

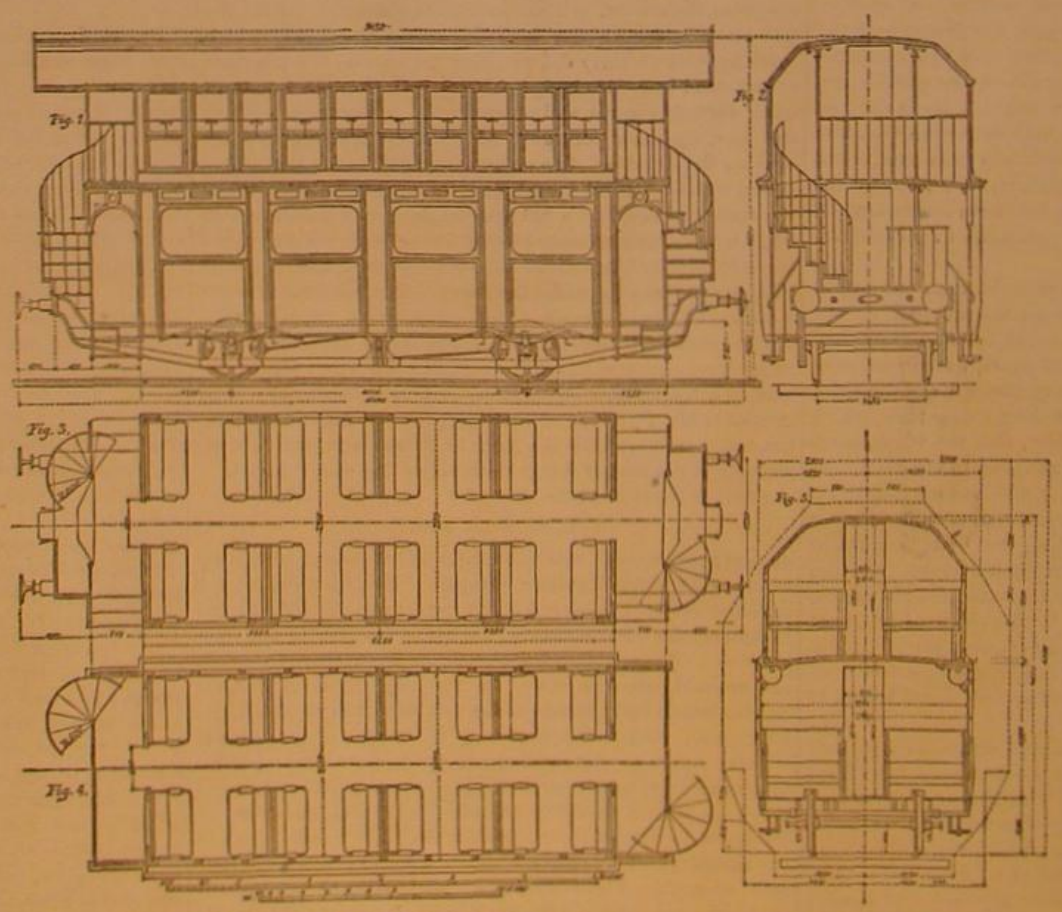
TWO-STORY RAILWAY CARS.

Since April 1, 1873, there has been in force a new federal law, concerning the building and working of all railways on Swiss territory. The extent of working railways in the Confederation at present amounts to about 1,000 English miles, while about one half this length is at the present time either building or concessioned. There are no State railways in Switzerland, the lines having been promoted mainly by private enterprise, and aided, in many cases, by governmental, or rather cantonal, subventions. Most of the new lines will open up shorter routes towards the International Gothard line now in course of construction, and these are therefore being made, like the rest of the Swiss lines, of the standard gage, namely, 4 feet 8½ inches. The Swiss are now also building meter (39·3 inches) gage lines, a width which has been found amply sufficient in many parts of this country for local traffic.

With the marked predilection that has sprung up in Switzerland, both among the companies and the public, in favor of two-storied cars for branch line service, the federal inspectors for railways have set themselves to the task of studying this question, and the design of a four-wheeled standard gage car, of which we annex engravings, is the result of these studies. Twelve cars on this plan are now building at the Swiss railway carriage and wagon works of Neuhausen, Fribourg, and Bern.

As will be seen, the cars are constructed on the so-called semi-American type, with platforms at each end, and with a central passage all along the train, such as has been stipulated by the new regulations. The staircases admit of very ready access to the upper story without interfering in the least either with the central passage or with the end platforms. Each story contains 32 first and second class seats, arranged on double-seated benches, while two more seats are provided for on the upper balconies, making thus 66 seats in all.

The other peculiarities of these fine cars will be gleaned from our engraving, and therefore we need say little about them. They are well suited for use in summer weather.



TWO-STORY RAILROAD CARS FOR SWISS BRANCH LINES.

The carriages are very solidly constructed, and weigh empty 10 tuns, equivalent to 3 cwt. per passenger, while they cost $2,250 a piece, making $34 per seat.

Griffiths' Propeller.

The trials of the British iron steamer Bruiser, with a casing over the propeller, on Mr. Griffiths' plan, have yielded very satisfactory results. Not only is an increased speed obtained, but in addition the vessel is more easily steered, and there is little or no vibration felt, while it is next to impossible to foul the screw. Another and, in one sense, most important fact was also discovered while the Bruiser was at sea, namely, that when pitching in heavy seas the engine worked as smoothly as in fine weather, the cause being attributable to the fact that when the stern is lifted the casing holds a quantity of water which offers sufficient resistance to the motion of the propeller to prevent the engines racing.

International Patent Laws.

Mr. Lloyd Wise argues in favor of the following, among other points, as a basis for an international patent law:

"Every application for letters patent should undergo examination, limited to the questions whether the specifications are clear and whether the invention is open to objection as being contrary to morality, or wanting in novelty, regard being had to prior publications in the patent office.

Should the result of the examination as to novelty be unfavorable, the applicant should be nevertheless entitled to obtain his patent, subject to the insertion in his specification of an acknowledgment of the existence of the prior matter found and pointed out by the patent office officials, with a clear statement of what he nevertheless claims.

Patents should be refused only in cases of fraud or where the invention is contrary to morality. Other points should be left to be adjudicated upon by the courts only, in case the validity of the patent should come into question.

There should be no publication of any report or opinion of the examining authorities as respects any application for a patent, saving reports of proceedings in disputed cases.

Thus on the one hand applicants who had been anticipated would be saved the useless expenditure they might incur if left in ignorance of the fact; and on the other hand, they could not become sufferers by reason of any erroneous judgment of the examining authorities. Moreover, the public would be amply protected by having all the facts (and facts only) placed in juxtaposition before them in the specification

Where the examining authorities have the power of refusing an application for a patent on the ground of want of novelty, there must always be considerable risk of injustice to the inventor, there being in many instances scope for diversity of opinion. Nor is the difficulty obviated by providing means of appeal. Appeals are somewhat costly consequently, in a pecuniary sense might may in the long run prevail over right.

Moreover, where the power of refusal obtains, as in the United States, there results a widespread idea that a patent once granted is practically indefeasible. Of course, people well acquainted with the law know better, but I am for the moment speaking of members of the outside public who may nevertheless have interests at stake.

Now I think the plan above proposed, while securing justice alike to the inventor and the public, would not be liable to such misinterpretation.

Provisional protection should be granted for twelve months at a nominal cost, to allow time, not only for perfecting the invention, so that it may be properly and fully described in the complete specification, but also for obtaining, if needful, the coöperation of capitalists."

The Oil Diagometer.

Professor Palmieri has discovered a new instrument which he calls a diagometer, and which is constructed for the rapid examination of oils and textures by means of electricity. What the apparatus will do, Professor Palmieri details thus: 1. It will show the quality of olive oil. 2. It will distinguish olive oil from seed oil. 3. It will indicate whether olive oil, although of the best appearance, has been mixed with seed oil. 4. It will show the quality of seed oils. 5. Finally, it will indicate the presence of cotton in silken or woolen textures.

LIQUID CARBONIC ACID AS A MOTOR.

In the search for cheap motive power, to which inventors of all classes are more or less giving their attention, the utilization of carbonic acid gas has been suggested, and practised to some extent, notably in the propulsion of submarine movable torpedoes. The Lay torpedo, of which some time ago we published a description, was driven and steered by this gas, compressed into a liquid state. The advantages offered, as compared with compressed air, are that, by the use of the liquid, a much larger quantity of motive power can be stored in the same space, allowing the employment of smaller and thicker vessels; and of the gases that may be liquefied, carbonic acid can be prepared most cheaply and readily. There are two methods by which carbonic acid gas may be reduced to a liquid state, first, by the aid of the pressure of the gas as it is evolved; secondly, by mechanical compression. The first process necessitates the repeated charging of a reservoir, producing a series of condensations; but in each charging a large quantity of gas is lost, since all that does not condense must be blown off in order that the generator may be refilled. The apparatus is simple but troublesome to work.

By the second method, which is in every way preferable, the gas is compressed, into a receiver immersed in a cooling mixture, by a condensing pump. This plan is that adopted by the United States Torpedo Station, at Newport, R. I., for the generation of the large amount of liquid (some 700 lbs.) needed to fill the flasks of the Lay torpedo. The apparatus used, while in principle very similar to that employed in the manufacture of soda water, is especially adapted to the work of producing the gas under very heavy pressures by many novel and important alterations. Its construction will be understood from the annexed engraving, which, with the facts given herewith, we extract from a paper prepared by Mr. Walter N. Hill, S. B., chemist of the Torpedo Station, and published under the auspices of the Ordnance Department of the Navy.

There are two generators, A, so that while one is in action the other may be emptied and recharged. These are of cast iron, and receive the marble dust and water. The wheel, E, serves to rotate an agitator within the cylinder. The sulphuric acid is contained in the smaller vessels, B, and admitted to the generators by valves operated by levers, *a*. C C simply contain water for washing the gas. The acid, admitted from B, acts upon the marble dust and generates carbonic acid gas, which passes up the lead pipe, *b*, to the cross, *c*. To this last are attached a pressure gage, *d*, and a tube leading to B, serving to equalize the pressure in that vessel. To the lower branch of the cross is attached a pipe which extends to the bottom of vessel, C, through the water of which the gas bubbles up, and finally is led away by pipe, *e*, to the receiver G. In this receptacle a supply of gas is kept, from which the pump can draft for a short time, if for any reasons both generators should be out of action. Also, if priming occurs, the material carried over remains in the vessel and can easily be removed. The gage, *f*, marks the pressure of the gas which the pump is taking.

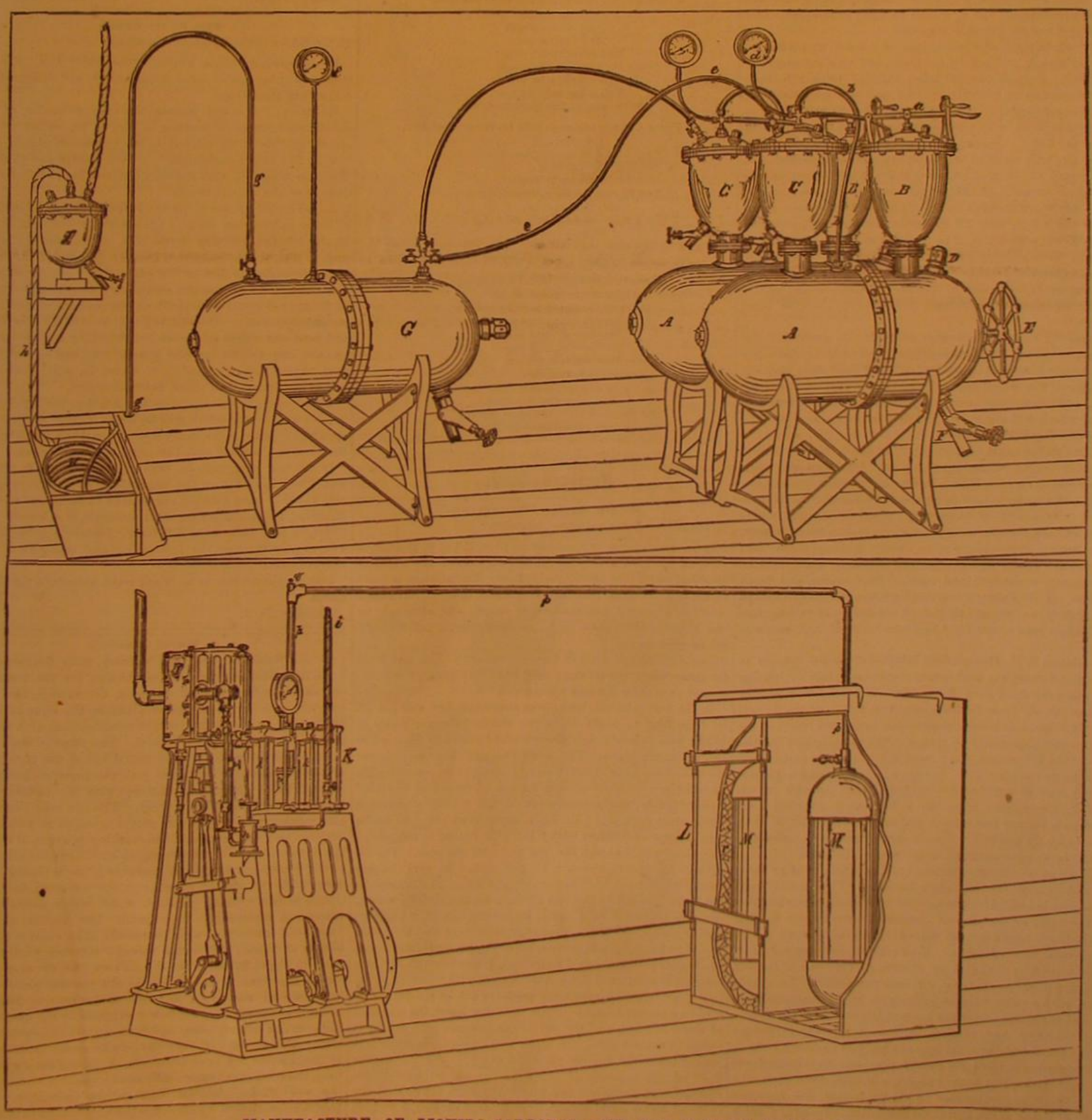
From the receiving vessel, the gas traverses a coil of lead pipe, H, which is surrounded by ice water, thence goes through an empty vessel, I, which catches any foreign matter carried over, and finally escapes by the pipe, *i*, to the pump. The latter resembles in form the Burleigh air compressor. The steam cylinder, J, is 15 x 7 inches, and there are two compressing cylinders, *k k*, of steel, each 2½ inches in diameter by 10 inches stroke, provided with steel pistons in which are small steel valves opening inwards. The rods are driven by connecting rods and cranks from the crank shaft of the steam cylinder, and the gas cylinders are well jacketed, as shown broken away at K. The gas enters the bottoms of the cylinders; and as the valves in the pistons close on the up stroke, the gas above is compressed and forced into the composition boxes, *l*. Thence it passes to an oil drip box, *m*, and thence by heavy pipes to the receivers, M, which are surrounded by freezing mixture, the drainage from which is carried to the coil, H.

One of the most important features of the apparatus is the supplying of the gas at high pressure, averaging 100 lbs. per square inch, to the pump. If the gas were drawn from the generator at atmospheric pressure, it would have to be compressed to $\frac{1}{4}\frac{1}{0}$ its bulk to average 600 lbs., the pressure of liquefaction; but if taken at 100 lbs. only to $\frac{1}{7}$g. In addition, the strain on the pump is greatly diminished.

It is estimated that the cost of gas made by the machine described, under favorable conditions, will not be greater than 15 cents a lb. This mode of preparing the liquid is not available on board ship, nor is it suitable to localities where ice is not attainable.

Mr. Hill has, however, devised another improvement, wherein the use of ice and salt is done away with, and a more uniform cooling of the receivers obtained. By means of an air compressor, air is compressed into a strong tank at 70 to 80 lbs. per square inch. This is used to drive the pump. By a simple arrangement, the exhaust from the driving cylinder of the latter is used to keep the flask, receiving the compressed gas, cold, the vessel being placed in sea water, which may easily be reduced in temperature below 32° Fah.

Liquid carbonic acid has a tension, at —4° Fah., of 322·5 pounds per square inch, and at 94° Fah. of 1,200 lbs. Under ordinary circumstances, the highest temperature above mentioned may be attained, and the corresponding pressure reached, so that the proper construction of vessels for containing it is a matter of considerable moment. After experimenting, the flasks found most satisfactory were those made of fine sheet steel (0·045 inch thick) in successive layers,



MANUFACTURE OF LIQUID CARBONIC ACID FOR MOTIVE PURPOSES.

four being commonly employed. The sheets are wrapped so as to break joints around a cylinder, and the last one or shell is lapped and riveted. Then all are made into a solid cylinder by means of pure tin, which is melted and worked in from the inside with the aid of gas blowpipes. The heads are made of cup-shaped pieces of steel, placed one within the other and sweated together with tin. The lengths of the flasks vary from 7 to 4 feet, and the diameters are 12 inches along the body and 13¼ inches at the heads. One flask which was tested to destruction gave way under a pressure of 3,136 lbs. per square inch. The total strains borne are calculated as follows: At 1,200 lbs., longitudinal strain, 19·104 lbs.; tangential strain, 38,800 lbs. At 1,365 lbs., longitudinal strain, 21,731 lbs.; tangential strain, 44,152 lbs.

