SCIENTIFIC AMERICAN

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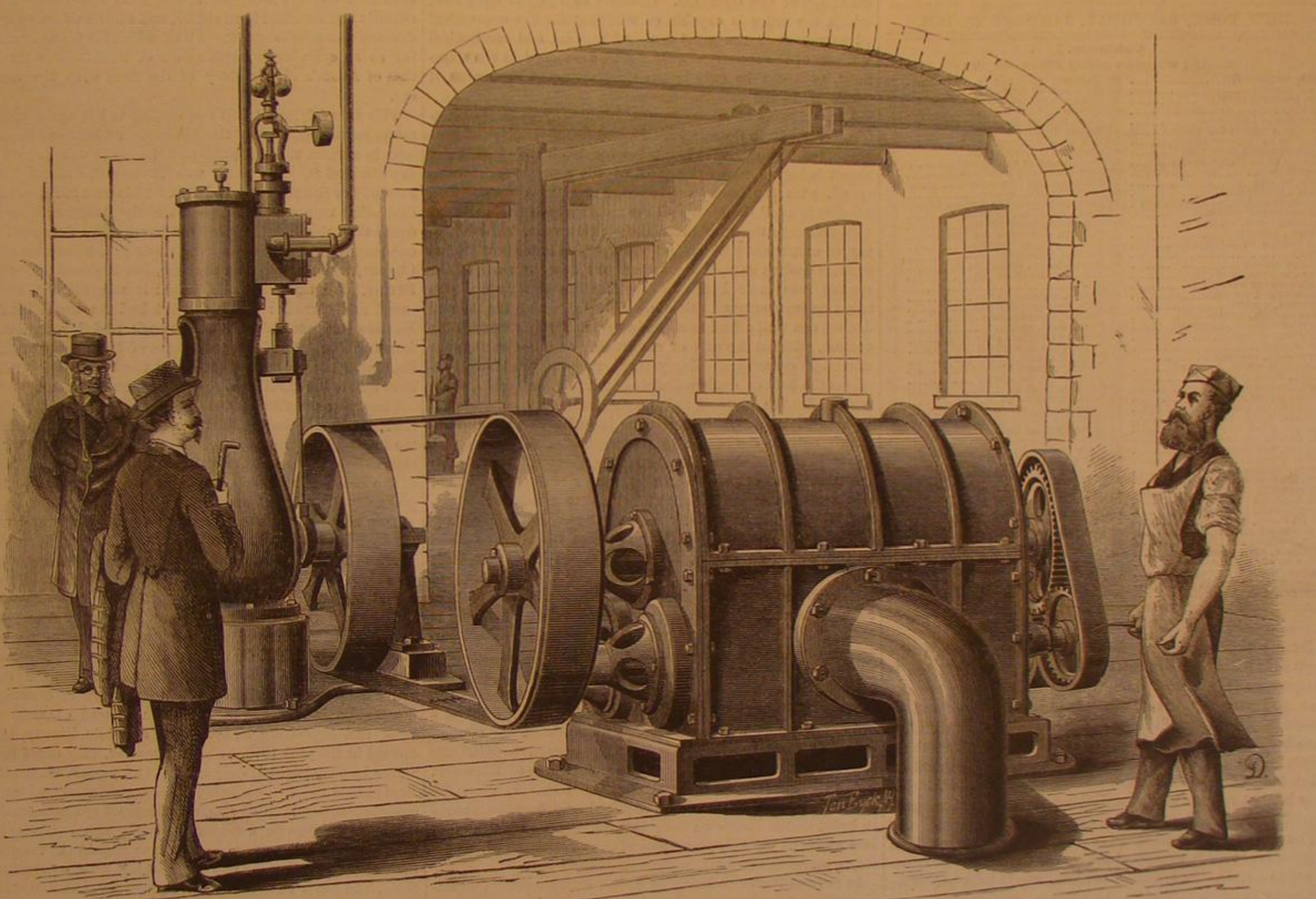
IMPROVED ROTARY PRESSURE BLOWER.

We present herewith engravings of a new rotary pressure blower. The machine produces a forced blast, in such a manner and by such means as to include a variety of advantages worthy of careful consideration. Of these perhaps the first to attract attention are fewness of parts and the strong construction of the entire mechanism. Another point of importance is comparative freedom from friction, there being no portions in actual contact, although in certain localities very close working is necessary. The machine is well adapted for mine use, since it is not liable to injury either by dust or weather; it runs continuously without stopping to be oiled or needing any careful attention.

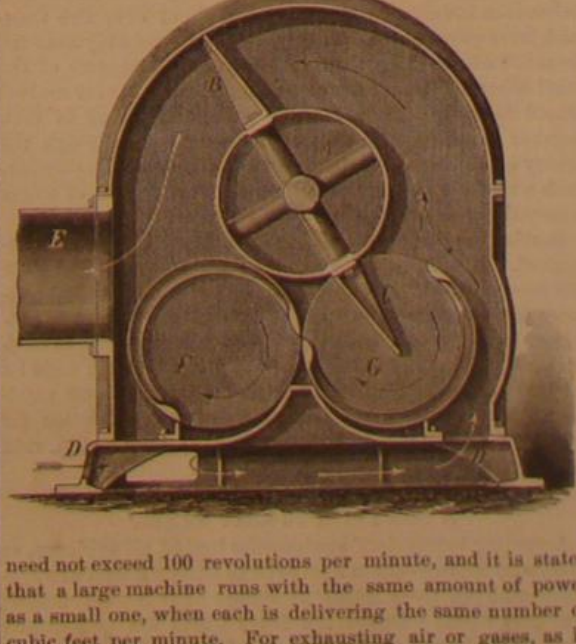


BAKER'S ROTARY PRESSURE BLOWER.

The large illustration affords an exterior view, and Fig. 2 gives a sectional representation of the interior. The external case is made of light boiler iron, formed up very truly and inserted into the heads of the machine, said heads being of cast iron, firmly secured to a bedplate of similar material. They are also bolted together longitudinally by outside iron rods. Within the chest, and concentric therewith, is a cylinder, A (a single iron casting), which is provided with two vanes, B and C. The shaft of the cylinder, A, is rotated by the driving pulley shown outside. The air enters at D, from underneath, and is forced by the vanes out through the outlet, E, in the direction of the arrows. In order to prevent any direct communication between inlet and outlet, two slotted cylinders, F and G, are arranged on separate shafts, the latter actuated by gearing on the main shaft (partially concealed by the figure on the extreme right of the large engraving) so that said cylinders revolve twice as fast as the central drum. As the cylinder, A, therefore turns in the direction of the arrow, Fig. 2, the vane, B, is almost in contact with the upper part of the casing, and is compressing the air before it, driving the blast out of the pipe, E. This compressed air is prevented from returning to the inlet by the cylinder, F, which above is close against the cylinder, A, and below meets the abutments formed on the bottom. The vane, C, at the same time has entered the slot of cylinder, G. A moment's consideration, supposing the auxiliary cylinders to revolve in the direction of the arrows drawn within them, will show that, whatever the position of the vanes may be, one or the other or both of these cylinders will prevent communication between inlet and outlet; while their slots will always be presented to the vanes so that the latter may, at the proper time, enter and so pursue the uninterrupted course necessary to drive a steady blast. In the construction of the machine, nice workmanship is of course required in order to bring adjacent parts just as near to each other as not to touch, and yet to avoid leakage as much as possible. The slight unavoidable leakage, it is believed, is much more than compensated for by the freedom of the moving parts from frictional contact with each other and with the chest.

The speed of this blower, to produce a steady current,

Fig. 2



need not exceed 100 revolutions per minute, and it is stated that a large machine runs with the same amount of power as a small one, when each is delivering the same number of cubic feet per minute. For exhausting air or gases, as in gas works, the capability of working at slow speed and without pulsation is a useful advantage. Similarly, for forcing heated air for drying lumber, grain, etc., or for warming buildings, the machine, owing to its metal construction throughout and nonrequirement of internal lubrication, is excellently adapted. Other utilizations, notably in founderies, will readily suggest themselves.

The inventor, Mr. John G. Baker, of Philadelphia, Pa., sends us a very excellent report, made upon the machine by a committee of judges at the recent Franklin Institute Fair, in which the results of elaborate comparative tests are given, showing the blower to be of a superior degree of efficiency.

Patented December 9, 1873. For further particulars address the manufacturers, Messrs. T. Wilbraham & Brothers, 2,316 Frankford avenue, Philadelphia, Pa.

Nitroglycerin as a Motor.

M. Champion, a French chemist, states that the heat developed by a given quantity of nitroglycerin when exploded is capable of exerting, when converted into motion, a maximum energy fully five times that produced by the explosion of the same amount of gunpowder, and three thousand times more than that caused through the combustion of an equal quantity of coal. A single quart of nitroglycerin, it is asserted, has the potential energy of 5,500 horse power, working during 10 hours. It remains to invent a machine in which the gigantic force can be harnessed and controlled.

A Novel Business.

A correspondent writes to know if it will be possible for him to secure by letters patent the exclusive right of selling pocket-knife blades, without handles. He thinks the idea original with himself, and, like Colonel Sellers, has reasons to believe "there's millions in it." Our correspondent's idea is certainly novel, but unfortunately the Patent Office laws contain no provision for the patenting of a new business merely.

WE are all living too fast. The man who is always in a hurry generally has his own work to do over again, besides being more liable to trip up and find himself sprawling in the mud.

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VOLUME XXXII., No. 4. [NEW SERIES.] *Thirtieth Year.*

NEW YORK, SATURDAY, JANUARY 23, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

THE SOVEREIGNS OF INDUSTRY.

During these times of financial depression, when the great industries of the country are languishing and labor is everywhere out of employment, diminished incomes are the rule, and economy the virtue most in demand. To those whose incomes are still liberal, though never so much less than heretofore, the problem of adapting expenditures to receipts is comparatively simple. They have merely to cut off a few luxuries more or less, to pinch their pride a trifle, it may be, but with no risk of trenching on the actual necessaries of life, either for themselves or their families.

For the great mass of working men, however—men whose wages never greatly surpassed the cost of living—the problem is not so simple. To strike off luxuries would help but little, not many luxuries falling to their share even in the best of times. To lessen the amount of their purchases means to eat poorer food, or less of it, wear cheaper clothing and live in poorer houses; in short, to submit to evils, not to practise economy.

The usual door of escape from the ills of poverty, hard work and more of it, is closed by the general stagnation of industry. Men are fortunate if they get any work, at reduced prices at that. How then can they manage to live? There is but one way, and that is by increasing somehow the purchasing power of money, so that the little they now have may go as far as the larger sums they have been used to: a hopeless undertaking, it might seem, for men without capital and with no influence in financial circles: but so it did not seem to the working men of New England, spurred on by that most efficient sharpener of the wits, necessity. The problem was to make two dollars buy as much as three, prices remaining the same. A glance at the conditions of trade will suffice to make plain the efficiency of the means adopted. During the flush times, before the collapse of 1873, money was plentiful, business brisk, and profits large. Consequently the race of middle men multiplied enormously. Between the miller and the mechanic, the price of a barrel of flour increased fifty per cent or more by passing through half a dozen hands, each charging roundly for the nominal and, for the most part, uncalled-for service rendered. In like manner, the cost of nearly every other article of food or clothing was similarly advanced. With high wages and plenty of work, the consumer was able to pay the extra charges; but when the easy times were past, his lessened wages left small margin for the support of go-betweens. The machinery of trade had become so cumbrous and costly that it was a burden rather than a convenience. Its excrescences had to be cut away; and this the working men of the East have set out to do, holding it suicidal as well as foolish to pay half a dozen large profits on each article they buy, when they can be served as well for a single small advance on prime cost. For example: A hundred laborers want each a barrel of flour. By going to the retail grocer they can get such an article as they desire at the rate of ten or twelve dollars a barrel. On the other hand, by clubbing their funds and buying a car load at the mill, the same grades of flour can be got for seven or eight dollars a barrel, transportation and delivery included. So likewise with nearly every other standard article; by jumping the needless middlemen and buying for cash at first hand, the purchasing power of wages may be immensely augmented, without doing injustice to any one.

It is but a short and natural step from temporary combinations for mutual benefit to permanent organization. This step has been taken; and under the somewhat grandiloquent title of "Sovereigns of Industry," the new organization is drawing together the working men of the Eastern States with a rapidity rivaling the development of the Grange throughout the West.