Very probably it will yet be found that liquid carbonic acid will receive many applications as a source of motive power. It has only to be made cheaply, and it will be extensively used.

The Palace Hotel.

Visitors to San Francisco will hereafter be struck with a new and conspicuous feature in the face of the young giant town. Seven stories high, with a base of 96,250 square feet, at the corner of Market and New Montgomery streets, now looms up the Palace Hotel. Its huge brick walls are ribbed from top to bottom with tiers of bay windows, and spotted like the sides of an ironclad with bolt heads that clinch the great rods running over and under and through and through the building, making it a kind of Cyclopean open work iron safe, filled in and lined with fireproof brick, where all treasure of human life and limb should be secure against fire or earthquake while the Peninsula stands. It is, indeed, to this element of security that we would draw special attention, while so many buildings are going up today in our great cities, which are a disgrace in flimsy and tawdry pretension, and a danger in their inflammable and carelessly thrown together materials.

The whole work of constructing this hotel was done by the day's work and not by the piece, and so done carefully and well. Seventy-one partition walls of brick run from the foundation up through the roof, and two feet above it, and the roof is of tin. There are four artesian wells, two in each outer court, with a tested capacity of 28,000 gallons of water per hour. Under the center court is a 630,000 gallon reservoir, with walls of brick and cement five feet thick and buttressed. On the roof are seven tanks of boiler iron, with an aggregate capacity of 138,000 gallons. Seven steam pumps force this water through the whole house by a system of arteries and mains, with 392 outlets in the corridors, provided in each case with three inch hose, from 10 to 100 feet in length, with nozzles. Under the sidewalks without the building, there are eight four inch fire mains connecting with the city water, by means of which the city engines can, if found necessary at any time, force water into the hotel mains.

In every room and passage there is an automatic fire alarm, by which any extraordinary heat will be instantly and noisily known at the central office of the hotel; and six watchmen will patrol day and night every part of the structure, and touch, half hour by half hour, at seventy-nine stations, which will report by electricity and fix the place and time of a dereliction of duty.

Through the heart of the hotel from top to bottom runs a fire brick tunnel, within which is a solid brick and iron staircase opening on each floor. In five like tunnels are five elevators, run by hydraulic power, besides six additional stairways from garret to basement. Wood is avoided where possible. In the construction of kitchen, oven room, bakery, store rooms, steam pump room, water heating room, coal vaults, ash vaults and shafts, and corridors, wood is supplanted by asphaltum and marble, iron beams, and brick arches. If the Palace Hotel can burn, the lessons of Chicago and Boston are lost, and all human precaution is vain against fire in this year of our Lord eighteen hundred and seventy-five.

Architect J. P. Gaynor was instructed by the owners to travel and study the best hotels elsewhere before submitting his plans for the Palace Hotel, and Warren Leland—mine host of the old New York Metropolitan Hotel, of the Leland family, famous as hotel keepers—was appointed lessee of the house, and manager of all things. The sunning and ventilation of the 755 rooms for guests are excellent, every room opening on the open light, having a fire place, and a separate flue of four by eight inches running clear through to the roof. Every second room has a bath room attached, most rooms are twenty feet square, and none of a less size than sixteen by sixteen feet. Two thousand and forty-two ventilating tubes open outward on the roof of the hotel.

Three great cañons or courts, cut down from roof to base, air and lighten the mountain building. The center court measures 144 by 84 feet, is covered with glass, made brilliant by the lights of the pillared verandahs surrounding it, floor above floor; with a tropical garden, fountains, statues, an instrumental band of music in the evenings, and a circular carriage drive fifty-four feet in diameter. Opening upon this "garden floor" there is an "arcade promenade," four yards wide, with a show window looking on the promenade from each of the stores under the hotel. Letter tubes, pneumatic dispatch tubes, and electric bells knit all this miniature Palais Royal and the hotel into one body of wonderful life

Ministering to the 1,200 guests that can be accomodated are four clerks, two book keepers, a French head cook who is a brilliant particular star in his profession, five assistant cooks of rising name, and three specialists—namely, a chief confectioner from Milan, a chief baker from Vienna, and "Muffin Tom" from New York, an old negro the fame of whose egg muffins and corn bread has made him the aristocrat of his race for the last half century from Charleston to Long Branch. The 150 waiters are to be negroes also. Forty chambermaids and a host of Chinese will see that the beds and bed linen are white and fresh. This is the kind of hotel we keep in San Francisco.

From China and India and Japan a stream of invalids and visitors pours yearly in upon this city, the great sanitarium of the future for the languid oriental world. From the islands of the peaceful sea, from our own east and north, from Spanish America, a great host shall make a Babel of the Palace Hotel, whose builders have not been confounded. Its white towering walls, dotted with the gilded iron bolts that bind the great rods of the building together, shall be familiar to strange eyes from far lands. The sick down easter shall abandon his nutmegs of wood and satisfy his soul with the grapes and the oranges of our State; yellow aristocrats from Siam and tawny revolutionists from Bogota shall join hands and pass the sirup over the steaming triumphs of Muffin Tom.

We have seven big world wonders now: the Bay of San Francisco, the Central Pacific Railroad, the Big Trees, the Bonanza, Yosemite, the Geysers, the Palace Hotel—and Assessor Rosener.—*Overland Monthly.*

Scientific Courtship.

Young Molly met Christopher down by the farm,
With his analysis
And his catalysis
And his dialysis.
What would he do there!
He came down to woo there,
He came down to sue there,
To bill and to coo there,
Not to fill all her soul with alarm.

O! Science, 'tis thus that a fair maid you win,
With parthenogenesis
And alterogenesis
And heterogenesis
And other such things;
For Love, he has wings
And with him he brings
Full many such things
In the ears of fair maidens to din.

Young Christopher came with his finest brochures,
On trilobites
And troglodytes,
Theodolites
And such delights,
And he said, my dear, these are yours,
Yes, they're yours.
Love may come and love may go,
Science endures.

The heart is a stubborn thing,
And conical in shape;
A remnant which with us we bring
From our ancestral ape.
It drives the blood to Molly's cheeks,
She opens her ruby lips and speaks:
Her mitral valve plays
In the wildest of ways;
Her columna carnea,
Gives her an idea
By the way that it acts;
And, accepting the facts,
She then and there agrees to become
The partner of his scientific home.

—*Journal of Applied Chemistry.*

Correspondence.

Steam Boiler Phenomena.

To the Editor of the Scientific American:

In your article on this subject on page 193 of your current volume, you give a very interesting account of the result of injecting water into overheated boilers. The account is more valuable than usual, for the conditions seem to have been carefully observed and the results noted; and although, as you observe, they seem to be contradictory, I believe they can be explained.

In calore, vis—in heat is force or energy This has been for many years my maxim; and from this point, I will endeavor to explain the two phenomena.

In the first case, the boiler was absolutely dry, and heated to from 600° to 1,000° Fah., the steam pressure being 0. Water was injected, and the pressure suddenly rose to 190 lbs. per square inch. The conditions are then as follows: An unknown quantity of water is brought in contact with an unknown quantity of iron heated to from 600° to 1,000° Fah. If, now, the arrangement of the injection pipe and pump were such that 1 lb. water injected at the first stroke would come in contact with 9 lbs. iron heated to 600° Fah., the water would absorb the heat and cool the iron. The resultant temperature would be 360° Fah. As each square foot of the iron in such boilers weighs about 12 lbs., and as the water injected by the first stroke may, and usually would, come in contact with a much larger surface than 1 square foot to each lb. of water injected, it is evident that the water would be heated to a higher degree of temperature, and steam of a higher pressure would be formed. If the quantity of water injected is small, and the heated surface with which it comes in contact large, an enormous pressure can be suddenly created in a confined space. If, on the other hand, the quantity of water is large, and the surface of the iron with which it comes in contact small, the water will be heated less; and, if heated below the boiling point, no steam is formed, as the limit of the capacity of the water to absorb heat is not reached. If, therefore, the first boiler were set so that the injected water could spread over a large surface, a sudden and high pressure would be the result; and if set so that the water could come in contact with a small quantity of iron, that is, lower at the end at which the water is injected, very little pressure would be produced, and the heat in the iron would be gradually absorbed by the water without any injurious results.

In the second case, the conditions were similar, and "an independent pump was at hand, and was put on with a full supply of feed. The steam rose to 20 lbs. by the gage, and as suddenly fell, the steam gage indicating a complete or partial vacuum." Reasoning from numerous practical experiments, I conclude that, at the first stroke of the pump, a quantity of water was driven over sufficient surface to heat the same suddenly, and thus produce the steam pressure indicated by the gage; and the second or subsequent stroke injected a quantity of water into the steam, and condensed the same, thus producing a vacuum. If the feed end of the second boiler were lower (as it should be) than the other end, and the feed pipe entered the end of the boiler some distance above the plate, a full supply of water would produce this result.

If heat be force, a boiler heated to 1,000° Fah. contains an immense quantity of stored-up energy; and a quantity of water less than one tenth in weight of the heated iron will become the agent through which this energy is exerted, by absorbing the heat and being changed from a cohesive fluid to an expanding gas, and thus exert an enormous and (if suddenly liberated) dangerous force. When, however, the same quantity of heated iron is brought in contact with a much larger quantity of water, the great capacity of water for heat compared with that of the iron (12 to 100) will absorb the heat without producing even steam.

Experiments of the above kind should never be attempted, as it is criminal to thus risk life and property; the fires should have been hauled in both cases, and the boilers gradually cooled.

Boston, Mass. JOSEPH A. MILLER.

The Keely Gas.

To the Editor of the Scientific American:

In the communication headed "The Keely Gas," the author is laboring under some mistakes. I will endeavor to correct his statements.

He states: "It is well known that the molecules of all substances increase or decrease in size in proportion to the specific gravity of the substance, the lighter substance containing the larger molecules." I need hardly say that, if this were true, and were known to be true, it would at once dispose of the atomic theory.

As for his experimental proof: If (as I suspect) he uses oil as being lighter than water, I am not at all surprised at his result; for the adhesion of oil to a smooth surface is far greater than that of water; so that, on pouring on the oil, it would immediately flow to the glass and cause overflow of the contents. Your correspondent may try the experiment of filling two equal and similar glass vessels with oil and water respectively. He will find that he will be enabled to add more water than oil before overflow. Let him, however, use absolute alcohol (specific gravity 0·8), and he will find that, to two similar glassfuls of water, he will be able to add more alcohol than water before overflow.

In the case of heavy liquids, the heavier the liquid, the greater the volume which may be added without altering the apparent volume. Let him try mercury, and the result will be the same as if he had added an equal volume of water.

In his last paragraph he says: "For it is plain that it would be impossible for the larger atoms of molecules of the cold vapor to pass between the smaller molecules of metal.' However, unfortunately for this conclusion, it is known that hydrogen penetrates iron, that the products of combustion in a stove pass through the iron casing, and that gold is pervious to water.

I do not intend this to be in any way a defence of the Keely motor. W. B. M.

Hoboken, N. J.

A Water Motor.

At the Sulzbach Altenwald Colliery, near Saarbrucken, Prussia, machinery has been established for the transmission of power from a steam engine at the surface, by a column of water circulating under pressure, the circumstances of the case not admitting of the establishment of a direct-acting steam pump under ground. The mine is sunk 306 yards below the surface. The piston rod of the high pressure engine above is connected with the pressure plungers, each of which plungers is connected with the underground engine by a tube filled with water. The last mentioned engine consists of four pressure pumps arranged in pairs, and between each pair is placed the working plunger of one of the mine pumps. When the engine on the surface acts, the power is transmitted by one pressure plunger through one water tube to a pair of pressure pumps under ground, and thence to one working plunger, which either aspirates or forces air, according to its position. The opposite pair of pumps and connections work conversely. The water is forced into an air vessel, and thence through the rising main 303 yards in hight, in one lift to the surface. On the change of stroke, the water in the cylinder of the pressure pump rises in the second water tube and follows the retiring pressure plunger at the surface, the power supplied by the descent of water in one column being sufficient, with the exception of a slight allowance for friction, to effect its return in the other. If the cataract pauses of the engine at the surface are not too long, the discharge is practically continuous. *The Engineering and Mining Journal*, from whose translation of the German description we condense the above, adds that, at the Phœnix mine in Cornwall, England, an arrangement of simi

lar description, consisting of a plunger attached to the main pumping engine, connected by a length of tube with a water pressure engine in another shaft, has been at work for the last ten years

PRACTICAL MECHANISM.

BY JOSHUA ROSE.

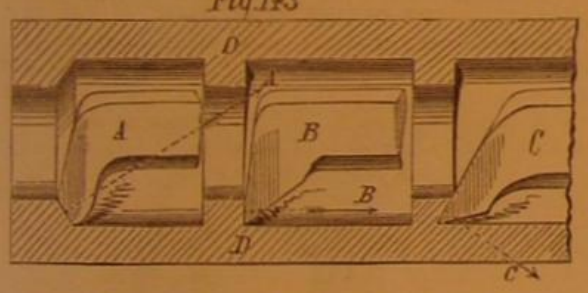
NUMBER XXXIII.

BORING TOOLS FOR LATHE WORK.

Boring tools for use on lathe work require to be shaped with greater exactitude than any other lathe tools, for the reason that they are slighter in body in proportion to the duty required of them than any other; and as a rule, the cutting edges standing further out from the tool post or clamp, the body of the tool is more subject to spring from the strain of the cut. It is obvious that, if the hole to be bored out is a long one, the cutting edge of the tool will become dull at the end of the hole as compared to what it was at the commencement (a remark which, of course, applies to all tools); but in tools, stout in proportion to the duty required of them, and held close in to the tool post, the effect of the slight wear of the cutting edge, due to a finishing cut, is not practically appreciable. In the case of a boring tool, however, the distance of the cutting edge from the tool post renders the slightest variation in the cutting capability of the tool sufficient to affect the work, as may be experienced by boring out a hole half of its length, and then merely exerting a pressure on the body of the tool, as near the entrance of the hole as possible, with the fingers, when the size of the last half of the hole will be found to have varied according to the direction in which the pressure was placed. As a result of this extreme sensitiveness to spring, the tool is apt to spring away from the cut as the boring proceeds, thus leaving the hole smaller at the back than at the front end. To remedy this defect, several very fine finishing cuts may be taken; but a better plan is to so shape the tool that its spring will be in a direction the least liable to affect the size of the bore of the work.

The pressure on the cutting edge of a tool acts in two directions, the one vertical, the other lateral. The downward pressure remains at all times the same; the lateral pressure varies according to the direction of the plane of the cutting edge of the tool to the line or direction in which the tool travels: the general direction of the pressure being at a right angle to the general direction of the plane of the cutting edge. For example, the lateral pressure, and hence the spring of the various tools, shown in Fig. 143, will be in each case in the direction denoted by the dotted lines. D is a section of a piece of metal requiring the three inside

Fig. 143



collars to be cut out; A, B, and C are variously shaped boring tools, from which it will be seen that A would leave the cut in proportion as it suffered from spring, which would increase as the tool edge became dull, and that the cut forms a wedge, tending to force the tool towards the center of the work. B would neither spring into nor away from the cut, but would simply require more power to feed it as the edge became dulled; while C would have a tendency to run into the cut in proportion as it springs; and as the tool edge became dull, it would force the tool point deeper and deeper into the cut until something gave way. Now, in addition to this consideration of spring, we have the relative keenness of the tools, it being obvious at a glance that (independent of any top rake or lip) C is the keenest, and A the least keen tool; and since wrought iron requires the keenest, cast iron a medium, and brass the least keen tool, it follows that we may accept, as a rule, C for wrought iron, B for cast iron, and A for brass work. To this rule there are, however, variations to be made to suit exceptional cases, such for instance as when a hole terminates in solid metal and has a flat bottom, in which case the tool, B (slightly modified towards the form of tool, C), must be employed. Or suppose a hole in cast iron to be, as is often the case, very hard at and near the surface of the metal. Tool, A, would commence cutting the hard surface and, becoming dull, would spring away from the cut in spite of all that could be done to prevent it; while tool, B, would commence to cut both the hard and the soft metal together, the cutting edge wearing rapidly away where it came into contact with the hard surface of the metal; and these conditions would, in both cases, continue during the whole operation of boring, rendering it difficult and tardy. But if the tool, C, were employed, the point of the tool would commence cutting the soft part of the metal first, and would undermine the hard surface, and (from the pressure) break it instead of cutting it away, as shown in Fig. 144, in which A represents a piece of metal to be bored, the bore being hard to the depth of the dotted lines, B. C is the tool shown as it would commence to cut, and also as it would operate while in full operation. After the hard surface is removed, tool B, in Fig. 143, may be employed to finish the boring, the point being ground a little more rounded. The objection to tool, C, in Fig. 143, for employment upon cast iron or brass, is that, in consequence of its excessive keenness, it is liable to jar or chatter. Tool, B, in Fig. 143, may be given top rake and employed to cut out a square corner, or it may, if not ground too keen, be used upon brass; but it is liable, in such case, to jar or chatter, unless the top face is ground away. Here, then, we come to the consideration of top rake, that is, the shape of the top face of the tool, our previous remarks having had no reference to that part of the subject. The application of top rake or lip to a boring tool lessens the strain due to severing the metal; by presenting a keener cutting edge, it lessens the tendency to lateral spring, and increases that to vertical spring, and is beneficial in all cases in which it can be employed. Upon wrought iron and steel it is indispensable; upon cast it may be employed to a limited degree; and upon brass it is inadmissible by reason of its causing the tool to either jar or chatter. In Fig. 145, B represents a section of the work, No. 1 represents a boring tool with top rake, for wrought iron, and No. 2 a tool without top rake, for brass work, which may be also used for cast iron when the tool stands a long way out from the tool post or clamp, under which circumstances it is liable to jar or chatter. A tool for use on wrought iron should have the same amount of top rake, no matter how far it stands out from the tool post; whereas one for use on cast iron or brass requires to be the less keen the further it stands out from the tool post. To take a very smooth cut on brass work, the top face of the tool, shown at 2 in Fig. 146, must be ground off, as denoted by the dotted line.