Thus far the Sovereigns have stuck to their original idea of mutual helpfulness in supplying the necessaries of life to the members of their several councils. It is to be hoped that they will continue to do so, avoiding strenuously the political follies of the Grangers. It would be a pity if the power which the order is capable of wielding for the economical advancement of the great army of manual and mechanical workers of the country should not be developed to the uttermost, as it can be only by the most stringent repression of demagogues and party schemers.

Various plans of operation are adopted by different councils, according to the number of members, their place of residence, and the local advantages for buying. The chief object being to make the most of the money they have to spend, with the least inconvenience or risk, it is a common practice to avail themselves of the machinery of trade already established in their neighborhood, taking care, however, to pay no exorbitant profits. An arrangement is made with one or more dealers in each department to throw the trade of the council into their hands in consideration of a special discount on regular retail prices, a concession which the favored dealers can well afford to make in return for an assured cash custom, without the cost of advertising or other outlays for attracting customers. Every three months the council receives the bids of dealers desiring its trade, and elects those which offer the greatest inducements, all things considered. Tickets of membership are then issued, the exhibition of which entitles the bearer to the stipulated discount on all goods purchased during the ensuing quarter. In all cases the council takes pains to secure trade circulars and lists of wholesale prices current, from which to estimate the justness of the charges of their local dealers. If the members can do better by ordering their supplies from the producer or the wholesale dealer, the local dealers lose their trade altogether.

In many cases large dealers undertake to fill the orders of councils at a slight advance on wholesale rates, delivering to the appointed purchasing agents the articles in separate parcels as required by the members, thus enabling the mechanics of the most out of the way village to command as favorable terms as the market will afford. Where the purchases are considerable and tolerably regular, it has been found a very satisfactory way to hire a cheap store room, and appoint one of the members storekeeper for the council, to distribute the purchases as called for, on certain evenings of the week. At the regular monthly meetings, the members elect the amounts of the several articles required, which are purchased in bulk, and of course on more favorable terms than in separate parcels. By this plan, most of the advantages of co-operative stores are secured, with none of the risks.

In several States, it has been found advantageous (experimentally, at least) to mass the trade of the order, or a great portion of it, by appointing a general purchasing agent, through whom the supplies for the councils are ordered, the superior advantages of such a buyer more than offsetting the cost of the increased machinery.

An idea of the rapid spread of the organization may be gained by the rate at which the order has grown in Connecticut. The first council, with seven members, was organized February 26, 1874. In May a State council met, with a membership of twelve hundred. By August, this number was more than doubled; and at the meeting of December 8, forty-seven councils, with a membership of over five thousand, were represented. To-day, there are probably near ten thousand of the more thrifty mechanics and laborers of the small State of Connecticut thus banded together for mutual benefit in trade. Thus far, the estimated saving to each member is thirty per cent of his purchases through the agency of the order—certainly an amount worth considering. Such a sensible and practical "strike" for increase of wages is something new in the annals of industry.

Besides the State councils, a national council has been organized. It will hold its session for 1875, probably before this reaches the eye of the reader. For what practical purposes the session will be held does not clearly appear to outsiders. We can only hope that it will take no action to complicate the objects of the order, or to divert its work from its original purpose. National councils are apt to be over ambitious, and the temptation to use a popular organization for political purposes is hard to be resisted: if indulged in, ruin is inevitable.

A BOX TRICK TO BEAT HARTZ.*

According to travelers' stories—the best of all evidence, as everybody knows—there used to be in India a school of vagabonds who got their living by dying. For a very modest sum they would emulate the frogs which are periodically discovered alive in solid rock—or in tree trunks, overlaid by innumerable rings of annual growth—and retire for a specified period from the cares of this life. They professed to have such control over their vital processes as to be able to die at will, and would allow themselves to be sealed up in coffins or tied up in blankets, and buried underground for a week or a month, or more.

A very circumstantial account of such an operation was given by Sir Claude Wade. When he was at the court of Runjeet Singh, in 1837, a fakir was thus buried for six weeks, a company of soldiers guarding the place of his interment to prevent untimely resurrection. At the end of the six weeks the seals were found intact; and on removing the lid of the box which served as a coffin, the white linen bag in which the fakir had been placed was found to be mildewed. When the bag was opened, the temporarily dead man's arms and legs were found to be shriveled and stiff; and his head reclined, corpse-like, on his shoulder. To all appearance he was as dead as an Egyptian mummy, no pulsation or other evidence of life being discoverable. He was then turned over to the manipulations of his servant, who made warm applications of various kinds, whereupon the arms and legs gradually returned to their normal state. He then removed the wax and cotton with which the fakir's nostrils and ears had been closed, and after half an hour the devotee was able to speak. All of which Sir Claude vouches for as an eye witness, with an air of truthfulness rivaling that of About's clever story of the man with the broken ear.

This art of dying at will and coming to life again appears not to be monopolized by the Hindoos. At least one Englishman in modern times, if human testimony is worth anything, has attained it. His name was Townsend, Colonel Townsend of the British army in India. This man could go into a death-like trance at will, so skillfully counterfeiting real death that the most critical observers were deceived. On one occasion the experiment was made in the presence of Dr. Cheyne, who reports upon the case, Dr. Baynard and a Mr. Skrine. All three felt his pulse: it was distinct, though small and thready: and his heart had its usual beating. He then composed himself on his back and lay motionless for some time. Gradually all signs of life disappeared, till there was no pulse, no beating of the heart, and a mirror held before his mouth gave no indication of breath.

The witnesses discussed this strange appearance for a long time, finally concluding that he had carried the experiment too far and was really dead. As they were about to leave him, a slight motion of his body was observed, and a beating of the heart. In a little while he began to breathe, and gradually life was fully restored.

This account has been accepted as trustworthy and credible by high medical authorities, and so likewise have those given of the fakirs who carried the experiment a degree further than Colonel Townsend, and submitted themselves to actual burial.

It is a pity the art has not been more widely cultivated; it would afford such a convenient refuge for geniuses born ahead of their time. On finding their generation too stupid to appreciate their grand discoveries and projects, they could retire for a season until in the regular course of events the masses should overtake them. Then instead of writing a book and depositing it, sealed, in a public library, to be opened in the year 1975, or such a matter, they could themselves be so deposited, duly labeled and preserved, till their time should come. We could name a good many whose acquaintances would gladly provide fireproof quarters for them and their projects for a century or two. The only fear that the fakirs had of protracted burial was that in the meantime their servants might die and there be left no one to resurrect them. In cases such as we have imagined, there would be no risk of this sort to deter the devotee, the community at large assuming the responsibility.

TESTING THE CORRECTNESS OF FIGURES BY WEIGHT.

We publish in another column a communication from our well known correspondent Dr. P. H. Vander Weyde, in which he suggests a rather novel and effectual method of testing the correctness of all calculations such as those pertaining to the squaring of the circle, and the contents of circular or other forms. His method is based on the practice, adopted sometime ago, of measuring the area of land by weight, in which the figure of the land is drawn to a scale on paper, and the figure cut out of the sheet. The figure of a square acre is also drawn to the same scale and cut from the paper sheet. The two are now weighed separately. The weight of the paper figure of the land, divided by the weight of the paper figure of the square acre, indicates with accuracy the number of acres contained in the land.

Applying this method to the squaring of the circle, Dr. Vander Weyde weighed the circle of paper and the proper squares, with the results given in his letter. It will be seen that the calculations of some of our prominent circle squarers, when thus weighed in the balance, are found wanting.

P'I-RYI.

Among the ways that are dark and tricks that are queer, for which the "heathen chinee" is peculiar, one of the cleverest bears the name p'i ryi. It fairly rivals the jugglery of our highly enlightened writing mediums, and is employed for the same useful purpose. When the pig-tailed earnest enquirer realizes the truth which the Widow Bedott versifies:

"Poor short-sighted critters, we
Kant calculate what's going to be
And, like enough, never'll take place!"

he consults an oracle, much as pig-headed enquirers do with us. The oracle does not put a slate under a table to be written on; he writes on the top of a table, previously dusted with sand or flour. The pen—that is to say the brush, for no other sort of pen or pencil is used in writing Chinese—is suspended by a string from the rim of an inverted wicker rice basket, which is balanced on the fingers of two persons sitting on opposite sides of the table. After the proper period of quiet waiting, the pen begins to move, writing out the answer to any question which may be put.

On one occasion, the Chinese teacher of the Rev. R. H. Cobbold, who is responsible for the story, consulted an oracle of this sort to discover certain names that were wanting to fill up an ancestral register. On being asked for a particular name, the oracle wrote: "Inquire of another branch of the family." It was done, and the "spirit" at once wrote down the name. The story reminds one of a great deal that passes for evidence outside of China, there being no proof that the names furnished by the "spirit" were correct. It is not surprising that the investigations made by the reverend gentleman were unable to discover the cheat.

Writing of p'i-kyi, in his chapters on China and the Chinese, the Rev. A. E. Moule says: "So great is the mystery, or, if you please, so clever is the trick, that some of the oldest and most wide-awake of the missionaries have been quite unable to explain it away, even when performed under their own eyes and on their own study tables." The chief difficulty seems to be the apparent impossibility of directing by muscular effort the formation of intricate Chinese characters by means of a pen suspended by a string.

LOSS OF A LARGE NEW YORK MAIL.

On the 7th of January the express train that left Washington for New York at 9.30 P. M., in consequence of a misplaced switch, went into collision with a freight train standing on a side track. One man was killed, and another badly injured. The coal oil in the lamps of the postal car was scattered and instantly burst into flames, soon destroying the mails and the contents of the adjoining express car. The mails lost were large, comprising upwards of one hundred thousand letters from the South, bound for New York and other places. The usual daily correspondence of the SCIENTIFIC AMERICAN office was consumed, and a large number of our correspondents will consequently fail to receive their expected replies. We hope they will promptly repeat their enquiries.

IMPROVEMENT IN CANAL NAVIGATION.

It will be remembered that some three years ago the State of New York offered a reward of one hundred thousand dollars for the invention of improved methods of navigating the Erie canal (400 miles in length), whereby merchandize could be transported with greater economy than by the present system of horse towage. A variety of experimental boats were made, all or nearly all propelled by steam. The ultimate result was that none of the competitors succeeded in complying with the peculiar conditions of the law, and they were finally modified, and under the modification an award was last year paid to the owner of the Baxter boat and to one other competitor. So ended the State reward project. But there is still a strong demand for improvement, and the subject is well worthy the attention of ingenious minds.

General Thayer, Canal Auditor of this State, takes up the subject in his recent report, and gives expression to the following eminently practical views:

"The Baxter Steam Canal Boat Company has been organized, and during the past season has constructed and operated seven boats, which, according to reports furnished this department, have proved successful, both in regard to increased speed and greater economy, as compared with boats moved by animal power. This company is really the first organized to employ steam as a motive power on a scale likely to prove a financial success. There can be no doubt that an organization with a sufficient number of steamers to ensure daily departures, and with convenient wharfage facilities at New York, will command business at remunerative rates. Such an enterprise can secure a large and profitable traffic in both directions on the line of the Erie canal, which of late years has been almost entirely abandoned to the railroad.

A PLAN FOR TOWAGE WANTED.

"One great need, however, has not yet been accomplished, that is, some plan for steam towage or propulsion adapted to the large number of boats now employed, five thousand to six thousand, and moved by animal power.

"Although I do not disapprove of the liberal bounty which the legislature granted to the Baxter boat, still, without intending in the least degree to disparage the merits of that boat, I am inclined to believe that, if the same liberal reward had been open to wider competition, we might possibly have secured a better result. When the law required that the motor should be adapted to the form of boat then in use, that restriction virtually prevented practical mechanical engineers from engaging in the contest. They knew that, as Mr. Baxter fully realized, a boat to be propelled by its own machinery must be of a different form and model from those that were simply towed, and hence were unwilling to assume the risk of being recognized by the commission or rewarded by the State when not adhering to the requirements of the law. Had the time for competition been extended, the mechanical genius of the country would have been enlisted; a greater number of plans would have been submitted, and might not the practical results have been more favorable?