Fig. 144

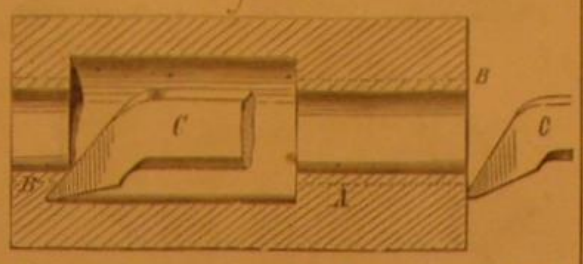
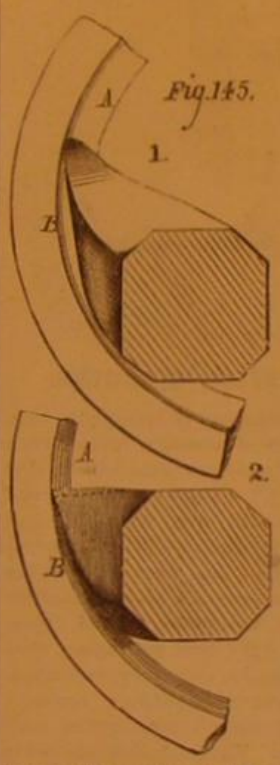
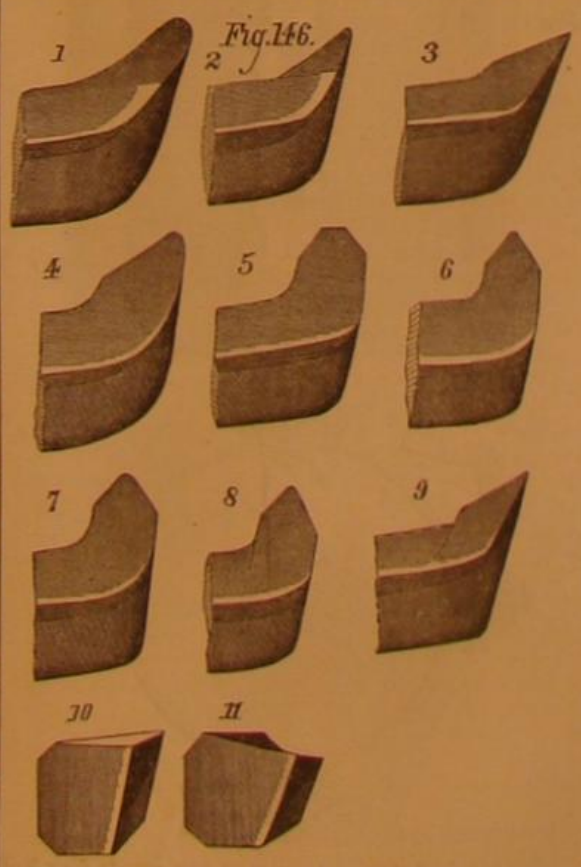


Fig. 145.



We have now to consider the most desirable shape for the corner of the cutting edge. A positively sharp corner, unless for a special purpose, is very undesirable, because the extreme point soon wears away, leaving the cutting qualification of the tool almost destroyed, and because it leaves the work rough, and can only be employed with a very fine feed. It may be accepted as a general rule that, for roughing cuts, the corner should be sufficiently rounded to give strength to the tool point; while, in finishing cuts, the point may be made as round as possible without causing the tool to jar or chatter. Now, since the tendency of the tool to jar or chatter depends upon four points, namely, the distance it stands out from the tool post, the amount of top rake, the acuteness or keenness of the general outline of the tool, and the shape of the cutting corner, it will readily be perceived that considerable judgment is required to determine the most desirable form for any particular conditions, and that it is only by understanding the principles governing the conditions that a tool to suit them may be at once formed. In Fig. 146 will be found the various forms of boring tools for ordinary use. No. 1 is for use when the conditions admit of a heavy cut on wrought iron. No. 2 is for use on wrought iron when the tool stands so far from the tool post as to be necessarily subject to spring. No. 3 is to cut out a square corner at the bottom of a hole in wrought iron. No. 4 is for taking out a heavy cut in cast iron. No. 5 is for taking out a finishing cut in cast iron when the tool is proportionally stout, and hence not liable to spring or chatter: the point being flat, the cutting being performed by the front corner, and the back part being adjusted to merely scrape. No. 6 is for use on cast iron under conditions in which the tool is liable to jar or spring. No. 7 is for taking out heavy cuts in brass when the conditions are favorable. No. 8 is for brass work, either roughing out or finishing, when the tool stands far out from the tool post, or is slight in proportion to its duty. No. 9 is for taking out a sharp corner in brass work. No. 10 is an end view of No. 7, and No. 11 an end view of Nos. 8 and 9. The tools for wrought iron will answer equally well for steel or for copper.

Fig. 146.

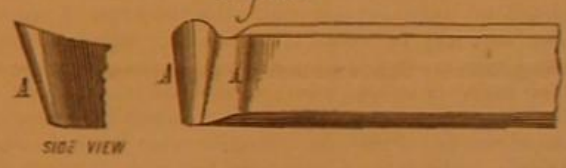


An inspection of all these tools will disclose that the tool point is more rounded for favorable conditions, that is, when the body of the tool is stout, and the cutting edge is not held far out from the tool post; that, to prevent jarring, the point of the tool is made less round, which is done to reduce the cutting surface of the tool edge (since it is apparent that, with a given depth of cut, the round pointed tool will present the most cutting edge to the cut); and that, to further prevent jarring or chattering, the leading part of the cutting edge is ground at an angle; while, as another precaution against that evil, the general form of the tool is varied from that of tool, C, in Fig. 143, towards that of tool, A, in the same figure; while for brass work, no top rake or lip is employed, but the tool is beveled off to suit those cases in which it is liable to excessive spring. It is obvious that the feed may be coarser for a round-nosed than for a more acute tool, and that, the rounder the nose, the smoother the cut (with the same rate of feed) will be.

All boring tools for heavy duty may be hardened right out, that is, not tempered at all, while those slight in form at the cutting edges should be tempered to a straw color.

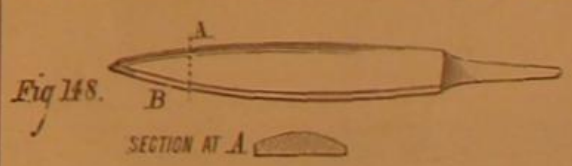
The side faces of the tool marked A, in both views of Fig. 147, may be beveled just sufficiently to well clear the feed of

Fig. 147.



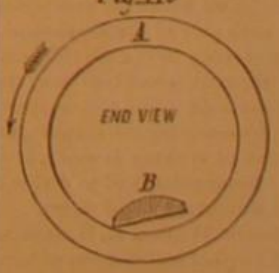
the cut when used on wrought and cast iron, and ground further back, that is, with more angle, for use on brass, especially if there is a tendency to jar or chatter. The straighter, however, these side faces can be kept, the better the cutting edges are supported by the metal behind them, and the longer they will stand without regrinding. When boring light brass work, it is well to hold a brush near the entrance of the hole, to prevent the turnings from flying about the shop; while cutting tools for outside brass work may have a split leather washer forced over the body near the cutting end for the same purpose. After a piece of brass or cast iron work has been bored and taken out of the lathe, and is found on trial to fit a little too tight, it may, if it is difficult to chuck it true again, be eased by a half round scraper, as follows: Take an old half round smooth file and grind the edges at an angle, as shown in Fig. 148, B forming the cutting edge. Then rechuck the work in the lathe as nearly

Fig. 148.



true as possible, and revolve the work at such a speed that the scraper will cut at about 380 feet per minute; then apply the scraper by hand in the position shown in Fig. 149, A A representing the work revolving in the direction denoted by the arrow, and B the scraper shown in section. If the flat face and the beveled edge of the scraper is ground true and even, and care is taken in using it to take out the metal only where required, this tool will perform excellent duty and cut very smoothly. It may be also used to advantage to ease out by hand the narrow places of a hole that is oval, or the small end of one that is taper and requires to be made parallel. The smoothness of its work is much improved by smoothing its edge upon an oilstone. Here it may be well to state that the application of an oilstone to the cutting edges of a boring tool increases its tendency to chatter; if, therefore, a hole requires to be made unusually smooth, the tool must be given less top rake and may then be oilstoned. In many cases a tool may be prevented from chattering by holding it with the fingers as near the entrance of the hole as possible.

Fig. 149

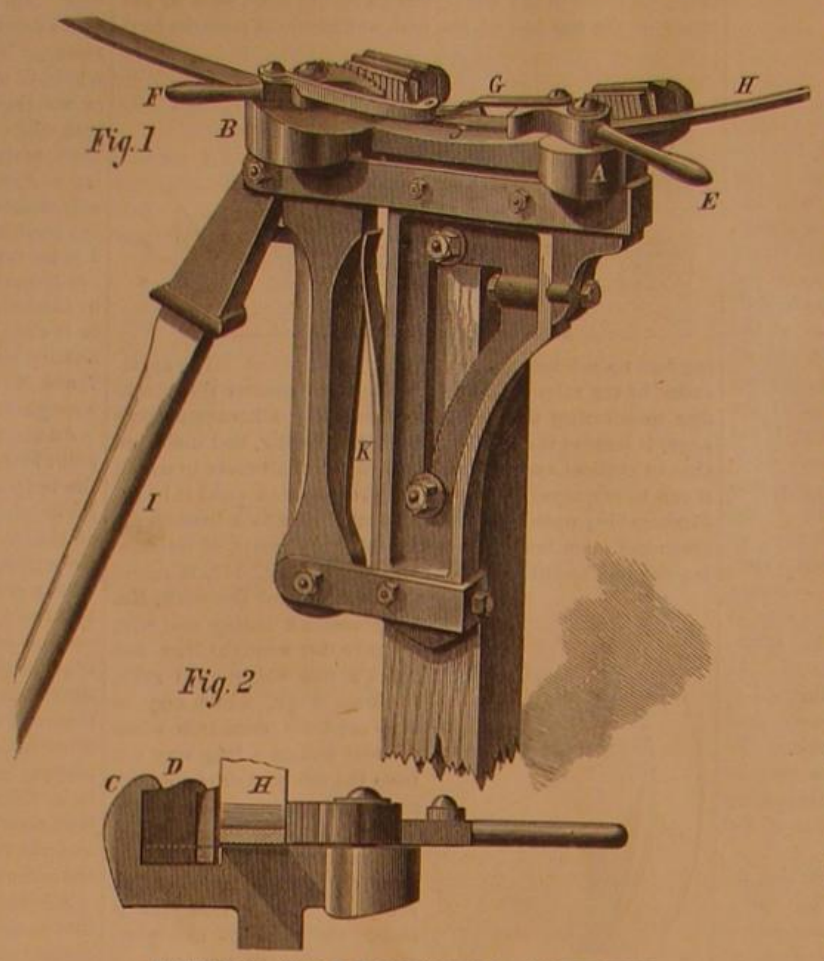


IMPROVED TIRE-UPSETTING MACHINE.

We illustrate herewith a new machine for upsetting or shortening wagon tires or iron bars. It may be operated by one man, and is so constructed as to be capable of doing the heaviest work without danger of breakage or strain in any part. It is quite simple and may be secured on any convenient support.

The stand, which may be of wood or iron, has on each side iron straps, which support the stationary head, A, and guide the hinged head, B. The stationary head is also attached to the end of the stand, and both heads are placed across the bars. C, Fig. 2, is a flange on each head, against which the adjusting blocks, D, are placed. E and F, Fig. 1, are griping jaws, pivoted one on each head, and provided with lever handles. Said jaws are connected by a jointed bar, G, so that by operating jaw, E, the power is applied to the jaw, F. The last mentioned jaw strikes the tire, H, first, griping the same; and the power being continued, the jaw, E, seizes the tire also. The tire being in a heated state, is firmly held between the jaws by the operator, so that it can have no longitudinal motion. With his left hand, the operator then grasps the cam lever, I, and forces the movable jaw and head toward the other jaw. This causes the jointed bar, G, to turn outward on its hinge, and completes the operation of upsetting the tire. J is the anvil, which is fastened between the jaws, and on which the tire rests. As soon as the cam lever is applied, the lever of the griping jaw, E, may be released, so that the right hand of the operator is at liberty to use a hammer in order to press down the tire in case it bends upwards from the anvil, as might occur when the tire is a light one, or to apply both hands on the cam lever, so obtaining a better purchase for upsetting a heavy tire. The back movement of the movable jaw and head is produced by the spring, K.

Patented through the Scientific American Patent Agency, March 10, 1874, by M. Schou. For further particulars address Messrs. Combs & Bawden, sole manufacturers, Freehold, N. J.



SCHOU'S TIRE-UPSETTING MACHINE.

HENNAMAN AND SHAW'S BOILING POT.

The accompanying illustration represents a new cooking utensil for boiling, so constructed that two kinds of vegetables, etc., may be cooked in it at once, without mixing. Housekeepers who find it necessary to economize space on their ranges or cooking stoves, or to whom it is an object to facilitate their culinary operations, will doubtless appreciate the advantages offered. An ordinary iron pot forms the outer vessel. Inside is set a perforated holder, A, in which the articles to be cooked are placed. On each side of the holder

is a vertical flanged groove, and in said grooves is held a detachable perforated diaphragm, B. On top of the latter is hinged a semicircular cover, C. Two kinds of vegetables may easily be prepared, one on each side of the diaphragm, and by turning the cover, C, successively over each side, and holding it with the hand, the separate chambers may be emptied without mingling their contents. The two compartments are easily thrown into one by removing the diaphragm.

In cases where a large amount of cooking is done, it is proposed to make the vessel, A, rectangular, and to divide it into several compartments, by a number of diaphragms.

Patented July 27, 1875, to Messrs. William H. Hennaman and William F. Shaw, Jr. For further information address the last mentioned inventor, 19 South Chester street, Baltimore, Md.

Scientific Apparatus Exhibition.

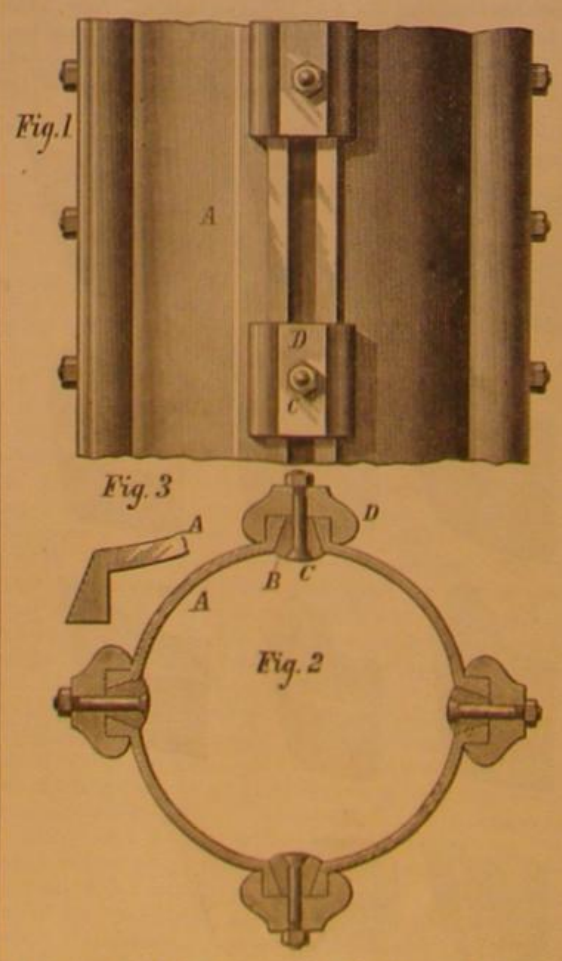
The British government intends to have an exhibition of scientific apparatus, to be held at South Kensington, London, in 1876, the present arrangements being that it is to be opened on April 1. The Committee of Council on Education, Science, and Art Department have just issued a kind of syllabus, indicating the articles that will be admissible. The exhibits are to include such instruments and apparatus as are employed for scientific research, experiment, and pupil teaching. It is also intended to include matters that will illustrate the progress of Science and its technical applications, with others of a more special kind, but of general interest and value. In cases where original apparatus, etc., cannot be sent, models, drawings, and photographs will be admitted. In certain cases apparatus may be arranged in such successive order that the steps of scientific investigation may be readily followed. A valuable provision will be that of, as far as found practicable, systematically explaining and illustrating the use of the apparatus, etc. The committee appeal to those institutions or individuals who possess instruments, etc., of historic interest to lend them. The entire exhibition will consist of eighteen sections, embracing arithmetic, geometry' measurement, kinematics, statics, dynamics, molecular physics, sound, light, heat, magnetism, electricity, astronomy, applied mechanics, chemistry, meteorology, geography, geology and mining, mineralogy, crystalography, etc., and biology. Instruments representing each of these subjects will be shown. The committee selected to carry out the object of the exhibition embraces some of the most eminent men in each department above named, the engineering branch being specially well represented.