SUCCESS OF CABLE TOWAGE

"The New York Steam Cable Towing Company was organized for the purpose of introducing upon our canals the cable system of towing. That company, during the season of 1872, laid a single cable between Buffalo and Lockport, and, with two steamers especially constructed for the purpose, has been operating the system, experimentally, during the past two seasons. It is claimed by the projectors of the enterprise that, during their experimental operations, 1,400 tuns of freight, with boats containing it, have been hauled in one train by a single cable steamer, against the strong current between Tonawanda and Buffalo, at the rate of three miles per hour, at as low a cost for steam power as any known steam canal boat carrying two hundred tuns, that is to say, doing seven times the work at the same cost for steam. The cable system ought not to be considered an experiment. It has been in successful operation on European canals and rivers for several years, and found to be the cheapest adaptation of steam for towing purposes yet devised. There is no reason why it should not be equally successful on our own canals, and certainly no more profitable field for the operation of the system can be found.

FURTHER IMPROVEMENTS DEMANDED.

"Before dismissing the subject, I cannot refrain from reminding the legislature that the State has made but one earnest effort to introduce steam on our canals. That effort should be continued, and not relaxed until success is assured. With steam successfully established on our canals, we shall command, without fear of diversion, our full share of western trade. The Lyons lock will be finished before the opening of navigation the coming spring. The completion of that structure will give us double locks the entire length of the Erie canal. Cheap and rapid transportation is the great problem of the day, and its solution interests producer and consumer alike. Railroads reaching from nearly all the principal cities upon the Atlantic coast to the great grain markets of the West are striving for supremacy in the carrying trade, and it is quite probable that active competition will have the effect to reduce rates, for a time at least, to a point below actual cost. But with our great lakes, on which a single vessel of modern build will carry one hundred thousand bushels of grain (equal to 300 car loads) from Chicago or Milwaukee to Buffalo, and with the Erie canal in good order, seven feet of water and double locks, together with steamboats and steam towage on the canal and river, through from Buffalo to New York, alongside of ship in five to six days, we can successfully compete with all the railroads in the country, even at the present rates of toll."

AMALGAM FILLINGS FOR THE TEETH.

We are indebted to Dr. J. W. Clowes for a copy of his very excellent essay on the above subject, as read before the Odontological Society of this city. Dr. Clowes has rendered a good service to the dental profession by his long-continued, sturdy support and practice of tin amalgam fillings. He has in times past been ridiculed for this by members of his own profession; but at last it begins to be perceived that, instead of ridicule, he was entitled to honor.

The use of tin amalgams as a filling for the teeth was begun many years ago, but the practice never became general among dentists. This was due to early prejudices against the material, engendered by lack of knowledge and skill in its use. Its employment is, however, being now judiciously revived.

The experience of some of our best dentists, throughout a period of thirty years, has conclusively shown that tin amalgam, properly prepared and applied, is a reliable preservative; while owing to the plastic nature of the amalgam, it may be inserted within sensitive or delicate teeth without pain to the patient, and under circumstances when the use of gold would be inadmissible. This amalgam when first applied is quite soft, and a gentle pressure therefore causes it to fill every interstice of the tooth with certainty. After a few hours' time the amalgam becomes permanently solid.

Complaint has been made that the tin amalgam fillings turn black and cause the teeth to decay. But this is not the case to any greater extent than when gold is used. Some of the worst looking and most badly decayed teeth we ever saw have been those filled with gold by a poor operator. The truth is that, if the dentist is an unskilled man, or if you neglect to keep your teeth scrupulously clean, they will decay and discolor, no matter what fillings are used.

When the decayed cavity in a tooth is properly excavated and filled with amalgam, it will preserve the tooth with certainty; while in general, it looks better in the mouth than gold. Dentists skilled in the use of the amalgam, and patients carrying this filling, will testify to the correctness of this statement.

Next to the breathing of pure air, exercise, and the use of suitable food, nothing more contributes to the preservation of health than the possession of good teeth. All the arts used for their preservation are therefore of the highest importance.

It should never be forgotten that the teeth will not ordinarily decay, either originally or after being properly filled, unless food or other foreign substances are allowed to remain between them long enough to acidify or decay, and thus act injuriously on the dental enamel. The importance of keeping the teeth clean, by brushing, by drawing silk threads between, by frequent rinsing, and other simple agencies, may thus be understood.

Captain E. B. Ward.

We note with regret the death of Captain Eben B. Ward, a well known citizen of Detroit, whose name for many years past has been closely identified with the remarkable growth and progress of our Northwestern industries. Mr. Ward was born in Canada, in 1811, and at the early age of 12 years was rendered dependent upon his own exertions for support. Entering upon the duties of cabin boy on a lake schooner, he speedily rose to command the largest vessels, and ultimately became himself an owner of a great number.

During late years Mr. Ward gradually withdrew from shipping interests, and devoted his talents and capital to the establishment of iron manufactures in his section of the country. He founded the Eureka Iron Works of Detroit, the North Chicago rolling mill, and the rolling mill at Milwaukee. He also made large investments in the Lake Superior iron mines and erected furnaces in the vicinity. He was for many years President of the American Iron and Steel Association, and, in this as well as in other prominent positions, labored to push forward the important industrial enterprises which he had initiated. Pecuniarily his ventures were highly successful, and he leaves an estate estimated at several million dollars. Mr. Ward's death was very sudden, owing to an apoplectic stroke, and occurred on the morning of January 2.

SCIENTIFIC AND PRACTICAL INFORMATION.

A NOVEL SINGLE RAIL RAILWAY.

The Turkish government has recently commenced the construction of a railway, termed the Steam Caravan, between Alexandretta and Aleppo, Syria, a distance of 94·2 miles. A single rail is employed, following the conformation of the land, but raised on a wall 28 inches high and 17·5 inches broad. The vehicles are mounted and straddle, so to speak, both rail and wall. The locomotives are provided below with horizontal, leather-covered wheels, which rest against the sides of the masonry and serve as brakes, and the last vehicle of each train has similar arrangements. Each side of each carriage contains two persons, and the complete train is calculated to accommodate ninety-six.

A NEW WAY OF PRESERVING EGGS.

It is stated by the *Revue Industrielle* that the best method of preserving eggs is to soak them for half an hour in soluble glass of a thick, pasty consistency. The material forms a chemical compound with the carbonate of lime of which the shell is composed, which renders the latter impermeable to air. After immersion, the eggs should be carefully dried and kept in oats or on perforated trays in a dry locality.

SCARLATINA AN EPIDEMIC.

The views of Dr. Alfred Carpenter, published some three years since in the *Lancet*, upon the subject of scarlet fever, ascribing to that disease an epidemic character, are strongly endorsed in a recent issue of the *Medical and Surgical Reporter*. The editor maintains that not only is the disease infectious in the full sense of the term, but also that the malignity of the infection is something frightful. Articles of clothing worn by patients retain a dangerous character for over a year, as do walls, furniture, and in fact everything that has been in the vicinity of the disease and in its spread. The secretions of the body, epidermic scales, and excreta are active carriers of the pestilence.

Thorough ventilation and disinfection are the best means for destroying the poison. Clothing, bedding, etc., should be submitted to a dry heat of 220° Fah. for several hours, and then soaked in a mixture of 1 pound hyposulphite of soda, 2 ounces sulphuric acid, and 8 gallons of water. Rooms should be purified by burning sulphur, and the patient thoroughly cleansed before having intercourse with other people.

VENUS AS A LUMINOUS RING.

Professor C. S. Lyman published in the *American Journal* eight years ago a brief notice of some observations made on Venus when near her inferior conjunction in 1866. The planet was then (for the first time, so far as appears) seen as a very delicate luminous ring.

No opportunity has since occurred of repeating these observations until the day of the recent transit. On Tuesday, December 8, Venus was again in close proximity to the sun, and the author had the satisfaction of watching the delicate, silvery ring enclosing her disk, even when the planet was only the sun's semi-diameter from his limb. This was at 4 P. M. or less than five hours before the beginning of the transit. The ring was brightest on the side toward the sun—the crescent proper. On the opposite side the thread of light was duller and of a slightly yellowish tinge. On the northern limb of the planet, some 60° or 80° from the point opposite the sun, the ring for a small space was fainter, and apparently narrower, than elsewhere. A similar appearance, but more marked, was observed on the same limb, in 1866.

These observations were made with a five foot Clark telescope of 4½ inches aperture, by so placing the instrument as to have the sun cut off by a distant building while the planet was still visible. The ring was distinctly seen when the aperture was reduced to 1¼ inches. The 9 inch equatorial could not be used, as there were no means of excluding the direct sunlight.

On the 10th the crescent, extending to more than three fourths of a circle, was seen with beautiful distinctness in the equatorial; and on this and two subsequent days, measurements were taken with the filar micrometer for the purpose of determining the extent of the cusps, and consequently the horizontal refraction of the atmosphere of the planet, on the assumption that the extension of the crescent and formation of the ring are due to this refraction.

VARNISH FOR WHITE WOODS.—Dissolve three pounds of bleached shellac in one gallon of spirit of wine; strain, and add one and one half more gallons of spirit. If the shellac is pure and white, this will make a beautifully clear covering for white wooden articles.

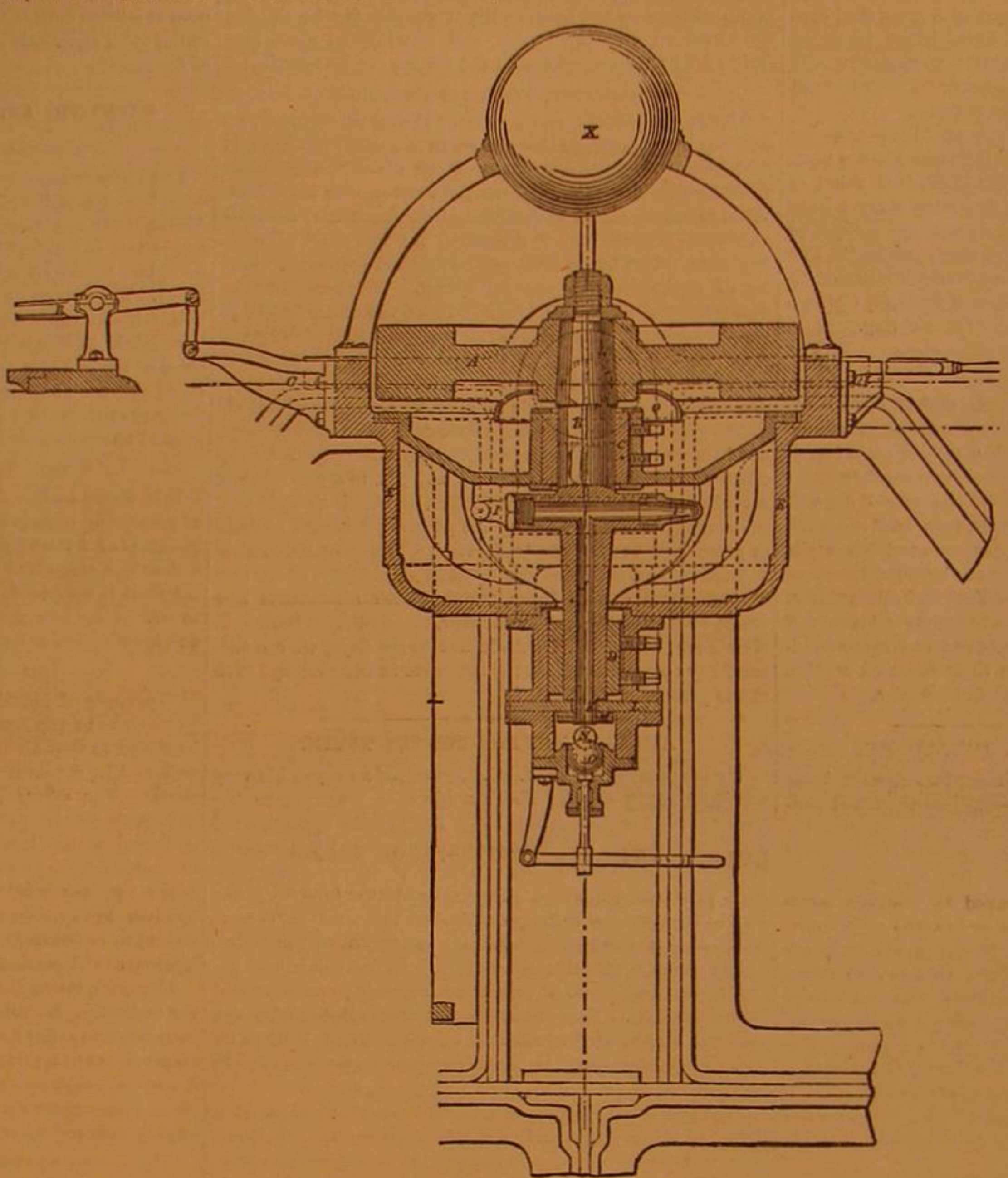
Cocoa nut husk is better than cotton waste and turpentine for taking temporary rust from iron or steel.