IMPROVED METALLIC COLUMN.

What with the extension of one elevated railway already in existence, and the construction of new ones in New York city (these projects being most favored just now as the solutions of the rapid transit problem, and hence there being a fair probability of their being undertaken) the attention of engineers will ere long be directed to the determination of the simplest and strongest methods of erecting such structures. Iron, in most cases, will be the material employed for the supports of the raised track, so that we may expect that all the various modes of building hollow columns of that metal, now in existence, will be subject to careful scrutiny, and perhaps to actual tests for strength, etc. The invention which we illustrate, in the annexed engravings, belongs to the above category, and therefore possesses a timely interest. It is a new segmental metallic column which is both simple and strong, and offers exceptional facilities for splicing. A perspective view is given in Fig. 1, and transverse sections in Figs. 2 and 3. The sides of the column consist of four or more rolled plate segments, A, having a flange on these outer edges. These flanges, as shown in Fig. 3, are thicker at their outer portions than at their bases Their inner sides are straight and outer sides be veled. When two of the segments are brought together to form a column, wedge-shaped blocks, B are placed between the beveled sides of the flanges, so as to hold the segments a suitable distance apart. Headed screw bolts, C, are then passed outward through the blocks, between the flanges, and through clamps, D, Fig. 2, which fit over and entirely cover the flanges on the outside. By screwing up the nuts, the wedges, B, are drawn in between the segments so as to force them apart and thus cause the clamps, D, to grasp the sides of the flanges, holding them very firmly together. In order to save the material, the wedges may be made as short as possible, while the clamps may either be constructed the full length of the column, or in short sections like the wedges. By properly clamping over the main body of the column, one of the segments may be removed, when the structure is in position in a bridge or building, so that the interior of the column may be painted as often as is necessary.

Splices may very easily be made by allowing the clamps to extend from ten to twelve inches beyond one set of segments in order to grasp the flanges of another set. The clamps are rolled, and the wedges are castings. In putting a column together, the wedges are all attached to the clamps with nuts slack, then slipped lengthwise over the flanges, when the nuts are finally tightened.

Patented August 31, 1875. For further particulars address the inventor, Mr. Charles H. Leidy, Norristown, Pa.



THE GRANGE FARM MILL.

To save one tenth of all the grain used on a farm or in a stable is no small economy; but the inventor of the device illustrated herewith believes that such saving may be effected through the use of a simple and well made mill (properly actuated by horse, wind, water, or some other cheap power that is everywhere available) for grinding the corn, oats, barley, and other cereals fed to the cattle and horses. Such a mill, suitable for all such purposes, he claims to have produced. Its form and construction will readily be comprehended from the illustration, rendering detailed description unnecessary. It is strong and compact, and is provided with a conveniently located driving pulley, to which the power is applied. The grinding plates are self-sharpening and will last a long time, costing but little to replace when worn out.

The inventor adds that any one having any kind of power at his command will find the mill a good source of income, if the machine be used for grinding wheat for others. Any one owning a horse which is idle a portion of the time might thus utilize the animal for light and profitable labor.

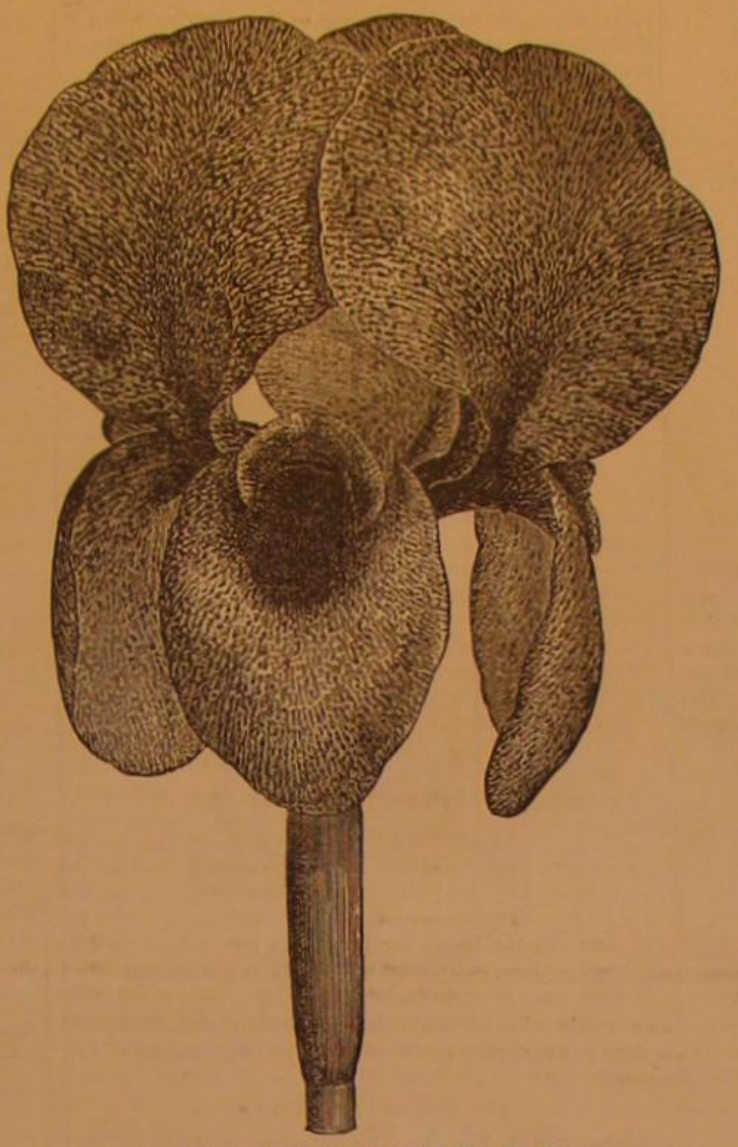
Patented through the Scientific American Patent Agency For further information and for mills, address Mr. H. H. Swift, Millbrook, N. Y.

THE GREAT SPOTTED IRIS.

The family of *iridaceæ* are renowned for their graceful beauty, from the wild iris, commonly called blue flag (*fleur de luce, fleur de Louis*, the armorial device of the kings of France since Louis VII.'s time) to the great spotted iris, of which we herewith give an engraving. The *iris versicolor* is a widely distributed plant, its flowers (on stems sometimes 3 feet high) being visible in damp places in early summer; the root of this plant is diuretic and cathartic, and is prepared for medical purposes by some pharmacists. There is also a yellowish or reddish brown species, *i. cuprea*, common in Illinois and other States. The well known orris root of the drug stores is the product of *i. Florentina*, *i. pallida*, and *i. Germanica*, which grow wild in Europe.

Iris susiana, the mourning iris, as it is sometimes called, has flowers very large in size, dotted, and striped with purple on a gray ground. In northern climates it needs to be protected in winter. Being one of the very finest of the genus, it will well repay the amateur for his care and attention; and it is readily hybridized, many varieties having been produced which are only locally known and have never been classified by botanists. Another kind well worth attention is the *iris Persica*, the blossom of which is of a pearly white hue, exhaling a very delicate perfume. This latter is well adapted for indoor growth.

Our engraving shows an unusually fine specimen of *i. susiana*, grown in the gardens of the Archbishop of Canterbury, England; but the blossom is three times as large as we have represented it. The best way to grow these beautiful flowers is in a large isolated bed, oval or circular in outline. The soil should be rich and open in texture, and well drained, for the sake of a few of the more delicate species; most of the kinds grow freely enough in stiff, coldish soil. The plants vary in size from *i. pallida* and *i. ochroleuca*, 3 or 4 feet high, down to some not 6 inches high, as *i. cristata*. They vary strikingly in color and markings too, so that an attraction of no mean order is a well planted and well arranged mass of irises alone. A few of the finer lilies, however, may be placed among them with good effect; and round the margins, in early spring, bulbous flowers may be dotted.



THE GREAT SPOTTED IRIS.

Rokitansky's Farewell Address.

On the 16th of July the distinguished anatomist and pathologist Rokitansky delivered, in the University of Vienna, his valedictory address before retiring from the professorship. It is a vigorous and thoughtful production, rich with the wisdom of wide experience. He entitles it his "Legacy to his Scholars." Various questions of the day are touched upon. One of his warnings is against admission of woman to equality with man; another, against an excess of competition in life; and a more urgent one, against modern individualism, which shows itself in the ruthless pursuit of personal objects, and in the readiness with which the ethics of the day excuse all manner of wrong-doing, out of a misplaced sympathy, or a belief that nothing is in itself bad.—*Medical and Surgical Reporter.*

CUPRESSUS NUTKAENSIS.

The northwestern shores of this continent, especially in the vicinity of Nootka Sound, Observatory Inlet, and the Island of Sitka, are the exclusive habitat of this remarkable species of cypress. When the late Dr. Fischer first saw it, he noted it down as a *thujopsis*, so much does it resemble that genus in habit and foliage. Later authors, however, prominent among whom is Mr. Gordon, have determined that the tree is most properly classed among the *cupressineæ*, in the sub-order *chamæcyparis*, which is distinguished from *cupressus* proper by having only two seeds under each scale of the cone, whereas the true *cupressus* has several. In St. Petersburgh the young plants have been raised in the open air, a sufficient indication of their hardiness. Under favorable conditions, the tree attains in its native habitats a hight of 80 to 100 feet, with a bole of over 4 feet in diameter, perfectly straight, and covered with a smooth, soft, dark colored bark. The branches spread very much, and are sub-divided into a vast number of smaller pendent ramifications, which in old trees are thickly covered with a highly aromatic resinous exudation. The leaves, in shape, arrangement, and color, bear a remarkable resemblance to those of *thujopsis*, being a little brighter, perhaps, and with somewhat less of bluish reflection. The cones (of which we give an illustration) are solitary, almost sessile, or borne on very short stalks, and are covered with a glaucous pubescence; they are about the size of large peas. If a twig or branch of this tree is broken or bruised, it exhales a very powerful balsamic odor, and the wood, which produces white and soft timber, also yields in great abundance a very aromatic gum, which, in its appearance and scent, has a strong resemblance to Canada balsam. The tree is, on account of this property, known on the continent as the *sapin aromatique*.

CONES AND LEAVES OF CUPRESSUS NUTKAENSIS.

CALADIUM CULTURE.

The caladium is undoubtedly one of the most ornamental and attractive of our fine foliaged stove plants, and few convey a better idea of the luxuriance and splendor of tropical

CALADIUM BELLEYMEI AS A VASE PLANT.

undergrowth to those who have never been in tropical regions. This plant is not difficult to grow to perfection if it is treated liberally, and care taken to prevent the plants getting a check at any time, which is almost certain to arrest the development of the leaves before they have attained their full size; and no satisfactory growth is made after that. The roots should be shaken out carefully about the beginning of March, and the largest selected and potted, two, three, four, or more in a pot, according to the size of the bulbs and the variety. Large single roots of *c. esculentum* will sometimes require a 12 or 14 inch pot at the first; while the little argyrites, when grown for neat specimens, will only want a 3 or 4 inch pot for a number of its little bulbs at the first shift. The pots should be carefully crocked, but not too deeply, and a soil consisting of two thirds light turfy loam, one of well rotted leaf mold and cow dung, and a considerable addition of silver or common clean river sand, according as the loam is light or heavy, will suit them well. The bottom layer of soil may be made moderately firm with the fingers; but, on the whole, they should be rather loosely potted, seeing that long fleshy roots, that give massive leaves and not flowers, are what should be encouraged. After potting, they should be plunged in a bottom heat of about 75°, to begin with, in a stove or warm pit, and very slightly watered at first—or, indeed, not at all for a time, if the bulbs have been dried off during the winter, in which case they are exceedingly apt to rot off as soon as committed to the moist soil again. The roots will grow faster than the leaves at first; but when the first leaves do appear, the plants may be copiously watered, for, though the caladium is not an aquatic, it delights in abundance of moisture. As regards top heat, a general and moist stove temperature will suit them well, according to the season of the year, and they must be kept in a good light, not far from the glass, and subjected to a free circulation of warm air, and shaded carefully on sunny days with thin canvas.

In potting, see that the roots are not disturbed in the least; only remove the crocks. Pot carefully, leaving plenty of room for watering, and restore the plants to their former quarters, until they have got established, when they may be moved into the plant stove or house where they are to be displayed during the summer. Here they must not be neglected, or be allowed to become dry or shaded; they must have room, light, and air, and frequent waterings with weak liquid manure. With this treatment they will grow apace. Any flowers they throw up must be pinched out at an early stage, faded leaves cut off, and everything done to keep up and prolong a vigorous growth until the plants show a natural disposition to go to rest in autumn.

THE FLAMINGO PLANT.

At a recent exhibition of the Royal Botanic Society, a vigorous specimen of the flamingo plant, *anthurium scherzerianum*, bearing four remarkable large spathes, was exhibited. Our illustration, sketched at the time when it was exhibited, will give our readers some idea of the appearance of this large-spathed variety, which, for healthy luxuriance, we have never seen exceeded. The broad flat spathes were fully 5 inches in length and 4¼ inches in breadth, and attracted much attention. In color these spathes were not so brilliant as those of some of the other varieties exhibited on that occasion; but perhaps spathes produced under more favorable circumstances, as regards weather, may be brighter. Like all other cultivated plants raised from seed, this anthurium is very variable in color; and this variety is now augmented by the introduction of a whitish-spathed kind.

THE FLAMINGO PLANT.

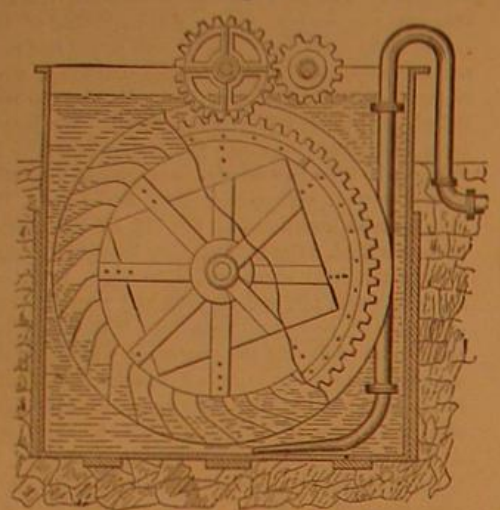
ATMOSPHERIC MACHINERY.

The various inventions below described, selected from Knight's "New Mechanical Dictionary," published by Messrs. J. B. Ford & Co., of this city, have been grouped together as devices in which the atmosphere is, by some means, brought into employment. In one case it is used as a means of transmitting power, in another it is mingled with steam, adding to its expansive force, and so through quite a variety of interesting instances.

CALLES' AERO-DYNAMIC WHEEL.

This is a curious invention, by which compressed air is

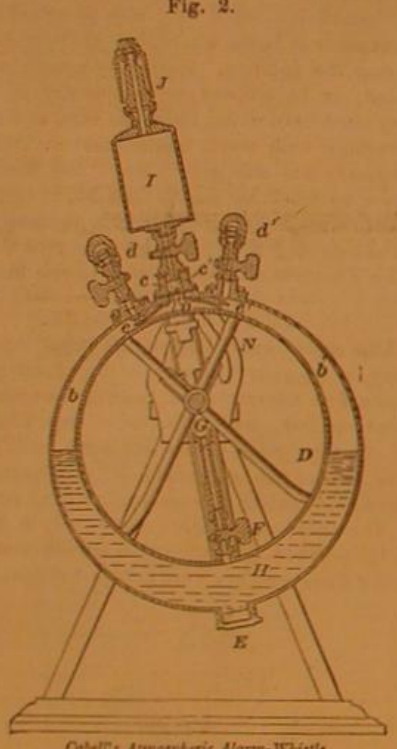
Fig. 1.



Calles's Aero-hydro-dynamic Wheel.

made to transmit the power. It consists mainly of a wheel, Fig. 1, fitted with buckets, similar to those in any ordinary water wheel and completely immersed in a tank filled with water. The wheel carries a toothed inner rim which works a pinion on the transmission shaft. The air is introduced under the bottom of the wheel, through a curved pipe. The air thus blown into the buckets has naturally a tendency to

Fig. 2.



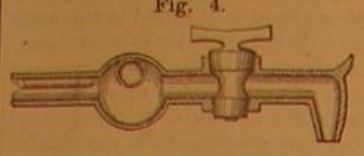
Cabell's Atmospheric Alarm-Whistle.

gain the surface of the water with a force equivalent to the weight of displaced water, and this upward tendency causes the rotation of the wheel, and at the same time brings back the discharged buckets successively before the pipe orifice. In a practical test of this invention, it was found that 83 per cent of the power of the 9½ horse power blowing engine was thus transmitted to the wheel, and this through a pipe 510 feet long having 14 elbows.

CABELL'S ATMOSPHERIC ALARM WHISTLE,

represented in Fig. 2, is used as a nautical alarm to warn ships from shoals or dangerous coasts. It is sounded by the alternate eduction and induction of air from and into an annular chamber, which is partially filled with water, and oscillates by the motion of the vessel, assisted by other power, if necessary. The motion may be made to work an air pump to increase the energy of the blast, or its effectiveness may be augmented by gas, generated by chemical means in the chamber. The chamber, D, has air spaces, *bb'*, communicating by valve, *c c'*, on each side of the dividing plate, *a*, with the blast whistle, J. *d d'* are vacuum whistles, which act alternately as the chamber sways in one direction and the other, supplying air to that side of the chamber which is abandoned by the water. The funnel, G, is the means of supplying the chamber, D, with water.

Fig. 4.