THE BESSEMER OSCILLATING SALOON.

As we shall probably soon hear that the oscillating saloon steamer Bessemer is running between England and France, conveying passengers over the uncomfortable and uncertain Straits of Dover, we present to our readers an engraving of the gyroscopic arrangement (by which the saloon is kept in a horizontal position, even under the greatest possible angles of variation of the ship), selected from *Engineering*.

The ordinary form of gyroscope (for an illustration of which see page 91, volume XXXI), is a heavy disk or wheel, made to revolve rapidly in any given plane, tending always to remain revolving in that plane; and it can only have the direction of its action of rotation changed by the application of considerable force, the amount of this force depending upon the weight of the revolving body and its speed of rotation. The manner in which Mr. Bessemer has availed himself of this gyroscopic action will be understood by reference to our engraving, which represents the controlling apparatus as constructed for the steamer. The gyroscope in this case consists of a steel disk wheel, A, 2 feet in diameter, and with a rim 4 inches square, this wheel being made of steel forged so as to make the mass as nearly homogeneous as possible, and carefully turned so as to insure its running perfectly true. As it may possibly be necessary under some circumstances to run the disk at as high a speed as 5,000 revolutions per minute, it is evident that great care is necessary to ensure perfect balancing. The boss of the disk is bored out conically to fit the conical upper end of the spindle, B, the spindle and disk being ground together to secure a perfect fit. A nut and washer at the top secure the disk in place, no keys or pins being used.

The spindle, B, which is also of steel, is steadied by two bearings, C and D, through which it passes, these bearings being capable of adjustment in one direction (that in which a disturbing force will be brought upon the spindle) by set screws as shown. The bearings are fitted to boxes formed by castings fixed to the top and bottom of the gun metal casing or frame, E, this casing being strengthened by internal ribs, and being slung on a pair of trunnions with which it is provided. The center line of these trunnions corresponds with the center line of the vessel, and the casing, E, can thus swing athwartships, but not in a fore and aft direction. The trunnion bearings are supported by wrought iron standards springing from the floor beams of the saloon; and thus, if the axis, B, be kept perpendicular by the gyroscopic action of the disk, A, the casing, E, must rock on its trunnions if the floor of the saloon departs from a horizontal position. The manner in which this movement of the casing, E, is made to control the action of the cabin we shall explain presently; meanwhile we must explain how the gyroscope is driven.



THE CONTROLLING GEAR OF THE BESSEMER SALOON.

It is evident that in such an arrangement, where the slightest interference with the gyroscopic action is to be avoided, the use of belts or other similar driving gear would be inadmissible, and Mr. Bessemer therefore decided to give motion to the gyroscope by means of a kind of reaction turbine, or Barker's mill, formed on the spindle of the gyroscope itself. For this purpose, the spindle, B, has, as will be seen, a pair of arms formed on it, these arms being bored out, and the hole through them communicating with another hole, J, bored up through the spindle from its lower end. Water under pressure enters through one of the trunnions of the casing, E, and passes down through a suitable pipe to a small casing, N, below the bottom of the spindle. Thence it passes up through the hole, J, in the spindle and through the radial arms, finally escaping through the lateral opening in the caps, I, with which the ends of the arms are provided. A small hole, forming a prolongation of J, conducts a supply of water to the upper bearing, C, and any water escaping at the upper end of that bearing is deflected downwards by the dished plate, Q, and thrown back into the casing, E. A flexible waste pipe, not shown in the illustration, conducts away the water from the casing, E, back again to the tank from which the pumps draw, this tank being fitted with screens so as to keep the water perfectly clear, and remove any particles which, if allowed to circulate through the apparatus, might cause a stoppage of the openings in the arms, I.

An exceedingly neat point in the design is the provision made for avoiding any frictional resistances due to the weight of the gyroscope. It will be seen that the lower end of the spindle, B, is considerably reduced in diameter, there being formed, at K, a square and carefully finished shoulder. Below this shoulder the reduced portion of the spindle passes through a phosphor bronze plate, L, the spindle being a free fit in this plate. Below the plate, L, are two metal disks, M, which also fit the spindle freely, and which are kept pressed lightly against the plate, by springs not shown in the engraving. These springs are only required to keep the disks, M, in place when the water is shut off from the apparatus; when in regular work, the pressure of the water tends to force them upwards. As a result of the free fit of the lower end of the spindle in the plate, L, there is always a slight leakage at that point when the apparatus is in use; and this leakage, besides lubricating the lower bearing, D, serves an important purpose, as we shall now explain. The upward pressure of the water on the area corresponding to the section of the lower end of the spindle suffices to balance the greater part of the gyroscope; but inasmuch as variations in the pressure of the water might otherwise create difficulties, the diameter of the lower part of the spindle is made such that, at the ordinary working pressure of the water, about fifty pounds of the weight of the revolving disk, spindle, etc., remains unbalanced. If no means were taken to prevent it, this weight would rest upon the square shoulder, at K, and a rapid abrasion of the plate, L, would result. But the leakage to which we have already referred prevents this. Thus the water leaking through the hole in the plate, L, around the lower end of the spindle comes against the shoulder formed on the spindle, at K, and it is thus brought to bear against an enlarged area, and is enabled to raise the spindle and its attachments. As soon as it has thus lifted the spindle, the leakage water can escape between the plate, L, and the square shoulder, at K; but it is evident that the amount by which the spindle is lifted is strictly limited by the amount of the leakage, and can never become excessive. It is also practically independent of moderate variations in the water pressure, an alteration in pressure merely producing a slight alteration in the thickness of the film of water flowing away between the plate, L, and the square shoulder, at K. Thus in all cases, when in action it is insured that the weight of the gyroscope is carried upon what may be called a water bearing, and one that it is consequently practically frictionless.

If while the apparatus was in action, the supply of water was shut off by means of a valve fitted to the supply pipe, the pressure of the water in the box, N, would at once cease, and the weight of the gyroscope, ceasing to be water-borne, would at once cause abrasion to commence between the square collar at K, and the plate, L. This result, however, Mr. Bessemer has ingeniously guarded against as follows: In a recess at the bottom of the box, N, is a gun metal ball, O, while at the lower end the hole, J, in the spindle, B, is countersunk so as to form a kind of valve seat. Under ordinary circumstances, the ball, O, rests in its recess at the bottom of the box, N; but when it is desired to stop the gyroscope, it is raised by means of the plunger and hand lever shown, until it is close to the lower end of the spindle. Immediately this is done, the pressure of the water carries it against the seat at the lower end of the spindle, and it then revolves with the latter, until, from the water being cut off from the arms, I, the gyroscope comes to rest. During this time, when the gyroscope is running down, as it may be called, the apparatus is still water-borne, as the pressure continues to be maintained on the box, N. When the gyroscope has come to rest, the water is shut off by a valve in the supply pipe; the leakage then reduces the pressure of the box, N, and the ball, O, falls into its normal position at the bottom of the box.

We have now to speak of the manner in which the gyroscope is made to actuate the valves by means of which the movements of the saloon are controlled. The saloon is hung on a longitudinal axis, and on either side of it are placed the hydraulic cylinders by which its movements in relation to the hull of the vessel are controlled. These cylinders are double acting, so that a pull upwards on one side of the saloon is always accompanied by a downward pull on the other, and *vice versa*, and the water has therefore to be admitted to, say, the top of the port and bottom of the starboard cylinder (or the reverse) simultaneously. The whole distribution of the water is effected by a cylindrical slide valve.

The connection between the valve and gyroscope will be readily understood. On the side next the valve the casing of the gyroscope carries an arm which is connected by a link with one end of a lever, the other end of the lever being connected to the valve spindle. Let us suppose that in our engraving we are looking towards the head of the vessel, and that the latter gives a roll over to port. The effect of this would be that, the gyroscope spindle remaining vertical, its lower end would be brought nearer to the valve casing, the arm raised in relation to that casing, the valve lowered, and water under pressure admitted to those ends of the hydraulic cylinders with which the pipe communicates; this admission of water to the hydraulic cylinders raising the port side of the cabin in relation to the hull of the vessel, and thus counteracting the list of the latter to port. On a roll taking place to starboard, the opposite action would, of course, take place.

It will be seen from this description that a slight movement of the saloon must take place before the gyroscope can actuate the controlling valve; but by adjusting the length of the lever in proportion to the length of the arm of the lever to which it is coupled, this movement, it is expected, will be brought within such small limits as to have no practical effect on the comfort of the passengers. This, however, is one of the points which of course can only be conclusively decided by actual trial.

Concrete Gravel Walks.

In Dick's *Encyclopedia of Practical Receipts* are the following directions for making concrete surfaces:

Dig away the earth to the depth of about 5 inches, then lay a bottom of pebbles, ramming them well down with a paving rammer. Sweep them off as clean as possible with a broom, and cover the surface thinly with hot coal tar. Now put on a coat of smaller gravel (the first bed of pebbles should be as large as goose eggs), previously dipped in hot coal tar, drained, and rolled in coal ashes, with an intermixture of fine gravel, and roll it down as thoroughly as possible. Let the roller run slowly, and let a boy follow it with a hoe to scrape off all adhering gravel. Next put on a coat of fine gravel or sand and coal tar, with some coal ashes, to complete the surface, and roll again as thoroughly as possible; the more rolling, the better. It will take some weeks to harden, but makes a splendid hard surface which sheds water like a roof. Do not use too much tar. It is only necessary to use enough to make the ingredients cohere under pressure, and a little is better than too much.

Nickel-Plated Screws.

In car building, nickel-plated screws are rapidly coming into general use. This grows out of the fact that, though their original cost may be a trifle more than silver-plated screws, yet, as nickel does not oxidize by exposure to air, the excess of cost is more than made up in the durability of the plating. Hence, in nearly all of the large car manufactories, nickel-plated screws are superseding silver-plated for use in joinery work. There is a steady increase in the use of nickel-plated screws in house joinery, which argues well for their final adoption for all such work in which silver-plated screws are now employed.

A Telegraphic Congress is to be held in St. Petersburg during the present year. The Russian telegraph department has set aside some $20,000 to pay the expenses.

TUBULAR FLOATING DOCKS.

It is quite unnecessary to insist at the present day on the general usefulness and merits of floating docks. The fact that they can be employed in deep water, and in situations where from the nature of the ground it would be impossible to cut docks on the ordinary system, and that, too, independently of the hight of the tide, is so manifest an advantage that it cannot be questioned that, at a time when increased dock accomodation is urgently required, their principle will be largely employed. The comparative cheapness of their construction also tells powerfully in their favor. To this must be added the consideration that floating docks are capable of being moved from place to place, so that if the demand for their use be diminished at one port they can readily, and at small expense, be moved to another where the demand is greater; while from their comparative cheapness they can at all times be more profitably employed than fixed stone docks which have been built at a large outlay. The story of the great Bermuda dock, safely towed across the Atlantic without accident or unusual difficulty, must be fresh in the memory of all who take an interest in shipping.

Floating docks of the ordinary type consist, as is well known, of parallel or nearly parallel walls terminating in a flat bottom, the space between being divided into a large number of watertight compartments, into and out of which water may be pumped by methods which need no description, and so be raised or lowered at pleasure; so that vessels of various sizes may be put on the dock, and raised by pumping the water out until the workmen can obtain access to the whole of the hull, and perform the requisite repairs, and can then be lowered by admitting the water until the vessel can be floated off. But the tubular dock of Messrs. Clark and Standfield, which we herewith illustrate, is of a totally different construction and is worked in a different manner. Both the bottom and the vertical sides of the dock consist of a number of circular wrought iron tubes, similar to egg-ended steam boilers. The bottom of the dock is formed of about eight circular tubes, which run the whole length of the vessel and extend some feet beyond its ends. These tubes are stiffened inside by angle irons every two or three feet, and are securely braced together by transverse beams of T and angle iron above and below, which are so united, by the tubes themselves and by gusset plates, as to form transverse girders of ample strength to support the vessel if its whole weight rests in the center. The whole forms a platform having sufficient buoyancy to support both the vertical sides of the dock and the vessel itself.

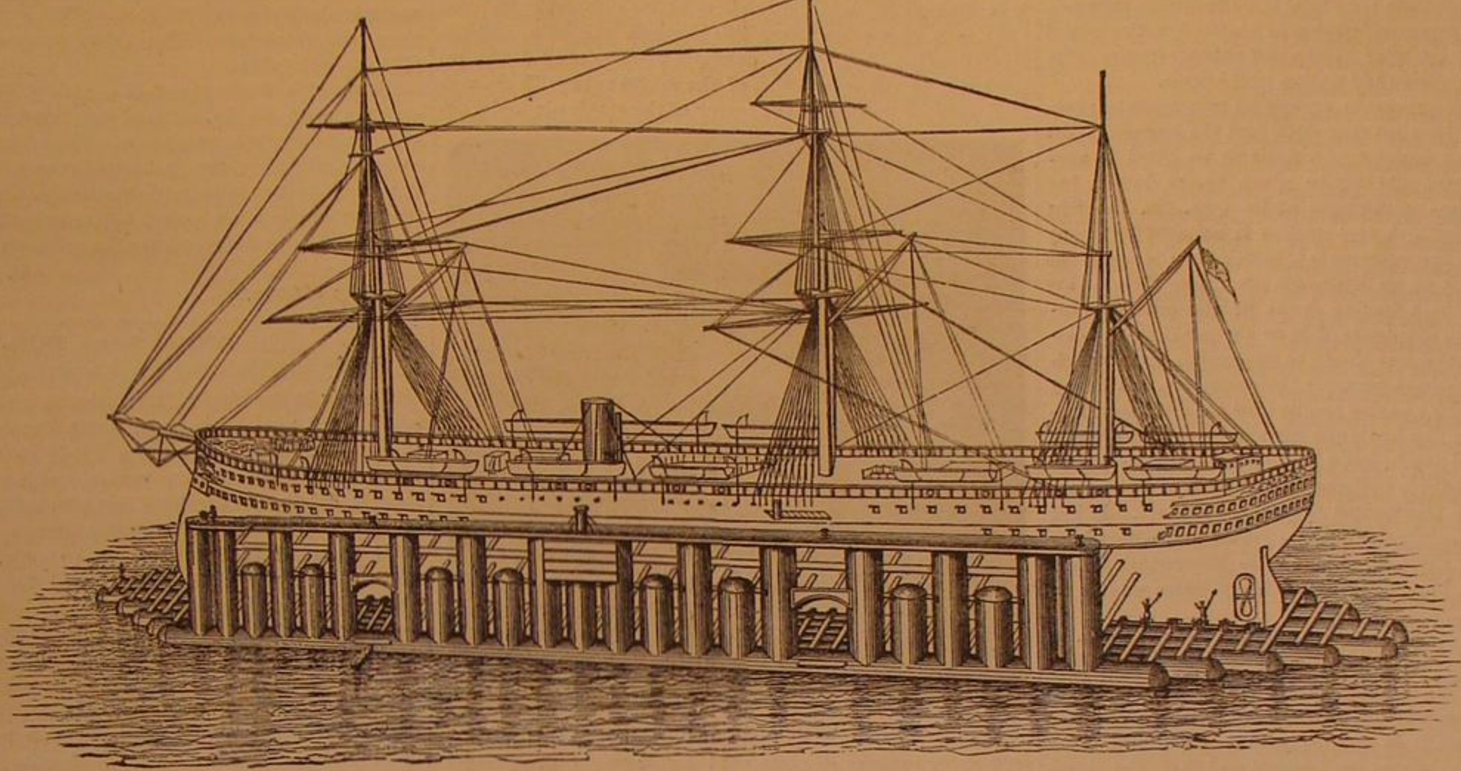
The sides of the dock are also formed of similar tubes which are fixed vertically. Each side is formed of from twelve to twenty-four of these vertical tubes, braced together and connected by a lattice work platform at the top running the whole length of the dock, forming a spacious gangway for the workmen. The longitudinal tubes are so connected with the iron platform at the top as to convert the whole dock into a beam or girder of great depth and of immense rigidity. The center longitudinal tubes are considerably larger than the side tubes, so that the general plan of the dock resembles somewhat that of an ordinary vessel. The two outer tubes are of larger diameter than the others, so as to give extra stability of flotation, and to afford convenient attachment for the side tubes.

The tubes are divided within into a great number of watertight compartments or chambers connected together by pipes; and the raising and submersion of the dock is effected by means of compressed air. The base of the dock is divided into about sixty airtight compartments, and the vertical sides form about forty additional chambers, and the whole of these last are hermetically sealed, so that the dock cannot under any circumstances sink. A certain number of the bottom chambers are so hermetically sealed; but the remainder are provided with valves at bottom, which can be opened or closed at pleasure, and with wrought iron pipes which are grouped together and are all brought to a valve house on the top platform of the dock, and are placed under the control of the valve engineer. When it is desired to sink the dock, the bottom valves are all opened and the air allowed to escape at the valve house until the dock settles down to its lowest level, ready for the reception of a vessel. When it is desired to raise the dock, air is forced into the tubes under compression, the water is expelled through the bottom valves, which are closed as soon as the dock and its vessel are fully raised; it then remains afloat with the vessel docked upon it, without any dependence on the air valves.

The engines are in two pairs, placed near the center of the dock within the vertical tubes, the main from these being led into the valve house. The whole of the watertight compartments in the bottom are divided into four equal groups corresponding with the four corners of the dock, by means of four corresponding valves in the valve house; air is admitted into or out of these respective groups in any desired proportions, so that the dock is maintained at all times perfectly level both in raising and lowering.

This novel form of dock has, to a great extent, the combined merits of the stone graving dock and of the ordinary hydraulic lift or pontoon dock, together with some advantages which are peculiar to itself. It has immense stability, owing to its great breadth, and to the great number of compartments into which it is divided, which prevent the tendency of the water to flow to the lower side—a tendency which may be, moreover, corrected at any time by allowing the compressed air (which is always kept stored in the vertical tubes) to act temporarily on any of the compartments. It is provided with sliding bilge blocks, similar to those used on hydraulic graving docks, which are drawn under the vessel by chains. The vertical tubes are also well provided with side frames, affording facilities for side shoring similar to those of stone graving docks, so that even loaded vessels may be readily blocked and shored up to any desired extent; this is a point of great importance in the lifting of heavy ironclads. Moreover, by admitting water into some compartments and expelling it from others, the lifting power can be to a great extent exerted directly under the load to be lifted. The vessel when lifted is high and dry above water, an advantage common to all floating docks; but owing to the vertical tubes in this dock being well separated from each other, there are great facilities of access to all parts of the

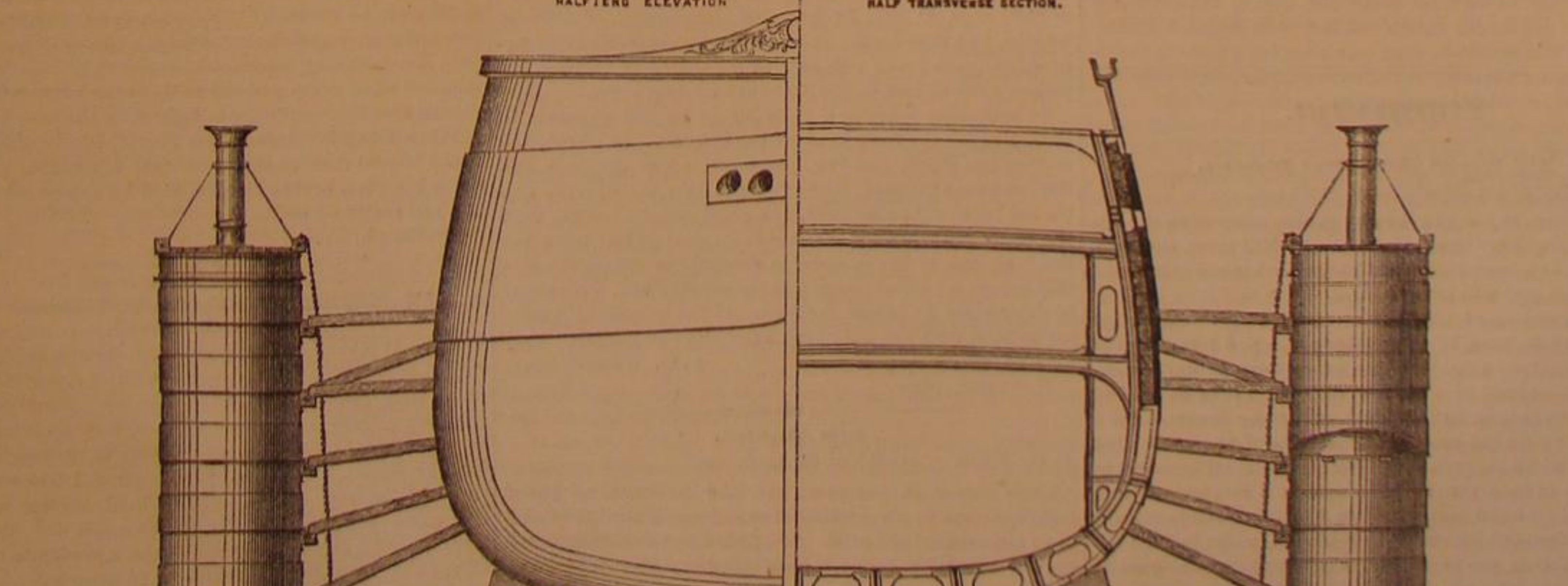
FIG. 1



CLARK AND STANDFIELD'S TUBULAR DOCK.

FIG. 2.

HALF END ELEVATION. HALF TRANSVERSE SECTION.



vessel. Two large gangways of extra width, provided with cranes, are also formed at each side for the landing of heavy timbers, plates, etc. The open sides admit of the air and light circulating freely round the work, so that paint dries and hardens much more quickly than in a sunken dock. From the same cause, repairs can be executed in a much more prompt and satisfactory manner than in a stone dock.

In exposed positions, it is proposed to submerge the dock entirely whenever it appears to be endangered by a cyclone or by stress of weather. The tubular sides afford great facilities for this operation; compressed air is pumped into them at leisure and kept stored up ready for use; after the dock is submerged, the opening of the valves will at any time allow it to expand and raise the dock to the surface. This use of stored-up power is also employed whenever it is desired to raise vessels rapidly—as, for example, in examining bottoms or screws; the power being stored up and ready for use, the docking of a vessel occupies but little time; by opening communication with the water in the tubes, the air expands and expels the water, and the vessel is immediately raised.

Fig. 1 shows a general elevation of the dock, with a vessel supported upon it by bilge blocks and shoring frames; Fig. 2 shows an end elevation and section of the same.

The floating dock appears to occupy an intermediate place between the old stone graving dock and the hydraulic lift dock. Where the number of vessels to be lifted is very great, preference will probably be given to the latter; but the floating dock has advantages of its own. In the first place, its greatly reduced cost renders it suitable for many positions in which the business is insufficient to warrant the cost of a stone dock or an hydraulic lift dock. There are several cases in which floating docks of the ordinary construction are paying dividends of 20 or 30 per cent, in positions in which stone docks would be impossible, or in which their cost would entirely preclude their adoption. It is not always easy to find a suitable position for an ordinary graving dock, and even the hydraulic lift system requires water of a certain limited depth; but a floating dock can be placed anywhere where there is sufficient depth for a vessel to approach, and can be transported from place to place. It has been stated that the tubular dock is raised and lowered by pneumatic means; there is, of course, no theoretical reason why it should not be worked by ordinary water pumps in the usual manner.

Floating docks appear likely to be applied in future to another purpose, to which sufficient attention has hitherto not been drawn. We allude to their employment as building slips for the construction or lengthening of vessels. On the ordinary system it is necessary that a building yard should be closely adjoining deep water, and that the vessel should be constructed and launched on inclined ways, a process not always devoid of risk. By building on pontoons this risk is almost entirely avoided; any shallow river or creek may be utilized, whatever its distance from deep water, and the ways may be laid on a pontoon, either floating in shallow water or resting on the ground in a shallow dry dock temporarily prepared for the purpose; and when the vessel is ready for launching, the water may be admitted to the dock, the valves closed, and the vessel floated out into deep water. In fact, floating docks have not yet assumed their proper place in the naval service. Constructed often in a temporary manner of wood or iron, and from imperfect designs, they have sometimes met with indifferent success or even with disaster; but experience has shown at once both their defects and their merits, and there is no doubt they are destined in future to become one of the most important elements both in navigation and in naval construction.—*Naval Science.*

Correspondence.