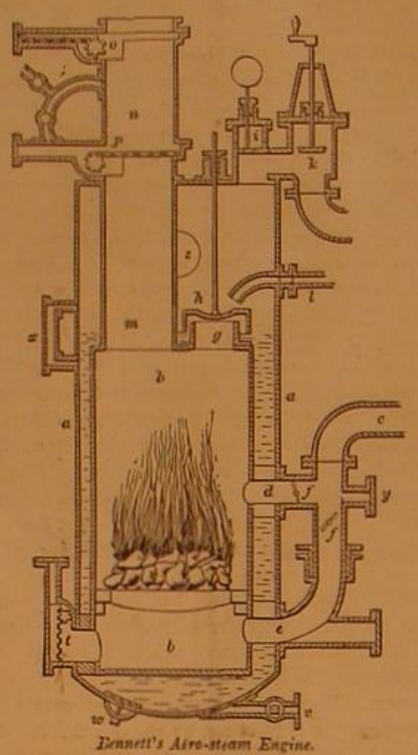


Bevan's Air-Cushion for Pipes.

HAGUE'S ATMOSPHERIC HAMMER,

shown in Fig. 3, is so constructed that the helve of the hammer is raised by the pressure of the atmosphere beneath a piston above the helve, the air being exhausted from above the piston by means of a pump. The hammer falls by its

Fig. 5.



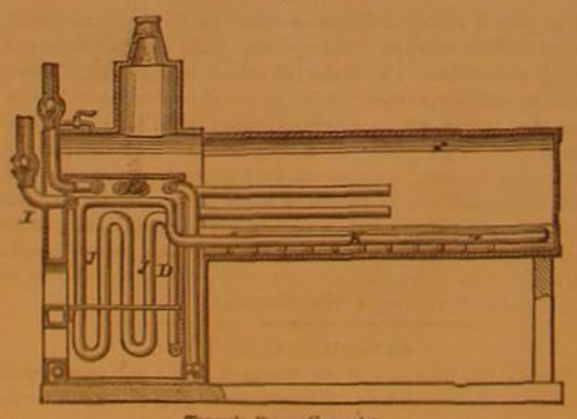
Bennett's Aero-steam Engine.

own weight when air is admitted above the piston. This last is done automatically on the piston reaching the end of its up stroke. An

AIR CUSHION FOR PIPES

is represented in Fig. 4. The object is to avoid the jar

Fig. 6.



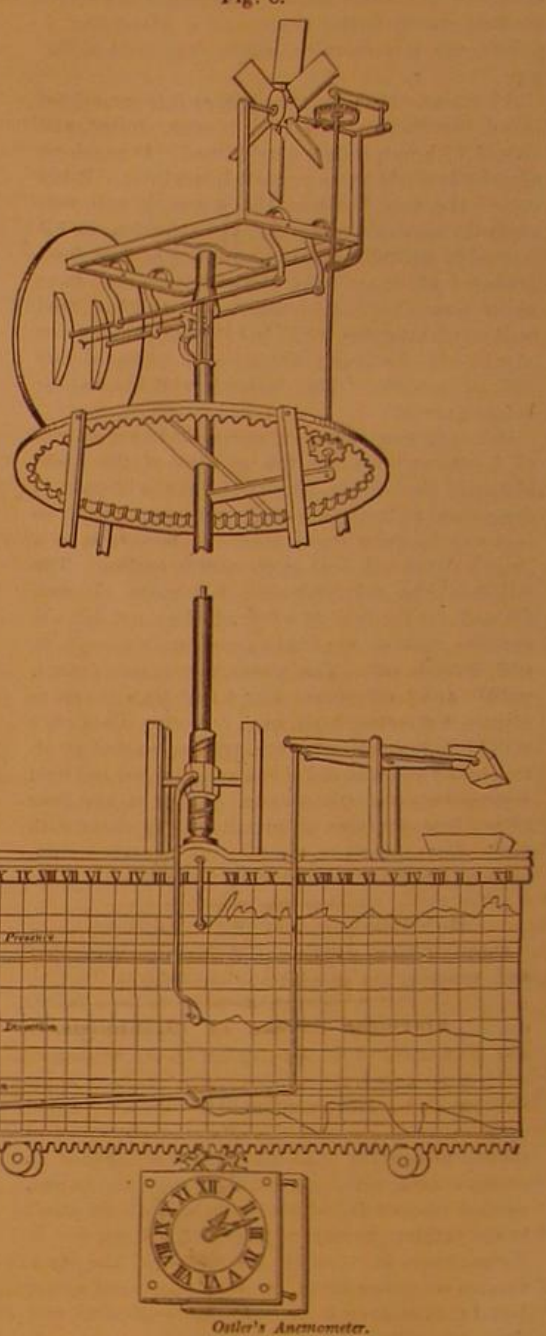
Tanger's Steam-Generator.

which occurs when a column of water in motion is suddenly arrested. As a means of imprisoning the air which is gradually absorbed in the water, and thus allowing the latter to contract and expand when the jar comes, a ball of india rubber is inserted in the pipe. The sack or ball is placed in an enlargement of the pipe and so gaged as not to stop the flow. A continuous tube, of the same material and containing air, is also arranged in the water pipe.

AERO-STEAM BOILERS.

Bennett's aero-steam boiler, which is represented in Fig. 5, is so constructed that an incoming charge of air is conducted to the furnace and made the means of maintaining combustion under pressure. The furnace is airtight, and the volatile results pass through the steam boiler, are washed

Fig. 8.

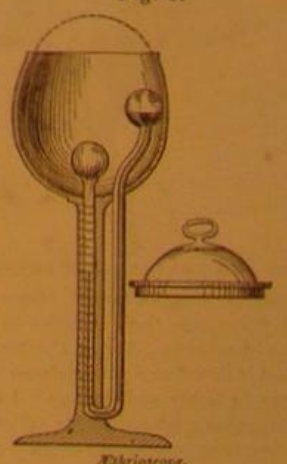


Ostler's Anemometer.

and pass fully saturated to the cylinder. The expansive power of combined heated air and steam is, therefore, used to drive the piston. *a* is the outer shell of the boiler. *b* is a cylinder forming the fire box and ash pit, placed therein and entirely surrounded by water. The tube, *c*, is connected to a blower, and has two branches, one, *d*, admitting air to the fire box, the other, *e*, to the ash pit. *ff* are dampers in each branch. The smoke and heated air escape by the passage, *g*, which is covered with a valve, *h*, so that the gases, etc., are compelled to pass through water, thus becoming washed. *k* is the pipe leading to the engine. *l* is the feed water pipe. *m* is the fuel pipe, having a hopper, *n*, and closed by two valves, *o* and *p*. When the engine is set to work, it forces air into the furnace both above and below the fuel at each stroke, which, having no vent to escape but at the valve, *h*, accumulates in the furnace until its pressure somewhat exceeds that of the steam upon the valve, *h*, when the latter is lifted and, the hot air, as before described, mixes with the steam.

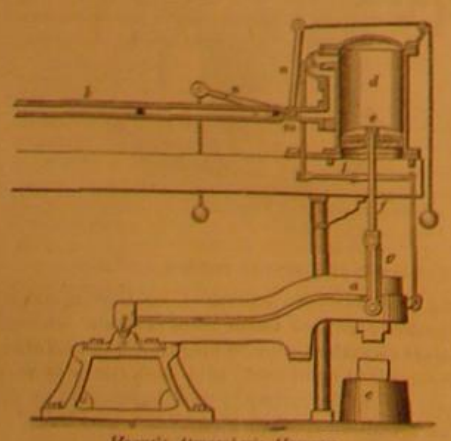
Tanger's steam generator is represented in Fig. 6. The air is injected into the pipes D and I, by means of a force pump, and, after being heated while passing through the convolutions of the

Fig. 9.



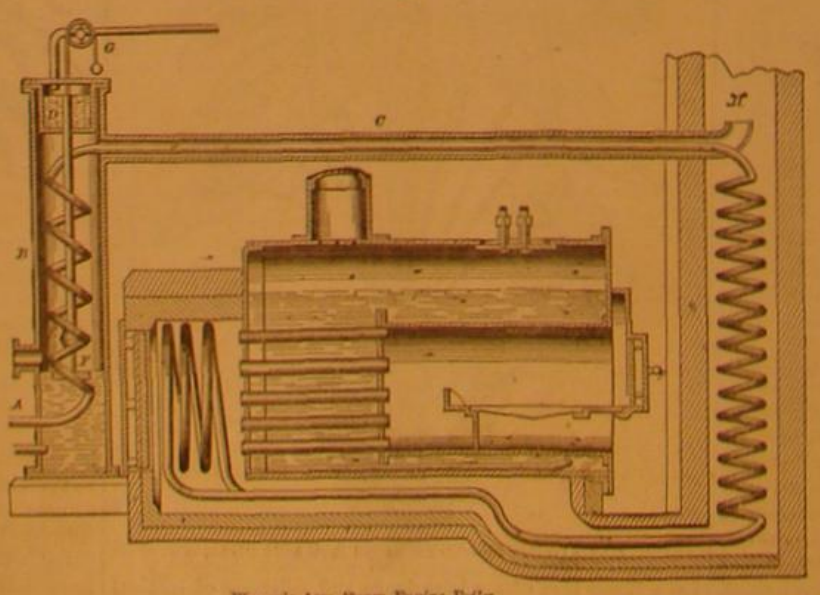
Æthrioscope.

Fig. 3.



Hague's Atmospheric Hammer.

Fig 7.



Warsop's Aero-Steam Engine Boiler.

pipes, F and J, is forced into the boiler by nipples, as shown at K.

Warsop's aero-steam boiler, shown in Fig. 7, is started by steam in the ordinary manner. A single-acting air pump, worked from the crank shaft, compresses air to a little more than the boiler pressure. The air then passes through a long circuit of straight and coiled pipe, which traverses the exhaust conduit, makes several spiral coils in the chimney, then descends at one side of the fire box, is exposed to the full fire, and finally passes by a valved opening into the boiler at the bottom of the water space. The air escapes into the water through perforations in the pipe.

Fig. 8 represents

OSTLER'S ANEMOMETER,

an instrument intended to measure the force of the wind, and hence one of the most necessary aids to the meteorologist. The device is considered to be one of the most perfect yet invented, as it not only denotes changes in the force and velocity of the wind, but keeps a record of the same. The essential part is a plate, having its face constantly presented to the wind, by a set of vanes, at right angles to it. The force of the wind on the plate causes it to move an arm carrying a pencil, which makes a mark on a sheet of paper especially ruled for the purpose, having separate compartments for registering the force and duration of the wind, and a third to show the amount of rain. The paper is slowly moved by clockwork. The pencil approaches or recedes from the edge of the paper, as the wind varies in force, while a similar pencil attachment, to an arm connected by a spiral worm and nut to the guide vanes above mentioned, registers the direction of the wind in the center compartment. The rain gage is attached to a bent lever, also carrying a pencil, which is drawn toward the center of the paper as the gage becomes filled with water, thus indicating the amount of rain. When the gage is completely full, it tilts, empties itself, and the record commences afresh.

THE AETHRIOSCOPE

is another meteorological instrument, and is designed for measuring the degrees of cold arising from exposure under different conditions of the sky. As represented in Fig. 9, a highly polished metallic cup or concave mirror is placed upon a pedestal, and a differential thermometer is arranged within it, so that one of the bulbs of the thermometer shall be exactly in one focus of the mirror. The other bulb, being not in either focus, is not affected by the pulsations, the effects of which on the cup are concentrated upon the first bulb, the air in which being suddenly contracted upon its exposure to a clear sky, the liquid in that branch of the stem is caused to rise. The cup is kept covered with a metal plate, except at the moments of observation.

Alarming Spread of Trichinosis.

The *Transactions* of the Indiana State Medical Society, 1875, contain a report on trichinosis, by Dr. George Sutton, of Aurora, Ind., which contains the following alarming observations:

From microscopic examination of pork killed in Southeastern Indiana, we have found from three to sixteen per cent of the hogs affected with trichina, the number of hogs diseased varying greatly in different localities.

"That over five millions of hogs are slaughtered and packed in the Western States, not including those which are put up for family use by the farmers: that if four per cent of this pork is diseased, which we believe to be a low estimate, we have two hundred and twenty-one thousand four hundred and eighty-four diseased hogs put annually upon the market; or, at an average of two hundred pounds to the hog, forty-four millions two hundred and ninety-six thousand eight hundred pounds of diseased meat, every ounce of which, under favorable circumstances, is capable of producing disease.

"That from the cases of trichinosis that came under our observation, and the *post mortem* examinations, and the effects upon the dog that was fed on the diseased meat, we have come to the conclusion that ninety per cent of disease produced from eating trichinous pork appears either as gastro-entiritis, or as a diarrhœa or dysentery, and not more than ten per cent as the fully developed form of trichinosis, in which the muscular system becomes affected.

"That as diarrhœa, dysentery, and enteritis rank high as causes of mortality in the United States, these diseases causing thirty-one thousand one hundred and fifty-three deaths in 1870, as shown by the last census reports: and as we have seen that a large amount of trichinous pork, capable of producing these diseases, is among the principal articles of food in our country: we think it more than probable that trichinæ have a much greater influence in the etiology of this class of diseases than has been recognized by the profession.

"That it is highly probable that, when the fact becomes more generally known that so large a percentage of pork is swarming with trichinæ, capable of producing disease, it may have an effect upon the use of this meat, and consequently affect the sale, to some extent, of one of the principal articles of commerce in the West."

Sight from Science.

Dr. Wm. Hunt, in the Philadelphia *Medical Times*, says:

"A man recently walked into my office with a freedom that suggested nothing about eyes, and said: "Are you Dr. Hunt? I have never had a good look at you, and wish to see you. I am here on business, and am going away to-night. I owe you much, and will never forget you; but may be you can do something more for me. Do you remember S——, of Illinois, upon whose eyes you operated at Wills Hospital in 1858?" I said, "Certainly I do." "Well," said he, "I am the man." Now, I am not going to relate here an ordinary case of successful cataract operation; but the history is this. S. was the son of a farmer; was fourteen years old when he was brought to Wills. He was practically blind from birth. There is some discrepancy in statement as to the early condition of his eyes; but, at all events, he had no recollection of ever having seen. He was healthy in other respects; had never been to a school for the blind, but was bright, as people usually are who have to feel their way through the world. Dense white capsular cataracts occupied the pupils of both eyes. There was great nystagmus or oscillation of the eyeballs. The boy was etherized, and I performed extraction, making the corneal incisions with a lance-shaped knife, and removing the cataracts with the fine hooks and forceps of the eye case.

The bodies of the lenses, if there had ever been any, were absorbed, as the opaque material seemed to be merely thick membranous substance.

The boy did well, the wounds healing nicely: but when we exposed him to light we found that we had a veritable Casper Hauser to observe! He was a grand confirmation of touch being the master sense, and the only one by which we originally establish our relations with the external world.

He could have given a direct answer to the question of Molyneux to Locke: "Whether a blind man who has learned the difference between a cube and a sphere by the touch can, on being suddenly restored to sight, distinguish between them by the aid of the newly acquired sense only?" Locke answered, theoretically: No! S. answered, practically and decidedly: No! He obtained no knowledge at first, by the eyes, of shapes, distances, sizes, extension, or consistence of objects; of color, of course, he had no idea. Everything, distant or near, appeared to be striking against him, or to be within him. Restrain his arms and hands, and he stumbled about worse, if anything, than before he was operated upon. Encouragement would cause him to move with care, but he was very much afraid. In fact, his sensations were more painful than pleasant, notwithstanding the good promise of the operation. He had to learn as a babe learns, who, in early life, grasps with equal confidence for the moon or its mother's breast. Its early days are occupied with a constant automatic struggle in correcting, by the touch, the deceit of the eye. By-and-by experience settles the question, and it soon gives up its vain endeavors.

The nystagmus in S. continued, and doubtless added to his confusion of vision. In this condition his father took him home. I heard of him now and then as making some good progress, and then lost all knowledge of him. And now, on the 3d day of December, 1874, he walks into my office. His sight is good for all ordinary purposes; the nystagmus is gone, he distinguishes shapes, sizes, distances, and color without difficulty. He told me he was a long time in learning how to see, and at eighteen he went to school and learned to read with ease.

Dear me! when will people be satisfied? I said in the beginning of this note that he wanted me, if possible, to do something more for him. Well, he said he was in winter a herder on the prairie, and he now could not see a horse more than half a mile off, and he would like some far-reaching glasses so as to be able to take in six hundred head of cattle at once!"

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

In washing calicoes in which the colors are not fast, be careful not to boil them; but wash in the usual way with soap, and rinse in hard water. For dark colored goods, add a little salt to the water; for light, a little vinegar.

In tempering long taps, to keep them straight, take a bucket of clean water and stir it around with a stick or hammer handle until a center is formed; then plunge the tap, already heated, endwise in the center, allowing it to cool before taking it out of the water.

The following is a simple but sure way to tell good from bad eggs: Put them in water enough to cover them. All that lay flat, as they would on a smooth surface out of water, are good. Those of which the big end rises are bad. The vessel used should have a smooth, level bottom.

In cases of a sudden jar, knock, or jam of the hand or fingers, immediately after the blow press the injured part, with the uninjured hand, say between the thumb and forefinger, and gradually let up on it. It will nearly always remove the pain, and generally any swelling, that might occur under the circumstances.

In making whiffletrees, they will be stronger if the front side of the whiffletree is nearest the heart timber and the back side toward the bark; they will retain their shape longer if the timber be split in this direction, across the grain of the wood.

DECISIONS OF THE COURTS.

United States Circuit Court.—Southern District of New York.

PATENT COTTON BALE TIE.—CHAS. G. JOHNSEN *vs.* IRA BRARD.

[In equity.—Before WOODRUFF, Cir. J.—April, 1875.]

[This was a suit in equity for an alleged infringement of letters patent of the United States for bale ties, granted to Charles G. Johnsen as assignee of Charles Swett, May 7, 1872. This patent was a reissue of an earlier patent granted the same patentee October 23, 1866 (antedated April 23, 1866) upon an application originally filed in the Patent Office in the year 1866. At the time of the reissue the drawing was amended to conform to the model as it then was. The defendant in the suit set up that this change was unwarranted and vitiated the patent.

A duplicate of the model conforming in all essential particulars to the drawing of the reissue, and certified to by the Commissioner of Patents several months subsequently to the date of the reissue, was put in evidence by the complainant.

After the proofs were closed the defendant moved to open the record for the introduction of testimony to prove the condition of the model at the time when it was filed in the Patent Office, as well as at the time of the grant of the original patent, it being alleged in support of the motion that the defendant had discovered, after the proofs were closed, that the model had been changed after its filing in the Patent Office, and that, originally, and even as late as October 23, 1866, it was in the condition shown in the drawing of the original patent.

This motion first came up in an interlocutory proceeding, and, after argument by counsel, was denied upon the ground that the essence of the allegation was fraud in the grant of the reissue, and, in a collateral proceeding like a suit for infringement, the question of fraud could not be inquired into.

When the case came on for final hearing, the motion was renewed. The question having been argued at considerable length, the court took it under advisement and rendered a decision in favor of permitting the introduction of testimony as to the condition of the original model.

The parties thereupon stipulated, for the purposes of the suit, a state of facts regarding the former condition of the model, and the case proceeded to a final hearing.

The conclusions of the court were expressed as follows:

WOODRUFF, Cir. J.:

My conclusions in this case are, first, that Charles Swett, the person named in the bill of complaint as assignee of the complainant, and therein alleged to be the inventor of the invention and improvement for which the letters patent therein mentioned were issued to the complainant, was not the inventor of any tie or mode of fastening cotton bale ties made or used by the defendant herein; nor any tie, buckle, or method of fastening cotton bale ties which is substantially the same in construction, or operating in substantially the same way as the ties made and used by the said defendant.

Second, that neither the original patent issued to the said complainant on the 23d *day of October*, 1866, upon or for the alleged invention of Charles Swett, in the said bill of complaint mentioned, nor the specification annexed thereto, nor the model of the alleged invention, nor any record of such invention in any manner shows, claims, intimates, or suggests a tie or method of fastening cotton bale ties which is substantially the same in construction or operates in substantially the same way as the tie made or used by the defendant herein.

Third, that the practicability of employing the tie or method of fastening made and used by the defendant was not conceived by the said Swett, nor by the complainant until after the said original patent was issued, and was borrowed from the suggestions of other parties.

Fourth, that if the reissued patent granted to the complainant dated *May* 7, 1872, and the claims made in the specification annexed thereto, must be construed so as to include (as the patented invention) the tie or method of fastening used by the defendant and called the "Eureka tie," such reissue is invalid.

Fifth, that the defendant has not, by making, selling, and using the said Eureka tie, infringed any right of the complainant, and such making, using, and selling is no infringement of any exclusive privilege legally vested in the complainant, or to which he is in any manner entitled.

The statement of these conclusions is sufficient to enable counsel to prepare a decree in such more technical or specific form, if any, as may be proper.

The state of my health forbids that I should attempt an elaborate discussion of the various points very ably presented by the counsel for the respective parties.

Let the bill of complaint be dismissed with costs.

[*Samuel A. Duncan* and *Geo. Gifford*, for complainant.
J. H. B. Latrobe and *Geo. Harding*, for defendant.]

United States Circuit Court.—Western District of Pennsylvania.

RIGHTS OF PATENT ASSIGNEES.—HENRY C. MEYER, FREDERICK E. SMART, AND SAMUEL J. SNIFFEN *vs.* GEORGE C. BAILEY AND S. A. BAILEY.

[In equity.—Before McKennan, Cir. J.—Decided May Term, 1875.]

1. An assignee, under the patent act of 1836, is one who has transferred to him in writing the whole interest of the patent, or an undivided part of such whole interest, in every portion of the United States.

2. A grantee is one who has transferred to him in writing the exclusive right under the patent to make and use, and to grant to others to make and use, the thing patented, within and throughout some specified portion of the United States.

3. If a part of the whole patent has been vested in another, so as to constitute him an assignee within the meaning of the statute, an efficacious surrender can be made only by the concurrence of both of the owners of the patent; but this may be manifested by the assignee by his direct cooperation in the surrender, or his subsequent ratification of it.

4. The owner of an exclusive territorial right under a patent may ratify a reissue thereof in which he did not join, by making an assignment under such reissue.

5. It is not essential to the validity of a reissued patent that a transferee of an interest in the original patent, who is not an assignee within the meaning of the statute, concur in the surrender.

6. Nor is it necessary to aver in a bill brought under a reissued patent that the grantee of a territorial right acted with the patentee in the surrender of the original patent or concurred in the reissue thereof.

7. M., the patentee, assigned the State of Pennsylvania to B., and afterward reissued the patent. Subsequently to the reissue, B assigned his title to an interest in the State of Pennsylvania, except as to certain counties, under the reissued patent, to the complainants, who, under the title thus acquired, filed a bill in equity against the defendants. Defendants demurred on the ground that B.'s interest was outstanding at the time of the surrender and that he did not appear to have been a party to or to have assented to or approved of the surrender, and therefore the reissue was void: Held, that B. was not an assignee within the meaning of the statute, and therefore it was not necessary for him to concur in the surrender in order to give validity to the reissue.

8. The bill sets out complainant's title to the exclusive right, title, and interest under the patent, to the State of Pennsylvania, excepting certain counties, and then avers that the defendants "are now constructing, using, and vending" the infringing goods * * * in the western district of Pennsylvania," concluding the averment as follows: "All of which acts and doings are in violation of the exclusive rights and privileges, so as aforesaid vested in your orators, under and by virtue of the said recited reissued letters patent." Held, that these averments, taken in connection with statement of complainants' title, necessarily import a charge of infringement after the grant to the complainants; and, also, within the territory covered by the grant.

This was a bill in equity to restrain the infringement of letters patent granted to John G. Murdock, on the 26th day of May, 1868, for improvement in hydrants, and reissued May 11, 1869.

Murdock, on the 18th of September, 1867, assigned the full and exclusive right for the State of Pennsylvania, under the original patent, to one Augustus Buerkle. Subsequently, on the 11th day of May, 1869, Murdock surrendered the original patent and received a reissue thereof. On the 27th day of January, 1875, Buerkle assigned the entire title to and interest in the State of Pennsylvania, under the reissued letters patent, excepting certain counties, to the complainants.

George C. Bailey, one of the respondents, demurred to the bill on three grounds, which are fully stated in the opinion.

The case came up on the demurrer, which was overruled by the court, and the defendant was ordered to answer.

[*W. Bakewell* and *T. B. Kerr*, for complainants.
G. H. Christy, for respondents.]

NEW BOOKS AND PUBLICATIONS.

EXPLORATION OF THE COLORADO RIVER OF THE WEST AND ITS TRIBUTARIES, Explored in 1869, 1870, 1871, 1872, under the Direction of the Smithsonian Institution. Washington, D. C.: Government Printing Office.

This very handsome volume is one of the most important contributions to our national geography which has yet been made. The exploring party, under the direction of Professor J. W. Powell, have done their laborious but interesting work with thoroughness; and the narrative, kept in the form of a diary, is written with care and minuteness, and in a facile and agreeable style. The illustrations are striking, the grandeur of the subjects being almost unparalleled, and are very well executed: the "Bird's Eye View of the Grand Cañon" being a most successful piece of drawing. We should be glad to hear that this book, which has been printed by direction of Congress can be obtained by the public at a moderate price.

A MANUAL OF METALLURGY. By William Henry Greenwood, F.C.S., Associate of the Royal School of Mines, etc. Volume II. Illustrated by Sixty-seven Engravings. Price $1.50. New York city G. P. Putnam's Sons, Fourth avenue and 23d street.

This volume completes a very excellent treatise, on a subject which has not hitherto been dealt with in a popular manner, the first part of which has already been noticed in these columns. We commend the whole manual to scientists, teachers, and students.

LOCKWOOD'S DIRECTORY OF THE PAPER MANUFACTURERS IN THE United States and Canada, and of Dealers in Paper and Paper Materials, Wholesale Stationers, and Publishers in the Principal Cities, for 1875—1876. Price $5.00. New York city: Howard Lockwood, Stationers' Exchange, 74 Duane street.

This is a trustworthy and well compiled manual of the personality of the paper trade, and contains some valuable statistical information, obtained by the expenditure of much labor. Mr. Lockwood is also the publisher of the "Paper Trade Journal," issued fortnightly, at $2.50 per annum, and of the "American Stationer," another semi-monthly publication, price $3.00, and other trade publications. These and other issues from the same establishment are largely patronized by the trade to whom they are addressed, and have a high reputation for their useful and correct information.

THE SEMI-TROPICAL, a Monthly Journal, devoted to Southern Agriculture, Horticulture, and Immigration. Terms $3.00 a year Volume I, No. 1. Jacksonville, Fla.: Charles W. Blew.

A creditable commencement of a serial of much local interest, which we trust will obtain a permanent footing among our magazine literature.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From July 3 to September 26, 1875, inclusive.

ANCHOR.—J. S. Williams, Riverton, N. J.
BRAKE, ETC.—J. Y. Smith (Pittsburgh, Pa.), London, England.
CARPET LOOM, ETC.—E. B. Bigelow, Boston, Mass.
CINDER SIFTER.—J. Sutton, Islip, N. Y.
CIRCUIT CLOSER.—D. Rousseau, New York city.
CLEANING FABRICS, ETC.—G. F. Blake, Boston, Mass.
CUTTING PAPER, ETC.—A. Campbell, Brooklyn, N. Y.
CUTTING PAPER, ETC.—S. D. Tucker, New York city.
CUTTING SCREW TAPS, ETC.—H. E. Boyd, Pittsburgh, Pa.
ELECTRIC SIGNAL.—D. Rousseau, New York city.
EXPLOSIVES, ETC.—C. F. W. E. Dittmar, Mass.
FARE REGISTER.—W. H. Hornum *et al.*, New York city.
FIRE-LIGHTER.—J. D. Husbands, Jr., St. Louis, Mo.
FOLDING PAPER, ETC.—C. Chambers, Jr., Philadelphia, Pa.
HARVESTER PITMAN.—G. W. Harrison, Lansing, Mich.
HOE.—M. Johnson *et al.*, Lockport, N. Y.
LIFE-PRESERVING BED.—A. G. Haskell, Mass.
LIQUID METER.—H. S. Maxim, Brooklyn, N. Y.
MAKING FELTING, ETC.—L. W. Whipple, New York city.
MEASURING ROLLS OF CLOTH.—S. C. Talcott, Ashtabula, Ohio.
OPERATING PROPELLERS, ETC.—G. B. Moore, Westford, Mass.
PILED FABRIC LOOM.—E. B. Bigelow, Boston, Mass.
PIPE-BENDING MANDREL.—M. L. Orum, Philadelphia, Pa.
PNEUMATIC BRAKE.—H. F. Knapp, New York city.
PRESERVING FRUIT, ETC.—K. H. Loomis (of New York city), London, Eng.
PROJECTILE.—L. W. Broadwell, Vienna, Austria.
RAILWAY TICKET, ETC.—J. H. Ross, Buffalo, N. Y. (Two patents.)
REFRIGERATOR, ETC.—D. McG. Foster (of Brooklyn, N. Y.), Liverpool, Eng.
ROLLING MILL.—I. Hahn, Pittsburgh, Pa.
SHEAF-BINDING MACHINE.—W. A. Wood, Hoosick Falls, N. Y.
SPARK ARRESTER.—W. H. Halsted, Trenton, N. J.

Recent American and Foreign Patents.

Improved Press.

Charles S. Swan, Tamaroa, Ill.—In this invention, the follower is arranged in a horizontal case, and worked by the toggle-jointed bars and drums, as in other presses now made. A vertical beater case and beater compress the hay, etc., to a considerable extent before it is acted upon by the press, so as to increase the efficiency of the press; and to raise it, an extension of the shaft by which the drums are worked is arranged above the sweep, with a drum on it carrying a block at the periphery, to which a rope is attached. This block is capable of sliding freely around the drum, being connected to it by lugs or projections, fitted in grooves in it, so arranged as to hold it on, while allowing it to slide freely. This block is held, when the beater is to be raised, by a pawl and catch. The pawl is pivoted to the drum, so as to swing around and allow the block to escape when it is released by the catch, and it is returned to and engaged with the catch by the spring. The catch is raised to release the pawl by pressing under a stationary cam in the crosstree above. The shaft is mounted in a step or socket in the top of the sweep, so that it can be lifted out, and it is provided with a lever to lift it out and let it rest while the drums are kept in motion for working the follower. A yoke holds it out of gear. The lower portion of the beater case is provided with a removable front, and arranged on pivots so as to swing forward when the front is removed, and dump the hay into the horizontal case.

Improved Tunneling Machine.

Olney B. Dowd, New York city.—This machine is designed mainly for tunneling under the beds of rivers, where the material is soft and liable to cave and crush in; and the invention consists of a cylindrical case, with a head at the front end, out of which projects at the center a revolving shaft carrying a cutting and scraping arm, which breaks and cuts down the earth, and forces it into the case through an opening at the bottom of the head. The shaft carrying the arm is hollow, and the arm is also hollow and suitably perforated to allow of softening the earth with water, by forcing the water out through the shaft. There is a pipe discharging through the head at the top for watering the earth in that way, to render it sufficiently fluid to be forced out through pipes. In the bottom of the case is an oblique opening, through which a large tube may be projected to sink a hole below the line of the tunnel by working through the tube to sink a boulder or other solid object out of the case. The case is to be forced along as fast as the earth is removed in advance of it, and it is to be followed up by the wall of the tunnel, which is to be built along at the same time as the work progresses, keeping the rear open end packed with the wall of the tunnel, and so as to exclude water and mud or silt from settling into the case. There is a pipe for discharging the silt, etc., by hydraulic pressure.

Improved Tuning Pin for Pianofortes.

Julius M. Branig, New York city.—The object of this invention is to enable the tuning pins of a pianoforte or other instrument to be firmly secured in place in such a way that they may be detached and again inserted without loosening them or injuring their screw threads. The invention consists in an open bushing, made of brass or other metal softer than the tuning pins, and a wedge, in combination with the plate and the tuning pins. The holes in the iron plate or frame of the pianoforte are made larger than the pins, and have the bushing inserted in them around the said pins. The bushing is made open at one side, and of such a size that its edges will not quite meet around the pin. A wedge is driven into a notch in the plate at the outer side of the bushing. The wedge forces the middle part of the bushing inward against the pin, so that the bushing may always bear against the pin in at least three points, so as to support it firmly. The soft metal bushing enables the pin to be put in and taken out without injuring its threads, and also beds it firmly in the plate.

Improved Cotton Planter.

James B. Onan, Pecan Point, Ark.—The dropping cylinder is formed of two short cylindrical vessels, made open at one end and closed at the other. They are placed upon the shaft with their open ends toward each other, and are connected together so as to be at such a distance apart as to leave sufficient space for the seed to pass out in the desired quantity. To the opener is attached a short chain, which passes back through the furrow directly beneath the discharge opening of the cylinder, so as to spread the seed along the drill as it is discharged from said cylinder.

Improved Car Coupling.

Archibald Smith, Omaha, Neb.—The invention consists of a drawhead divided by a central vertical partition into separate cavities, to one of which a wedge-shaped link bar is secured by pivot pin and spring, while to the adjoining cavity with tapering mouth a wedge-shaped and spring-cushioned friction plate is applied. The latter is retained by a lever pin that binds into step-shaped recesses at the back of the friction plate, to hold the same in coupled and uncoupled position. The lever pin is adjusted by a slotted top guide and set screw into fixed position to secure the lever pin and link bar rigidly in position. The entering coupling bar carries the lever pin into vertical position and strikes against the rear part of the friction plate, so as to cause the swinging in and sliding back of the same into the cavity, producing the dropping of the lever pin into the recesses, and the coupling of the link bar by its wedge action and that of the friction plate.

Improved Sulky Plow.

Eli W. Russell, Ashley, Mo.—By suitable construction, by pressing the upper end of the lever downward the plow will be swung to the rearward to withdraw it from the ground; and at the same time, and by the same movement, it will be raised from the ground. The upper end of the lever, when lowered, is caught and held by a spring catch, so as to support the plow above the ground for any required length of time, for convenience in passing to and from the field and from place to place.

Improved Heel Plate.

George Dunlop, Williamsburgh, N. Y.—This is an improved plate for attachment to the heels of gaiters and other boots and shoes, which shall be so constructed that it may be adjusted or turned, as it wears, to keep the heel straight.

Improved Oil Stoves.