The Second Mill River Disaster.

To the Editor of the Scientific American:

I have seen, in one of your city papers, concerning the late break in Hayden, Gere & Co.'s dam on Mill river, the question: If a dam constructed as this one was is not safe, what can be built that will stand?

The dimensions of the dam as stated were: Length 141 feet; width at base, 13 feet; width at top, 6 feet; head of water, 20 feet. I consider those proportions entirely inadequate for that head of water. A dam for a head of 20 feet should have at least 30 feet width of base up stream, from a right angle with the breast or break-over of the water; and whatever width is given to the wall on top must be added to the length of base, thus: If the wall is 6 feet wide at top, the base must be 36 feet, provided the front wall is plumb; if it is angled, the base must be made still wider to suit; but the main things are to make the base up stream at least 1½ feet for every foot in hight of head, and to make the upper wall or sheeting as tight as possible, leaving the front comparatively open; for if the front wall is made perfectly tight and the other loose or open, the pressure really comes on the front wall, as the balance of the work is made much lighter by being in the water. By this way of building a dam, the weight of the water bears down on the work and not against it, as it does on a wall narrow at the base.

We have a dam here, built in 1852. It is 100 feet between the abutments, with a head of 20 feet. It is built of pine timber, on the above described principle; but it is constructed of trestle work, each trestle being entirely independent of the others, except as to sheathing plank laid across them; and they are in no way anchored to the abutments. It has never needed any repairs, and has never shown the least sign of moving.

A. W. IRWIN.

Arroyo, Elk county, Pa.

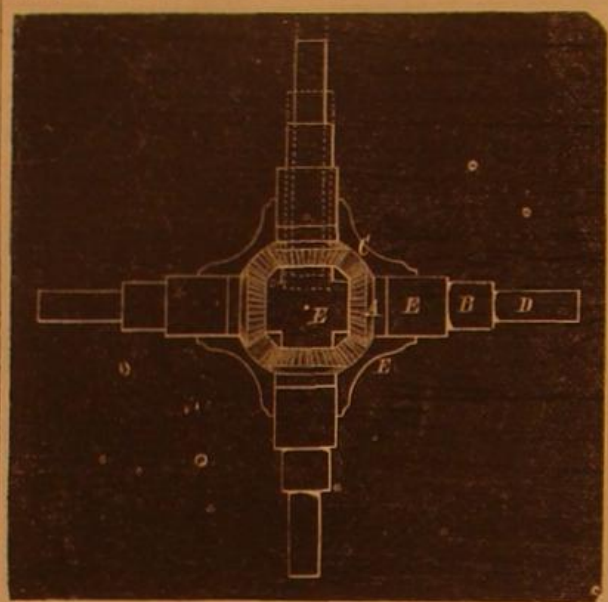
Placing Engine Cylinders in Line.

To the Editor of the Scientific American:

I notice a query in a late issue of your journal as to the best method of placing locomotive cylinders in line.

The most approved modern practice leaves but little to do in placing a cylinder in line, either in stationary or locomotive work, after the cylinder and its bedpiece leave the lathe and planer, except to test the accuracy of the draftsmen and machinists. If the machinists have accurate vertical and horizontal plan drawings for their guide, and work exactly accordingly, no after cutting or trimming will be needed to bring the cylinder into line. In locomotive work, one of the most difficult jobs is to fit the bedpiece to the boiler so that the two faces, upon which the cylinders are to be bolted, shall be exactly in their true position, which are usually indicated to the workman by the drawings.

In order to test the accuracy of the work after the bedpiece has been permanently fixed to the boiler, clamp a cylinder to its seat on the bedpiece and fit a wooden cross (with a pin hole through its center) to the bore of the cylinder at its front end; then pass a fine strong line through the hole, and extend it back so that it shall occupy a point exactly at the intersection of the central line of the driver axle with the vertical plane of motion of the center of the crank pin and con-



necting rod; draw the line taut and fasten it in this position; then apply calipers or a gage at the rear end of the cylinder, between the surface of the bore and the line, above and below and right and left of the line; and if the cylinder is in line, the four distances will of course be exactly the same. It is essential that the two horizontal distances should coincide exactly, and that the central lines of the two cylinders of a locomotive should be exactly parallel with each other, but for obvious reason the exact coincidence of the two vertical distances is not essential to the efficiency or correct working of the engine.

Instead of a wooden cross, as above mentioned, a more convenient instrument, made of metal, may be provided, consisting of four bevel gears, A, which serve also as nuts, which work four sockets, B, with threads cut on their inner ends, all neatly fitted to a light casting, E, having a fine central hole for the line, as shown. A central gear, C, works the four gears, of course all at the same time. Several sets of steel rods, D, may be provided if necessary, of different lengths, and thus render the instrument universal in its application, each set of rods serving for cylinders varying two inches, more or less, in the diameters of their bores.

To determine whether a cylinder of an old engine is in line: Remove the front head of the cylinder, the piston, the stuffing box gland, and the crosshead; apply the cross and line, as above directed, extending the line, through the piston rod hole in the rear head, to a point exactly central with the crank pin when the crank is at its dead point; draw the line taut, and, if the cylinder is correctly in range, the line will occupy a central position in the stuffing box, which may be determined as before directed. If the crosshead guides are parallel with the line, both vertically and laterally, they are also correct.

F. G. WOODWARD.

Worcester, Mass.

Grit Wanted.

To the Editor of the Scientific American:

Little things in universal use, like the American postal card, are often of great importance. A small portion of silica or alumina, or any other grit, added to the sizing, would convert our cards into tablets which could be written upon with a metallic point, and from which no ordinary friction will erase the writing. The writing with the metallic point would also be more legible than the writing with most inks or pencils.

The addition of the small amount of grit required does not injure the surface for writing with a pen, and could not add appreciably to the expense of their manufacture. The government furnishes the cards. Let it furnish also miniature metallic-pointed pencils for the vest pocket at one cent a piece. The government would make money by doing so, and a single pencil would carry on an ordinary citizen's card correspondence for a year.

These metallic points should be made of lead with a small percentage of bismuth. There are two ways of making such pencils. A cylinder of the alloy two inches long and one eighth of an inch in diameter can be wound with fancy paper until the diameter equals one sixth of an inch; the paper might be put on wet, compressed in a mold (*maché*) and varnished. Or a polished wooden cylinder, two and a half inches long and one fifth of an inch in diameter, can have a metallic point inserted at one end in the common way.

The present postal card can be written on with a soft metal point, but not with an alloy hard enough to give a fine, black, permanent mark.

W. F. C.

Small Steam Engines.

To the Editor of the Scientific American:

I will give you the result of my experience with a small boat engine, the vessel being 47 feet long, 11½ feet wide, and 4½ feet deep. She has a three-bladed screw, 4½ feet in diameter with 6 feet pitch, which is made to rise or fall in the water. The engine has two 6 x 10 inches cylinders, running at 120 revolutions per minute, with 70 lbs. steam. The engine exhausts into 75 feet of two-inch pipe, 60 feet of which is in the water outside of the boat, coming in again to conduct the water to the hot well. The pump takes the water to the boiler at 190° Fah. This arrangement makes a very good condenser. The boiler is 7½ feet x 4½ feet, with 120 two-inch tubes.

I have with this boat towed a ship of 700 tuns at 4 miles an hour, with 60 lbs. of coal per hour, and I can make 9 miles an hour when not towing. The mistake generally made by those who have not had experience with boat engines is that they do not give sufficient boiler capacity; and I find that the ample boiler power above described gives an excellent result as to fuel consumption with my small engine.

P. M. BLATCHLEY.

Guilford, Conn.

Splicing Large Belts.

To the Editor of the Scientific American:

There is in the Upper Mills here, in which I am engaged, a 26 inch, 8 ply rubber belt, doing the following duty: It runs off the fly wheel of a 24x48 inch engine, the fly wheel being 18 feet in diameter and making 65 revolutions per minute, driving an overhead line of shafting and two lines at right angles to it, said shafting driving two 8 inch guide mills by an 18 inch rubber belt to each, one at 230, the other at 280, per minute. Each mill finishes sixteen tuns gross of finished iron every 24 hours. Two pairs little mill shears, one pair bar mill shears, and one 36 inch circular saw for hot iron are also driven by the main belt.

In the early part of last summer, an accident occurred by which the above mentioned belt was torn into several pieces and ripped into strips. Knowing that it was impossible to obtain a new belt without ordering it from the makers, we had to do the best we could with what we had; so we patched up a ragged-edged strip of the torn belt (averaging 12 inches wide), thinking to run a part of the above machinery with it. Some laughed at the idea of attempting to run any part of it with such a cord as that looked to be; but to the surprise of all, it performed the entire duty of the original belt, and in so satisfactory a manner that the new belt was on hand some four weeks before a favorable opportunity was afforded to put it on.

A member of the firm here adopted some years ago what was then a new way of fastening the ends of and splicing large belts; it has proved a cheap and reliable way, and is now in general use in this vicinity: Cut your belt perfectly square on the ends and to the proper length; then cut a piece of belt of the same width and thickness, about 3 feet long. Bring the ends of the belt together, and put the short piece on the back of the joint, or outside, and bolt the belt and piece together with what are known as elevator bolts, used for fastening the buckets to elevator bands. The tools required are a brace and bit to bore the holes and a small pair of blacksmith's tongs to tighten up the nuts with.

When a belt becomes dry or glazed, I have always found that a liberal dose of castor oil was a specific; and I have never known a belt to be mutilated by rats or other vermin if it had castor oil on.

Pittsburgh, Pa.

T. J. B.

[For the Scientific American.]

A NEW METHOD OF MEASURING SURFACES, APPLIED TO THE CIRCLE.

The fact that the modern chemical balance gives a greater degree of accuracy in the determination of weights, and with much more facility than is the case with any other kind of measurement, especially that of curved lines, has given rise to a method of determining irregularly shaped surfaces of land in square miles or acres, by tracing them on paper of uniform thickness, cutting it out to the correct shape, and comparing the weight of the piece of paper thus obtained with that of a piece cut to the size of a square mile or of an acre, of the same kind of paper, to the same scale. By calculating how often the weight of the latter piece is contained in that of the former, it will give the number of square miles or acres contained in the land in question. This calculation consists, of course, in only a simple division. I can recommend this method fully, as, when carefully applied, it gives results the correctness of which is not surpassed by those of any other method whatsoever. This may be verified by taking regularly shaped forms, easily measured by the ordinary methods. I have in this way determined the surface of islands and continents in square miles, of farms in acres and rods, etc., and am compelled to testify that the method is far superior, in the correctness of its results, to that by means of the graphic method, with the help of Amsler's polar planimeter, now so excellently made in Switzerland and to be obtained in our large cities. The method by the help of the balance gives not much more trouble, less calculation, and less liability to error than the use of the instrument in question; and the latter costs almost half as much as a good chemical balance, which is therefore far to be preferred. The planimeter is, however, an instrument enclosed in a box which can be carried in the pocket, and this is an advantage it has over the balance.

In order to test the degree of accuracy which can be obtained by the use of the balance for this purpose, and at the same time practically to demonstrate the fallacy of the assertions of such circle squarers as Lawrence T. Benson, who maintains that the surface of a circle is equal to three fourths of the square of its diameter, I took a piece of paper of uniform thickness, not varying $\frac{1}{4000}$ of an inch from the average thickness of $\frac{1}{400}$ of an inch, as tested by the micrometic screw used for determining the correct thickness of the covering glasses for microscopic objects to be examined by immersion objectives of very high power. From this paper a square of 12 inches was cut, and its weight found to be 3,511 milligrammes. A circle was then cut out of it, scrupulously made tangent to the sides of the square; its weight was found to be 2,757 milligrammes. This number, divided by the former, gives 0·7855, the quarter of the square 3,511 being 878·75, and three quarters, 2633·25 milligrammes. The actual weight of the circle, 2,757, is thus 123·75 milligrammes more than the weight of three quarters of the square, while the quotient, 0·7855, expressing the relation between the surface of the square and the circle, is remarkably near to the fourth part of the well known number 3·141592, etc., or 0·785398, etc., which latter expresses the ratio between the square of the diameter and the surface of the circle.