Frederick Gates, Frankfort, N. Y.—The case that incloses the lamp and its chimney is made rectangular in form, and is closed by a door made of perforated sheet metal, to allow air to pass through it. To the inner surface of the case is secured a hollow deflector, to deflect the air and cause it to pass down into the lamp, and then up into the cones of the lamp burners. A portion of the air passes through the cavity of the deflector and is projected against the lamp chimney. In the top of the case are formed boiler holes to receive the cooking vessels. Between the boiler holes are attached deflectors, which are made V-shaped to divide the current of heated air. Plates attached to the top plate project down a little below air holes, so that the heated air, after passing up to the boiler holes, must descend a little before it can escape through the air holes, so that there will always be a stratum of hot air in the upper part of the case. When the stove is to be used for baking or roasting purposes, a grate is placed upon the top plate of the case, and has provided short feet to raise it a little above the said top plate. In this case the grate is surrounded by a box, the walls of which are made double to prevent the too rapid radiation of heat, and which is provided with suitable devices for maintaining a circulation.

The same inventor has also devised another oil stove, so constructed as to prevent the oil from becoming heated. The upper compartment of the lamp is open at the top, and is partially filled with plaster of Paris, saturated and kept saturated with water to protect the oil chamber from heat. The entire lamp is inclosed with a case, open at both ends, and upon the upper edge of which is placed a plate, in the middle part of which is formed a hole to receive the vessel in which the cooking is to be done. In the lower part of the case is formed a ring of openings to admit air to support combustion. Into the case, just above the top of the lamp, is fitted a hollow ring, which acts as a deflector to cause the air to pass down through the outer part of a plate, while another portion of the air will pass through the holes in a lower plate of the ring, and will be projected against, and will rise around, the chimney, and will thus become heated, and will carry up the heat to assist in the cooking.

Improved Log Turner.

Henry Knowlton, Otter Lake, Mich.—This is a device for turning logs upon the sawmill carriage in such a way as to save the carriage from jar. In using the device, a shaft is turned to raise a lever into an erect position, with its straight edge against the flat side of the log. A bar is then drawn over the top of the log, and its hook is driven into said log. The shaft is then turned in the other direction, which draws the lever back, turning the log. The log is then pushed back upon the head block and secured.

Improved Fireplace Grate.

John Bawden, Freehold, N. J.—A fireplace basket of the usual shape is cast at its grate-supporting bottom part with a longitudinal connecting bar. The bar is provided with a central semicircular supporting part, that extends toward the rear of the fireplace, for preventing the grate from tilting toward the rear of the fireplace. A front lip of the grate rests on an inside projecting shoulder of the bottom frame, until, by inserting a handle into a perforated lug of the grate, the contact of the lips may be interrupted, and the grate be shaken from one side to the other for dropping the ashes.

Improved Burial Case.

David W. Hunt, San Francisco, Cal.—This coffin is furnished upon its bottom with cells for retaining dirt or an equivalent absorbent beneath the body.

Improved Spring Power Regulator.

Orrin Collier, Sacramento, Cal.—A brake lever has a forked end for pressing against a band wheel, each side of the face in which is the groove for the band. The lever between its forks contains a spring for bearing with an elastic pressure. The lever has an elbow, which is pivoted to the frame, and an arm extends nearly down to the floor, and terminates in a foot piece, located so that the operator may conveniently rest the foot on it. Under the foot piece a spring is attached to it, and arranged so that by pressing on the floor it lifts the lever and presses the brake on the wheel, and slows the motion or stops it altogether, according to the force with which it is allowed to act.

Improved Machine for Making Split Keys.

Willard H. Fox, New Haven, Conn.—This invention comprises pushers and formers, in combination with bending dies of peculiar construction, whereby flat pieces of metal for split keys will be bent double, with the usual ring at the bow, by being pushed through the dies edgeways. The invention also comprises a contrivance whereby a number of pushers and dies, together with cutters for cutting long strips into suitable lengths for the keys, are organized in one machine.

Process of Coloring Enameled Photographs.

William W. Williams, Houston, Tex.—This process of coloring enameled photographs consists in first pasting on a glass plate, coated with dry layers of collodion and another material, a transparent photograph, then backing it with layers of transparent paper, and then laying colors thereon in the usual manner.

Improved Boot.

Harry Hall, Pontiac, Mich., assignor to himself and Henry H. Wilson, of same place.—Flat wires made of steel, whalebone, or other suitable material, are inserted beneath supporters, between the rows of stitching and the seam, and are secured, when made of steel, at their upper and lower ends by rivets, the said wires being of such a length as to extend from the top of the boot leg to a little below the top of the counter.

Improved Glass Monument.

Anselm Pfeiffer, New York city.—This is an improved monument, which may be ornamented to any desired extent, and which may also be used as a receptacle for flowers, wreaths, and other tokens of remembrance placed upon the grave, to protect them from the weather. It is formed essentially of glass set in a suitable metal, wood, or stone frame work.

Improved Washing Machine.

Thomas McGuire Morris, Wabash, Ind., assignor to himself and Freeman Alger, same place.—In this machine, the oscillating rubber will adjust itself to the thickness of the clothes to be operated upon. It may be operated either with or without a cover, and will allow the stationary rubber to be removed for convenience in cleaning the suds box. There is a semicircular bottom for the suds box, formed of detachable blocks with a corrugated rubbing surface.

Improved Trucks for Moving and Carrying Rails, etc.

Charles W. Carter, Terre Haute, Ind., assignor to himself and George W. Travis, Cape Girardeau, Mo.—In using the truck, it is backed up to the object to be carried, and a bar is raised until hooks rest against the side of the object, and at the same time a rod is drawn upward, so that the hook may pass over and take hold of the said object. The bar is then lowered, which raises the load above the wheels, and it may then be transferred laterally by drawing the truck.

The same inventor has also patented another truck, for picking up and carrying car axles provided with wheels, railroad rails, bars, shafts, bundles of iron, and other heavy objects. Hooks are caused to drop over the axle, and a handle is lowered, which raises the wheels of the car axle away from the ground, and allows the axle to be conveniently transported wherever desired. In the same way, bent lever jaws are opened and lowered to grasp and pick up a railroad rail or other object to be carried.

Improved Children's Carriage.

Henry C. Moody, Oswego, N. Y.—This invention consists in attaching a bent rod to the lower edge of the corner curtains of the carriage. The rod preserves the desired form of the curtains, preventing their edges turning up or wrinkling, and enables them to be neatly and expeditiously folded and secured to the top.

Improved Refrigerator.

Henry H. Barnes, Brooklyn, N. Y.—This invention consists of a refrigerator with an ice receptacle and a series of milk and butter coolers, having separately hinged lids, the coolers being so arranged therein that the cold air can circulate around the sides and bottom of the cooling vessels.

Improved Planking Clamp.

James Hastings, Elizabethport, N. J.—In using the clamp for planking a vessel, the plank is placed upon the ribs in its proper place. Hooks are then secured to the rib in such a position that the forward end of a screw may rest against the outer side of the plank. The screw is then turned forward to force the plank against the ribs, which brings its outer edge opposite the forward end of another screw. The screw is then turned forward to force the inner edge of the plank close up against the edge of the preceding plank, and the said plank is then spiked to the ribs. When the second screw is operated to force the plank edgewise against the edge of the preceding plank, a grooved bar moves with the plank and slides upon a crosshead, and thus prevents the first screw from being strained or bent.

Improved Car Coupling.

Henry C. Hervey and George H. Abrams, Athens, N. Y.—When the cars are run together, the entering link pushes a dog back and passes it, when the said dog instantly drops through the link, and the cars are coupled. With this construction also, when the cars are coupled, the forward edge of the dog rests against a solid shoulder of the bumper head, both above and below the link, so as to have a firm support. In the upper part of the cavity of the bumper head is secured a spring, the forward part of which is slotted to receive the dog, and its forward ends are bent upward, so as to serve as guides to the link in passing to its place in said bumper head.

Combined Cistern Valve and Overflow Pipe.

Bernard McGrann and John Solis, New York city.—A socket, which is secured in the bottom of the cistern, serves as a seat for the valve, and has a bar to serve as a guide for the valve stem. The valve stem is made hollow, so as to serve as an overflow pipe to prevent the water from rising any higher in the cistern than the upper end of the said hollow valve stem.

Improved Chimney Cowl.

Emanuel Cole, New York city.—This cowl is made of sheet metal, and is secured, by a chimney connecting tube and cap piece, rigidly to the crown of the chimney. A series of vertical partitions run at equal distance from each other in diametrical direction from the end of the chimney tube, and form, with the straight top and bottom plates, a number of channels, that taper toward the communicating apertures around the end of the chimney tube. The wind passes readily along the radiating channels from whatever direction the same may come, and then across the chimney tube to the diametrically opposite channel, which assists, by its widening shape, the passage of the wind, and creates also, by the cross draft, a supplementary draft in the chimney, and thereby the escape of the smoke with the wind. A central diaphragm is attached above the chimney tube to conduct any entering rain sidewise to be collected at the bottom of the chamber, and discharge through an exit spout to the outside.

Improved Boiler Cleaner.

Thomas O. Kemp, Beamsville, Canada.—This is a combination, with boiler and superposed reservoir, of pipes provided with stop cocks, one having mouths at the surface of the boiler water, and the other more deeply down into said water. The water level may vary to any ordinary extent and the desired effect still be maintained, namely, a current drawing from the surface of the water.

Improved Scaffold Clamp.

William C. Fellows, Toledo, Ohio, assignor to himself and Charles Whittingham, same place.—A roller acts along inclines of a block to clamp the block fast. The roller is applied by means of a bolt which connects the two ends of the yoke. The clamp binds better because of the more free movement of the roller along the block than the sliding bolt; and, by reason of the curves of the block whereon the roller works, the action is more prompt and certain.

Improved Square.

William H. Walker, Charleston, S. C.—The wood pieces of the head are connected to the tongue by bolts which move in slots around the axis, whereat an auxiliary head is pivoted to the tongue, and the parts thereof are pivoted together. Braces are pivoted to the auxiliary head, and the wood head is also fastened to them. This arrangement makes a more accurate instrument than when the two parts of the head are pivoted to the tongue separately. The head auxiliary is arranged in the groove of the principal head, into which the braces and the tongue fold.

Improved Clasp for Ladies' Dress Supporter.

Egerton A. Bliss, Jersey City, N. J.—The clasp is made of a doubled wire, having arms that proceed from the ring in which the chain is held, are held at their crossing by a band, and then turned inwardly to form reversed hooks, the inwardly bent clamping ends being in the same plane with the shank. The hook is fastened in the lady's belt or girdle, and connected with the clasp by a chain, the dress being lifted from a point below the pendant clasp, and secured therein.

Improved Paper Bag Holder.

George H. Cleveland, Camden, Me.—To a plate of heavy brass is attached a pointed rod, of such a length as to be capable of holding a hundred paper bags. A plate of spring brass is swiveled to the upper part of the heavy plate, and is bent twice at an angle, so as to bring its lower end into such a position as to receive a pointed rod. In using the device the lower end of the plate is sprung off the point of the rod, and is turned to one side, so as to leave the rod free. The bags or wrapping paper are then placed upon the rod, a few at a time, until the whole hundred have been placed upon it, by forcing the said rod through the said bags as near their edge as will hold them securely, and so near the edge that each bag may be torn off easily and without injuring the bag for use.

Notes & Queries

A. K. will find a description of wire rope transportation on p. 370, vol. 31.—R. J. will find a recipe for mica varnish on p. 241, vol. 32.—J. T. will find directions for preserving shingles on p. 123, vol. 33.—F. D. R. will find that an inoxidizable white metal is described on p. 119, vol. 33.

(1) U. N. O. says: 1. I have used a paste or glue that is used by the various express companies, that is excellent for all purposes such as attaching labels, etc. It is a dry brownish powder, and is prepared for use by pouring hot water on it; it looks like pulverized gum arabic. Can you tell me what it is? A. We are unable from your indefinite description to tell of what it is composed. If you consider it to be gum arabic (C_{12} H_{11} O_{11}), test it as follows: A solution of it in water is precipitated, by alcohol and by ether, in white flocculi, or, if dilute, in the form of a milky turbidity. If boiled with dilute sulphuric acid, it is gradually converted into dextrin, and then into a fermentable variety of sugar. 2. Please give a recipe for good paste for labels, that will set quickly and stand exposure to weather. A. Dissolve gum sandarac and mastic, of each 2 ozs., in 1 pint spirit of wine, adding about 1 oz. clear turpentine. Then take equal parts of isinglass and parchment glue; and having beaten the isinglass into small bits, and reduced the glue to the same state, pour the solution of the gums upon them, and melt the whole in a vessel well covered, avoiding as great a heat as that of boiling water. When melted, strain the glue through a coarse linen cloth, and then put it again over the fire. This preparation may be best managed by hanging the vessel in boiling water, which will prevent the matter burning on the surface of the vessel, and the spirit of wine from taking fire.

(2) R. S. S. asks: Can you give me an account of the process of making ferro-manganese? A. You will find an article describing the process in the *Journal of the Franklin Institute* for May, 1874.

(3) G. G. asks: What will remove the tarnish from plated goods that have turned dark, probably from the action of gas? A. Steep the plated ware in soap lye for 2 hours; then cover it over with whiting, wet with vinegar, so that it may stick well upon it and dry it by the fire: by thus drying, the whiting is removed from the crevices without the least difficulty. Rub off the whiting and pass over it with dry bran; the silver will look exceedingly bright.

(4) J. G. W. asks: 1. Will galvanized iron tubing in a bored well be durable? Would the water from such a well be wholesome? A. The use of galvanized iron pipes for family water supply is not desirable. For a short pump, if the water is pure, and the precaution is taken not to use water that has stood long in the pipes, perhaps no bad effects would result. But there have been repeated examples of poisoning from the use of galvanized iron conducting pipes. In a case at Portsmouth, N. H., a family of four persons were thus poisoned, and Dr. Jackson found four grains of oxide of zinc in the water. In another case, near Boston, where the house was piped with galvanized iron pipes, one of the young members of the family died and, a *post mortem* examination revealed the presence of oxide of zinc in the stomach and other organs. Death was directly attributed to the use of the above pipes. They are made by heating and dipping the iron pipes in melted zinc.

(5) E. M. K. asks: Why does water shorten a rope? A. We were under the impression that wetting a rope exposed to strain causes it to stretch.

(6) S. S. says: A. says that there is no power required to raise water to the pump, that the atmosphere does part of the pumping. B. says it requires just as much power to raise water 1 foot below the pump as it does to force the water 1 foot above the pump. B. contends that, in our case, the pump being 21 feet above the water, it requires the atmosphere in the pump to be reduced to about 5 lbs. to the square inch in order to let the water flow in; and he also contends that, to do this, he has to add 10 lbs. additional weight or power to his plunger to reduce the air. Which is right? A. B., certainly; if the pressure of the air forces the water into the pump barrel, that pressure must first be removed.

(7) J. S. G. asks: Can we, by continued observation, see the whole surface of the moon, or do we always see only the one half? A. We only see one half for reason that the moon turns once on its axis in the time of making a revolution in its orbit.

(8) W. S. S. asks: What is your method of getting the foundation bolts of an engine in the proper place, supposing we have our center line on the bed plate template all right? What is the best mode of getting a right angle line from that, so that the back box will be in its right place when it is over the foundation bolts? A. Make holes in the template corresponding to those in the bed plate, and put in the holding down bolts, with packing blocks under the top nuts, making the distance from bottom of template to top of packing blocks equal to thickness of bed plate at bolt holes. Then arrange the template in position, and level it, placing it so that the under side is where the bottom of the bed plate is to be. Proceed to build the foundation, first anchoring the bolts at the bottom, and building them into the masonry, as the work proceeds. In this way, when the work is done, you will have the bolts firmly secured in the proper positions.

(9) A. D. B. asks: What internal atmospheric pressure can I with safety put on an ordinary linseed oil barrel, holding about 40 gallons? A. We think you can safely use a pressure of 10 or 12 lbs. per square inch. Perhaps some of our readers have data in relation to the matter, which they will send.

(10) H. L. says: Please tell me the number of square inches bearing surface of the ordinary screw propeller, such as is in use on the Erie canal? A. To determine the surface of a propeller, form its development or view of the blades if flattened down on a plane surface. Then its area can be found by the rules for irregular figures. Any calculation of the probable slip of a new form of propeller will be of very little value, unless verified by experiment.

(11) W. P. says: A friend claims that it is impossible that salt water, taken from the ocean, can be made fit for drinking by working it by steam through a filtering bag, or some other way so as to take the salt taste from it. Is this so? A. Salt water is very commonly prepared for drinking by evaporating it, and condensing the steam. Nearly all ocean steamers are fitted with fresh water condensers.

(12) J. C. M. says: 1. I propose to build a boat, 30 feet over all, 18 feet keel, 18 inches beam, 15 inches deep, of ¼ inch selected pine. On each side will be a smaller airtight boat, 10 feet long, 6 inches beam, 4 inches deep, connected by iron arms ¾x1 inch, 4 feet long, to the main boat, which is for one person, decked over and containing 8 watertight compartments, with the cock pit amidships. I have an engine 1¾ inches stroke x1½ inches bore, tested to 600 lbs. per inch. Would it run the boat, and at what speed? A. Yes, at 4 or 5 miles an hour. 2. What dimensions of wheel and how much steam should I use? A. Wheel 18 inches in diameter; steam pressure 100 lbs. 3. Could I make a coil of gas pipe in a drum of sheet iron answer for a boiler, and how small should it be? A. We think you will have difficulty with this arrangement. 4. Could I use gas made from zinc and blue vitriol for fuel, and would I need a retort? A. We advise you to design your boiler for the use of coal or charcoal.

(13) C. S. says: 1. I am running a portable engine, and drawing water from a well slightly impregnated with salt. Will it injure the boiler? A. It will form scale in the boiler. 2. Do not ocean steamers use salt water? A. Ocean steamers are ordinarily fitted with surface condensers, for the purpose of supplying as far as possible fresh water to the boilers.

(14) R. C. P. says: I have a large upright boiler that leaks badly; leakage is caused by scale. I think it is becoming loose and falling on the crown sheet; but the flues stand so close that it is impossible to get a scraper through them. Will anything dissolve it, so that it could be washed out with a hose? A. On hauling the fire at night let the water remain in the boiler until morning, or until it is quite cool. Then run it out and wash out the boiler, in all parts inaccessible by hand, with a stream of water from a hose. By repeating this operation several times, at intervals of a few days, you may succeed in removing the scale. Possibly, however, you may find it necessary to use some preparation, such as tannate of soda, in the feed water. These remarks will also serve as an answer to G. S., who sent us a small package of scale, which seems to be mostly composed of mud.

(15) J. A asks: With two steam gages, one connected to boiler and one connected to steam pipe, some 200 yards distant from boiler, both gages being on a level, should there be any difference in the indications? A. The pressure would be less in the more remote gage on account of the pressure required to give the steam motion, and the losses from radiation and condensation.

(16) M. F. P. says: I am making a boiler of 6 inch wrought iron pipe of three sections each, 18 inches long, with 6 inch flues in each. I connect them at top and bottom to a three-sided casting with a core of 1 inch square, which gives a good circulation at the top and bottom, each with the other, and I enclose all three in an iron jacket, connected at the top with the smoke bonnet and stack; the grate is 15 inches in diameter; the heat goes up through the flues and the space around the cylinders. Is it a good plan, and will it drive a cylinder 3x5 at 40 lbs.? A steam dome is also placed on the top for superheating the steam. A. The idea strikes us quite favorably. We would be glad to have an account of your experience.

(17) S. W. asks: 1. What proportions of copper and zinc make the strongest brass? A. Take, by weight, 25 parts copper, 2 of zinc, and 4½ of tin. 2. What can I use as a flux for brass, to make it flow freely, and cast smooth and solid small articles? A. Melt the copper first, then add the tin, using a mixture of potash and soda as a flux; add the zinc last.

(18) C. W. says: Does the cone form of the tread of the car wheel produce oscillation of the car? A. The oscillation is due to irregularities in the track, and to the fact that there is necessarily some play between the tracks and the flanges of the wheels. The most successful preventives of oscillation seem to be close coupling of cars, weight of cars and trucks, an increase of the number of wheels for a truck, and the use of an improved form of springs between car bodies and trucks.

(19) R. M. says: 1. I have a hand power jig saw, that I turn by a crank. I can saw hard 2 inch oak rather easily, but the work becomes tiresome when done for half a day at a time. Can I use some motor besides steam? A. An air or gas engine would answer your purpose. 2. I have thought that, if a tank were built 30 feet above the earth, to hold 100 barrels of water, and the water came down through a tube to a small water wheel, a pump pumping some of it back into the tank, power enough could be realized to drive the saw. Would this do? A. The water project is too nearly of the nature of a power creator to be successful.

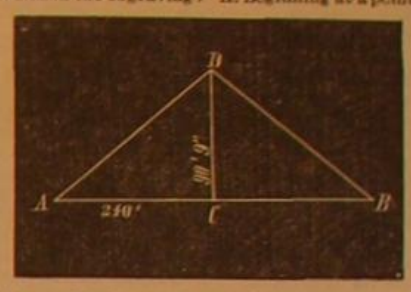
(20) C. S. asks: Is there to be a canal across the Isthmus of Panama? A. The matter is only discussed, as yet.

Is there any paint made that is better and as cheap as white lead and oil, for the outside of houses? A. We would be obliged to decide upon the claims of a number of rival manufacturers, to answer this question; and we do not care to make such a distinction in these columns.

Do you think the engineer's trade a good trade to learn? A. The trade which has numbered in its ranks such men as Watt, Rankine, Brunel, and a host of others whom the world delights to honor, needs no eulogy from us.

(21) F. H. D. asks: Why is not towing canal boats in trains practised on the Erie canal? A. It is not advisable, principally on account of the large number of locks.

(22) C. S. asks: What is a proper description to be given in a deed of a piece of land, as shown in the engraving? A. Beginning at a point,



A (state how determined) running thence southerly in a straight line to a point distant 240 feet, thence in a northeasterly direction in a straight line to a point distant easterly in a straight line 90 feet from the middle point of the line running southerly from the point or place of beginning, thence in a northwesterly direction in a straight line to the point or place of beginning.

(23) S. T. J. says: Vapor of ammonia has been tried as a motor. Can you inform me wherein it needs practical improvement? A. So far as we know, the ammonia engine has been pretty well worked out in principle, and it only requires perfection in matters of detail and construction. You will find a very interesting discussion of the theory and description of such engines in Dr. Barnard's masterly "Report on the Paris Exposition."

(24) M. C. K. asks: Is there any more heat in steam at a high pressure than at a low pressure? A. The total heat in 1 lb. of steam increases with the temperature, at the rate of 0·305 of a unit for each degree Fah.

(25) S. E. S. asks: 1. What is the metal composition used in making small toy engine cylinders? A. We believe it is a kind of type metal composed of lead and antimony. 2. Will solder, used for soldering tin, do for soldering sheet iron also? A. No. Use a solder composed of equal parts of copper and zinc.

(26) A. B. W. asks: 1. How are electro-gilding and silvering done? A. For gilding, see No. 28 on this page. Silver solution is prepared with least trouble by dissolving cyanide of potassium in water (¾ oz. to the pint), and adding the silver by the battery process. This is done by placing a sheet of silver and a porous cup in the cyanide solution; the silver is then connected to the positive pole of a battery, and an iron or copper rod, placed in the porous cup, is connected with the negative pole. The porous cup also contains some of the cyanide solution. When a deposit begins to form on the metal in the cup, the solution is of the right strength. One or two Daniell cells form sufficient battery power; if gas is given off, reduce the strength sufficiently to prevent its evolution. Work at a temperature of about 60° or 70° Fah. 2. How is silvering on glass done, to make mirrors? A. Bottger gives the following method for silvering on glass: Nitrate of silver is dissolved in distilled water, and ammonia added to the solution till the precipitate first thrown down is almost entirely redissolved. The solution is filtered and diluted so that about ⅛ of a quart contains 15·43 grains nitrate of silver. Next, 30·86 grains nitrate of silver is dissolved in a little water and poured into about a quart of boiling water 25·6 grains Rochelle salt is added, and the mixture boiled a short time, till the precipitate contained in it becomes gray, and it is then filtered hot. The glass plates, thoroughly cleaned with nitric acid, caustic soda, or alcohol, are placed in a shallow vessel and covered a quarter or half an inch deep with equal volumes of the two solutions. In an hour the reduction will be complete. The plates are then washed and the operation repeated until a sufficient coating of silver is obtained. When the silvered surfaces are dry, they may be cautiously polished with the palm of the hand. If the silver is only required as a coating of the back surface, this polishing is, of course, superfluous. In this case, also, the operation may be shortened by heating the solutions to about 58° Fah. before mixing. The silver may then be varnished over as a protection. When prepared, the solution will keep about a month in a dark place.

(27) E. J. W. says: Will steam, when exhausted into a cistern through a number of small holes in a coiled pipe, heat the water to a higher degree of heat than it does when exhausted through a straight pipe into the cistern, and why

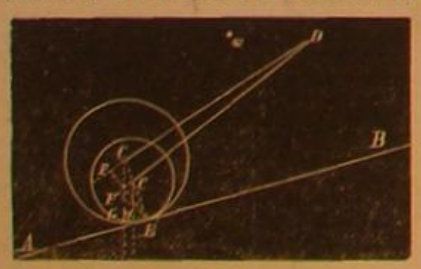
A. The principal difference will be that, in the first case, the steam will be condensed more rapidly: so that, using the same size of pipe and steam pressure in each case, the water will be heated the most, in a given time, in the first case.

(28) H. C. F. asks: 1. How can I make a solution for plating with a battery out of old gold rings? A. Add one volume of nitric to three of muriatic acid and dissolve the rings in the menstruum so formed. When this has been done, drive off any free acid that may remain by gently heating the whole. No yellow powder should result from the operation; if it does, a drop or two more of acid must be added to redissolve it. The solution should then be much diluted, and cyanide of potassium added as long as any precipitate is formed. Separate this from the liquid, wash, and redissolve it in cyanide of potassium, and the solution is ready for use. About half an ounce of the precipitate to a gallon of the cyanide (water and cyanide) is a good working strength. One Smee cell is sufficient to cause the deposit. The solution should be heated to about 130° Fah., and pure fine gold is needed for the anode. By properly regulating the battery power and heat, the color of the gold may be considerably modified. As cyanide of potassium is a deadly poison, too much care cannot be exercised in handling it. 2. Can I plate articles that have been nickel-plated with such a solution? A. Yes. 3. Would 5 cells Daniell's battery be sufficient? A. Five cells of Daniell's battery would probably cause the evolution of gas, which is to be carefully avoided. One cell in good condition would do well.

(29) S. A. T. says: In an old building in Philadelphia resides a man about 75 years of age, who has been at work on a machine composed of levers, without springs or weights, for years. He is very eccentric, lives alone, and no person knows who he is or whence he came. The machine is nearly all composed of wood; it is completed, and has been running for weeks. He is now building one very much larger, from which he intends deriving power. The man is not a man to deceive any one, and there is nothing about the machine hidden from view. I understand that the man has been working at this problem for 40 years. When I say "he has a machine which supplies its own power," I say what my eyes tell me. I am no believer in perpetual motion; but what is this? A. This is the old story that we have heard so often. We have in our possession numerous circulars, describing just such wonderful inventions and endorsed by the most wonderful names, but they do not seem to have much effect upon our views, and we are constrained to think that, while your eyes may be all right, you did not use them as judiciously as was desirable, directing them by your reason.

(30) C. W. P. says: I have two iron tanks in the top of my house, holding 125 barrels each. One is for soft water, the other for drinking purposes. What is the best paint or composition to coat them with to keep them from rusting? White lead will not do. A. Trautwein says: "White lead applied directly to the iron requires incessant renewal, and probably exerts a corrosive effect. It may, however, be applied over the more durable colors when appearance requires it. Red lead is said to be very durable, when pure. An instance is recorded of pump rods, in a well 200 feet deep, near London, which, having first been thus painted, were in use for 45 years, and at the expiration of that time their weight was found to be precisely the same as when new; thus showing that rust had not affected them." A slate paint is sometimes used to coat the interior of tanks. Iron, well cleaned and washed with hot linseed oil, will sometimes be thus preserved from rusting.

(31) N. G. W. says, in commenting on M. W. W.'s answer to the question why a given load can be moved up a given incline on a small wheeled truck with less power than would be necessary to move the same load up the same incline on a large wheeled truck: Let P=power, W=weight, R=radius of wheel, b=angle of inclination of road=E C G, a=angle made by line of traction, D C, with road=F E C. E is the center of moments. The



power, P, acts to raise the weight, W, over the point, P; the weight, W, resists the action. F E, the lever arm of P=R sin. a. G E, the lever arm of W=R cos. b. Writing out the equation by moments, we have P R sin. a=W R cos. b, or (reducing) we have P sin. a=W cos. b, that is, the power multiplied by the sine of the angle made by the line of traction with the road is equal to the weight multiplied by cos. angle of inclination of the road. The angle, a, varies inversely as R: hence, as the wheel becomes smaller, the angle, a, increases, as is shown in the figure. The sine of an angle varies directly as the angle, consequently, as a increases, sin. a increases. Resuming the last equation: Considering the weight constant and the angle of inclination of the road also, it would follow, to keep up the equality, that, as the diameter of the wheel is diminished, less power would be required to move a given weight up a given incline.

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

J. N. D.—Both are argillaceous shale, containing a small amount of micaceous red oxide of iron.—E. McD.—No. 1 contains iron and manganese, along with silver and alumina. No. 2 is galena with a small percentage of iron. It is not arsenical. No. 3 is plumbago with silex and lime. No. 4 is silica and alumina, iron in small amount, and lime.—J. H. P.—The smaller piece contains galena, pyrite, talc and quartzite. The larger is galena in limestone rock.—E. W. W.—No. 1 is iron pyrites which has lost a part of its sulphur and been partly converted into oxide of iron. No. 2 is excellent iron ore. It contains neither black lead nor quicksilver.—H. L. C.—They are of two kinds. The glossy kind is quartz, the waxy variety is chalcedony. Tampa Bay, Fla., has long been celebrated for the chalcedony found near it.—R. W. Z.—No. 1 is zinc ore. No. 2 is willemite. No. 3 is mica schist, containing a small amount of red hematite. No. 4 is calamine. No. 5 is strontianite. No. 6 is calamine.—C. H. P.—It is probably a siliceous scoria, its density being only 2·14. Besides silex, of which it is mostly composed, it contains iron, lime, and carbonaceous matter.—J. J. F.'s specimen, supposed to contain silver, did not arrive.—C. A. W.—The clay contains silica, alumina, lime, iron (as sesquioxide), magnesia, potash, and traces of soda. The above ingredients are arranged in order of the amounts as existing in the specimens sent.—W. H. G.—We find none of the precious metals present. It is a deposit of carbonate of lime and magnesia upon quartz. It contains about 10 per cent of sesquioxide of iron.—C. W.—It is a fossil belemnite. These curious fossils vary in size and form; some are small, delicate, transparent like amber; others are opaque, and from ten to twelve inches in length. They are very common, having been met with in all ages and countries, and giving rise to much speculation as to their real character.—C. B. K.'s and D. M. S.'s minerals did not come to hand.—A. M. D.—No. 1 is a handsome chrysolite, which is a silky variety of fibrous serpentine. No. 2 is hornblende. No. 3 is beryl.—J. L.—The water has been examined. It has taken up alumina, lime, and organic matter. The latter is to be dreaded; and it would be safer to boil the water before using.—A. B. P.—Nos. 1, 2, 3, and 4 (both hard and soft) are varieties of shale rock containing an amount of oxide of iron. By fluxing, No. 1 gives a black slag. They are not entitled to the name of iron ores. The paints are ochers of inferior quality. No. 5 is impure iron alum.—A. B. P.—The two bottles labeled No. 1 and those marked Nos. 2 and 3 contain lime and alumina with organic matters. In No. 3, the two latter substances are in considerable quantity, and there is likewise present a large percentage of iron.

COMMUNICATIONS RECEIVED.

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

On Large and Small Wagon Wheels. By M.G. P.
On the Tides in the Gulf of Mexico. By W.
On a New Explosive By E. G. A.
On Steam Boiler Phenomena. By L. M. K.
On State Laws regarding Patents. By W. W.

Also inquiries and answers from the following:

A. G.—J. W. D.—P. S.—C. L.—D. F.—A. L.—J. B.—F. J. C.—J. R. N.—A. W.—E. J. N.—S. M. S.

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: "Whose is the best process of making gas from petroleum? Who publishes working drawings of steam engines? Whose is the best steam siphon valve? Whose is the best machine for reducing sand and small gravel to a fine powder?" 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.]

INDEX OF INVENTIONS

FOR WHICH

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September 14, 1875,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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DESIGNS PATENTED.

8,647.—Medal.—W. B. Cunningham *et al.*, Phila., Pa.
8,648.—Pianoforte Leg.—C. E. Hoffmeister, N. Y. city.
8,649.—Casting.—A. P. Reger, Philadelphia, Pa.
8,650.—Gridirons.—W. P. Warren, Troy, N. Y.
8,651.—Caps.—M. Isidor *et al.*, New York city.
8,652.—Waist Belt.—W. C. Shimoneck, Washington, D. C.
8,653.—Back Comb.—W. C. Shimoneck, Washington, D. C.
8,654.—Fan.—H. B. Sommer, Philadelphia, Pa.

SCHEDULE OF PATENT FEES.

On each Caveat	$10
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On application for Reissue	$30
On filing a Disclaimer	$10
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CANADIAN PATENTS.

List of Patents Granted in Canada, September 14 to 20, 1875.

5,178.—H. Bolton, Elizabethtown, Ont. Potato digger. Sept. 14, 1875.
5,179.—J. A. MacKinnon, Sandwich, Ont. Whiffletree. Sept. 14, 1875.
5,180.—W. R. Fenerty, Halifax, N. S. File and tool handle. Sept. 20, 1875.
5,181.—G. Keely, Londoa, Ont. Feather-renovating machine. Sept. 20, 1875.
5,182.—J. W. Johnson *et al.*, Towanda, Pa., U. S. Grain separator. Sept. 20, 1875.
5,183.—G. H. Bliss, West Stockbridge, Mass., U. S. Culinary apparatus. Sept. 20, 1875.
5,184.—A. Cunningham, Milwaukee, Wis., U. S. Saw mill dog. Sept. 20, 1875.
5,185.—F. K. Kalbfleisch, New York city, U. S. Carrier for acids. Sept. 20, 1875.
5,186.—G. Walling, Port Henry, Ont. Suction meal and flour-saving fan. Sept. 20, 1875.

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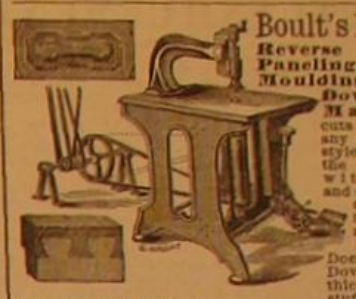

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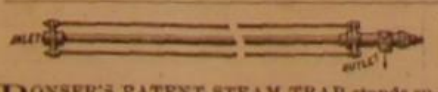

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