In order to find how far the method of weighing could approximate the true ratio, another experiment was made, in which the graduated arm of the balance was used, on which a so-called rider makes it possible to weigh to tenths of milligrammes. [The balance, by the way, is one of the very best of Becker & Sons', and indicates even one tenth of a milligramme when charged with 100 grammes in each scale; it is thus sensitive to $\frac{1}{2000000}$ part of the charge.] A piece of other paper, if possible superior in regard to uniformity of thickness, was cut into a square of 18 inches; its weight was found to be 7,644 milligrammes. The circle, carefully cut from it, tangent to the sides, had a weight of 6,003·5 milligrammes; this, divided by the former number, gives 0·785401, which differs from the theoretical and more correct number, 0·785398, by $\frac{3}{1000000}$ parts.

In order to have an additional test in regard to three quarters of the square of the diameter, the circular paper was folded in 16 radial lines, and 16 chords, spanning segments of 22° 45′ each, were drawn and cut so as to change the circle into the inscribed polygon of 16 sides. Its weight was found to be 5,851 milligrammes, which is 118 milligrammes more than three quarters of the square: $\frac{3}{4} \times 7{,}644 = 5{,}733$. It is thus seen that not only the circle cut from a square, but even its inscribed polygon of 16 sides, has a larger surface than three times the square of the radius, which, for the diameter $=1$, is expressed by 0·75, a number considerably smaller than the more correct expression 0·785398, used by all mathematicians, not because it is simply accepted as true, but because its accuracy has been demonstrated.

It can also be demonstrated that the figure representing correctly three fourths of the square of the diameter is the inscribed polygon of 12 sides. It is remarkable how this also can be verified by the balance in the above manner. For instance, on a square of paper of 15 inches side and 4,901·5 milligrammes weight, a tangent circle was drawn, and then an inscribed polygon of 12 sides. When the polygon was cut out, its weight was found to be 3,676, and the piece cut off around weighed 1,225·5 milligrammes: together, 4,901·5, of which 3,676 is very nearly three fourths.

The above details are not given as a demonstration. Mathematicians do not need experiments of this kind to see into a truth; but it is given only for the benefit of those whose minds are so constituted that they can perhaps only be convinced of their erroneous notions by a practical test, which any one who has a chance to use a good balance can easily make.

New York city. P. H. VANDERWEYDE.

The Electrolytic Preparation of Magnets.

The late Professor Jacobi proposed to determine experimentally whether, by proper arrangement, precipitated iron can be induced to arrange itself so as to form permanent magnets. The author maintains that he solved the question twelve years ago, and obtained magnets by electrolysis. He finds that iron precipitated from a solution of iron containing sal ammoniac is, in a very eminent degree, capable of permanent magnetism; that precipitated from other solutions of iron is magnetic only in a slighter degree. If the precipitate is obtained under the influence of powerful magnetism—prejudicial circumstances being avoided—strong magnets of homogeneous structure are formed from solutions containing sal ammoniac. On the other hand, solutions free from sal ammoniac yield magnets distinguished by their irregular structure, in consequence of which the feeble magnetism of the precipitate is rendered still weaker. A not unimportant degree of coercive power cannot, under any circumstances, be denied to iron, unless altered in its structure by ignition or other processes. The nature of the solutions themselves must be regarded as the cause of the irregularities of structure. While the sal-ammoniacal solution remains perfectly clear, a solid crystalline layer is separated upon its surface. If pieces are broken off, they fall to the bottom. Solutions of ferrous chloride become turbid, and continually deposit a slimy precipitate upon the electrodes. Klein's solution remains tolerably clear, but upon the surface is formed a slimy foam. If any of this falls down, the electrodes are likewise soiled. Thus the iron precipitate is deprived of its homogeneity, and by partial removal of the impurities—for example, by brushing and by the rise of gas bubbles—the formation of partial magnets is explained.—*W. Beetz, in Poggendorff's Annalen.*

Japanese Paper Clothing.

In the Japanese exhibit at the Vienna Exposition was displayed a remarkable variety of objects of common use made entirely from paper, the mode of manufacture of which has hitherto been unknown out of Japan. The articles included handkerchiefs, napkins, garments, lanterns, umbrellas, and many others, all made from a fabric noticeable for its strength and solidity.

A member of the German Society of Orientalists, M. Zappe, has recently explained the process by which this paper is produced. The material used is the bark of the *Broussonetia papyrifera* or paper mulberry, the same source from which the natives of Polynesia derive their tapa cloth and mats, though treated in an essentially different manner.

The culture of the plant is quite simple. Pieces of root, some three inches in length, are placed in the earth so as to protrude slightly above the surface. These speedily send forth shoots, often of nine inches in length during the first year, and increasing threefold in size during the following twelve months. By the end of the third year, the plant attains a hight of about thirteen feet, and by careful pruning is eventually brought to a broad and strong shrub.

In winter, the branches are removed and chopped in bits about two inches in length, which are boiled in water until the bark comes off readily in the hand. Drying of the bark in the air for two or three days follows; and after immersion in running water for twenty-four hours, the material is scraped on a cutting blade so as to separate the two kinds of fibers of which it is composed. The exterior fibers are of dark color, and are called "*saru kawa*"; they serve to make paper of inferior quality.

The interior filaments, known as "*sosori*", which are used for fine paper, are rolled in balls weighing some 35 lbs. each. These are washed in running water and left to soak for a short time, after which they are removed and squeezed dry. Boiling then follows, in a lye made from the ashes of buckwheat bran, care being taken that the contents of the vats are constantly stirred. Another washing in water removes all remaining impurities, and the fibers are then pounded, for twenty minutes at a time, upon blocks of hard wood. They are finally massed into balls, and these, by ordinary means, made into pulp. Into the latter a small proportion of a liquid extracted from the root of the *hebiscus manihot* is mixed, and a quantity of rice water, to prevent the ravages of insects. The subsequent treatment of the pulp is similar to the usual process of paper-making.

Leather paper, so called, is made by the superposition of several sheets of the material previously soaked in an oil derived from the *yonoko* (*cellis Wildenowiana*), subjected to strong pressure, and lastly covered with shellac. Clothing is made from a paper called "*shefu*", which is cut into threads more or less fine according to the fabric to be produced. These are twisted by the fingers, previously moistened with milk of lime, and are woven into cloth either alone or with silk. The stuff can be washed and is of great strength and durability. *Papier crêpé*, so called by the French from its having the wrinkled appearance of crape, is produced by moistening the sheets and pressing them under rollers having suitable corrugations on their peripheries.

Astronomical Discoveries in 1874.

Professor Daniel Kirkwood gives the following *resumé* of new heavenly bodies discovered during the year just ended.

Six minor planets have been added to the list:

No. 135, discovered by Dr. C. H. F. Peters, February 18, at Clinton, N. Y.

No. 136, by Palisa, at Pola, Prussia, March 18.

No. 137, by the same, April 21.

No. 138, by Perrotin, at Toulouse, May 19.

No. 139, by Professor Watson, at Pekin, October 8.

No. 140, by Palisa, at Pola, as above.

Four comets were also discovered, the most interesting of which, Coggia, we have fully described. The star shower of November 14 entirely failed, and no further return of the meteors in any considerable number can be expected until near the close of the century.

It has been found that the aphelion of Mars differs in longitude but one degree from the perihelion of the minor planet Aethra, discovered in 1873: and that the greatest distance of the former exceeds the least of the latter. These facts indicate the possibility of so near an approach of the two bodies that the disturbing influence of Mars on the asteroid may materially modify its orbit.

New Postal Car.

The Lake Shore railroad has had under construction for some time, and has just completed, at their car works in Adrian, a postal car of a new pattern, intended especially for newspaper work. It has already been put upon the route between Chicago and Buffalo. The car has been built partially as an experiment, and partially from a knowledge of what the service demands. It is 60 feet and 6 inches in length, and weighs 49,300 pounds. It contains 122 distributing boxes in the center of the car, while the ends are arranged for the convenient storing away of the filled sacks. Besides these, the car is fitted up with all the modern conveniences for the rapid and easy disposition of the work. There is room for two men to work; and it is expected that with the convenience afforded they can conduct newspaper distribution as expeditiously as that of letters.

Beginners.

BY PROFESSOR H. VOGEL.

Old and young, when they take up photography, have generally no ideal purpose in view beyond the practical project of gaining their daily bread with the aid of the camera. They care very little for the chemical reactions, or the action of the light, or the disposition of molecules, etc., and less still about the question whether photography is really an art or not; their object is to create a good business, and this goal they try to reach as quickly as possible. Generally speaking, they begin by undergoing a few weeks' tuition under some other photographer, where they learn to coat a plate in a passable manner.

I am often asked how long is really necessary in learning to become a photographer, and I always reply that the matter very much depends upon the individual himself. Those who possess a knowledge of chemistry, and have natural aptitude, will learn to take negatives in a very short time. I could mention a well known scientific man who studied my manual carefully, and came into my studio impressed with a good deal of technical knowledge of the matter, therefore, and under these circumstances there was really nothing for him to learn but the practical manipulations, the pouring on of the collodion, developer, etc., and the adjustment and working of the apparatus, things obviously that can only be taught by demonstrations. This gentleman was qualified to operate in five days. Of course during this short period he had not been looking on with his hands in his pockets, lounging about under the impression that he knew enough; but he practised at home what he learned from day to day, and was exceedingly successful in what he did.

Another pupil that I had, who was an exceedingly good chemist, and thoroughly acquainted with the materials which he had to manipulate, turned out quite the reverse, for, after six months' tuition, he was still a clumsy operator. He belonged to that numerous class which are usually termed "butterfingers." When he took up a plate to clean it, it slipped through his fingers; the dipper he would infallibly break after one or two experiments; the developer ran off the plate, and the filter never acted under any circumstances. I was exceedingly glad to get rid of so awkward a pupil, for I could never have made anything out of him. These two are, of course, merely instances, and do not hold good in all cases.

There are people who enter a studio without any previous knowledge, and who are exceedingly quick at picking up the first rudiments of the art. In a week they are so self-satisfied that they hasten home to follow up their success, but, unfortunately, find themselves stuck fast in a day or two over a question about which they possess no experience.

The matter is easily explained. It is easy enough, when you have good plates prepared for you, good collodion, good dipping bath, good developers, intensifiers, etc., to secure a good picture, especially when found in a well regulated studio; success is here obtained without difficulty; but the beginner has to thank the pure chemicals and the photographer who has prepared the baths and solutions for it, for he does not know how soon these may become changed after working or standing some time. He finds that the collodion, especially if the drainings go back into the bottle, becomes thicker and thicker; it gathers dust and impurities, and thus spots and stains are produced, whose presence he is unable to explain from his eight days' apprenticeship. It is the same with the dipping bath. Unfortunately a bit of lime or kaolin has fallen into the solution, and this has rendered it slightly alkaline, and at once the plates show signs of fogging; or again, the collodion is full of organic impurities, which produce streaks on the sensitive plate; or the film has other defects, such as pinholes, patches of insensitiveness, flatness, etc. All these phenomena, which may not come unexpectedly to those who have studied a photographic manual, are enough to confuse any beginner who relies upon his own brief experience in the matter. If to these well known defects we add, moreover, those that arise from faulty exposure or intensifying, bad fixing or varnishing, we have no inconsiderable host of disagreeables. I have pointed out in my manual as many as sixty different sources of failure, and this number is by no means complete. Those who desire to know something about these vexatious phenomena, and the means necessary for their avoidance, will not be able to finish their apprenticeship in a week, for it is only long practice and study that make the skillful photographer.

Dr. Jacobsen says that a little chemistry should belong to the culture of all men; and the photographer is a man. There are many operators who take excellent pictures, and yet boast that they know nothing of chemistry. This, however, is mere nonsense, for such people, if they have not studied chemistry theoretically, have been so long working with photographic chemicals, and observing the reactions, that they have become possessed of the chemical properties of the things employed. They know from experience that iodide of ammonium when decomposed gives off iodine, and becomes red; that iodine colors collodion yellow, and starch blue; that nitrate of silver is easily dissolved in water, and in alcohol only with great difficulty; that it freezes at a high temperature, and becomes decomposed in one still higher; that it dissolves iodide of silver; that it is reduced by organic substances, etc.

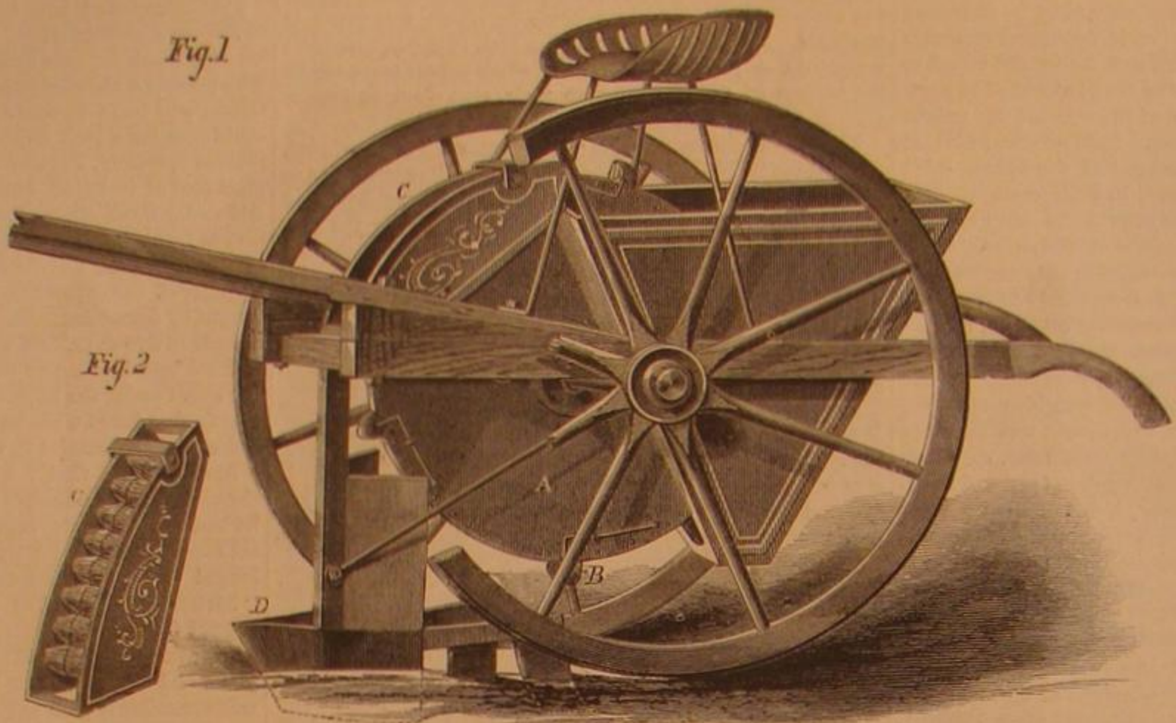
In the building up of this practical knowledge piecemeal, of course many a pint of collodion is lost, many a costly silver bath thrown into the residue pan, and much valuable time frittered away in aimless experiments. The same amount of chemical knowledge they could have acquired in a tenth part of the time and tenth part of the cost by studying photographic chemistry; and this knowledge is readily acquired, for photographic chemistry occupies but a small section in the thick manuals on organic and inorganic chemistry.—*Photo. News*

IMPROVED POTATO CUTTER AND PLANTER.

We illustrate herewith two new agricultural implements, one of which serves for cutting seed potatoes into any number of pieces by means of simple mechanism. The other makes the drill, drops in the seed at any required distances apart, and finally fills the soil back into the furrow.

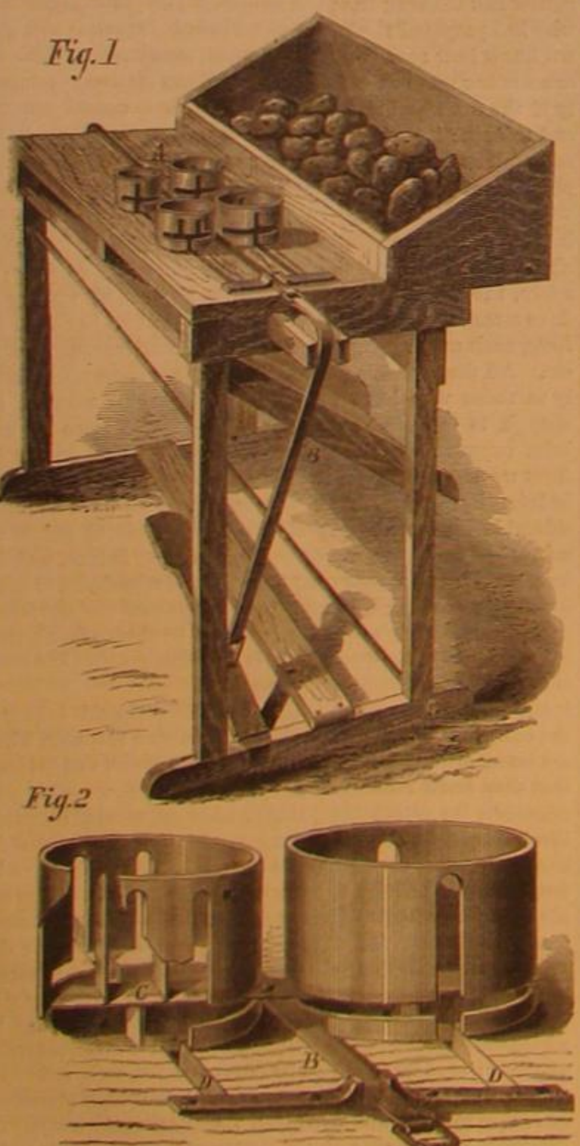
Fig. 1 of the small engraving is a perspective view of the cutter. The potatoes are contained in a suitable receptacle, whence they are removed by hand and placed singly in the tubes, A. These last are of varying diameter to accommodate potatoes of differing size. B is a strap which passes longitudinally across the table, through a guide piece thereon, Fig. 2, thence over a pulley, and is connected beneath with a treadle. On the upper side of the strap are bolted horizontal blades (one of which is shown at C, Fig. 2) which carry one or more vertical cutters on the portions contained within the peripheries of the tubes, A. These tubes, it will be seen, are slotted in order to allow all the blades to be drawn through them, an operation effected through the strap and treadle already referred to. By increasing the number of vertical cutters in any tube, the number of pieces into which the potato is divided is of course augmented. The system of knives is connected by bars underneath the table, secured to vertical arms extending down through slots, D, in the same.

In operation, after the potatoes are deposited, one in each tube, pressure upon the treadle carries the knives through them; and thus divided, they fall, through apertures beneath the tubes, upon an inclined plane, and into any vessel placed for their reception.



MEWBORNE'S IMPROVED POTATO PLANTER.

The larger engraving represents the planter, into the hopper in the rear of which the cut potatoes are deposited. Secured upon the axle is a cast iron disk, A, around the periphery of which a number of holes are made in order that the cups, B, may be fastened thereon, at any points or at any distances apart. As this disk revolves, the cups, which are turned rearward, enter the hopper from beneath, passing through an orifice protected by bristles, which serve to prevent the escape of the seed. The cups thus become filled. As they are carried on out of the hopper by the disk, they pass through a box, C (also shown larger, in Fig. 2). The sides of this attachment are fitted with bristles, which, while offering no resistance to the passage of the cup, retain the seed in the same as it is reversed by the rotation of the disk.



MEWBORNE'S POTATO CUTTER.

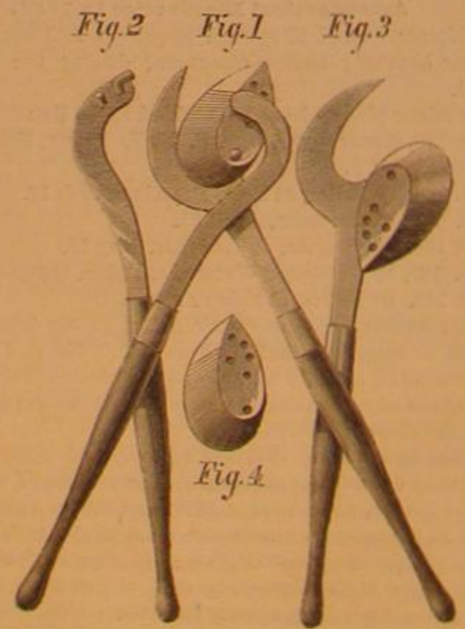
As soon, however, as each cup emerges from between the bristles its contents drop out, directly, however, into the drill made by the opening plow, D. Wings in rear of the latter, as the machine advances, replace the soil in the furrow, completing the planting. The knives in the cutter divide the seed into pieces of uniform size, and thus the constant filling of the cups is rendered more certain. Both inventions appear to possess labor-saving capabilities which will doubtless commend them to farmers.

Patented through the Scientific American Patent Agency, October 14, 1873, to Lemuel J. Mewborne, of Kinston, Lenoir county, N. C., by addressing whom further particulars regarding sale of rights, etc., may be obtained.

BROADBOOKS' EXCELSIOR PRUNING SHEARS.

We illustrate herewith a novel pruning shears, the feature of which is a cam-shaped blade adapted for giving a very powerful drawing cut.

Fig. 1 represents the shears partially open, showing how the drawing cut is secured. Fig. 2 is the wrench or lever, provided with a hook and stud that drop in perforations on the blade, Fig. 4. Fig. 3 is the other handle, with the blade turned back against the shank, forming, when used singly or without the lever wrench, a hatchet or knife, for trimming small limbs, sprouts, or shrubbery. The cam-shaped knife blade is provided with a series of perforations to receive the hook and stud of the lever wrench. When the handles, Fig. 1, are brought toward each other, as is evident, the drawing cut is produced. The point of contact of the knife edge with the limb, where the power is to be applied to do the cutting, is inside the pivot or bolt that holds the blade. The shape of the hook, Fig. 3, is such as to bring the limb to be cut directly under the fulcrum or pivot on which the blade operates. When the knife blade is applied it holds the limb firmly until cut, and prevents its slipping on the hook. Injury to the bark is prevented, also any crushing of the limbs, the ends being left smooth enough for grafting. In other pruning shears, where the power is applied outside of, and at a distance from, the fulcrum or pivot which holds the two jaws together, slipping of the limb often occurs, thereby mangling the bark. The very long handles also employed frequently crush the branches. The handles of the shears represented in the engraving are only eighteen inches in length, so that the power is in the shears itself instead of in long handles.



The efficiency of the device is very remarkable, judging from specimens of its operation forwarded to us. Two fragments of boughs are before us, one 1½ inches and the other 2¼ inches in diameter, each of which has been divided with a clean, smooth cut, apparently at a single stroke. The wood is hard maple, and the length of the cut is greater than the above diameters, owing to its being made at an angle.

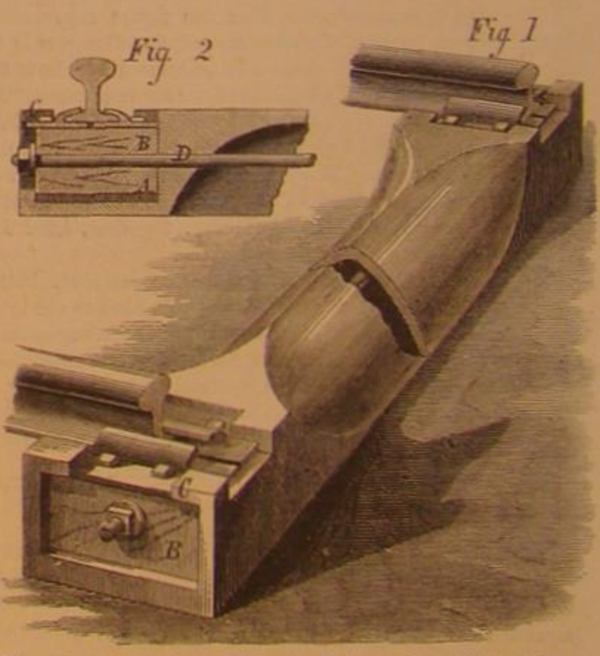
For information, relative to the additional advantages of the tool, and descriptive circulars, address Broadbooks & Co., Batavia, N. Y.

BLAISDELL'S IMPROVED RAILWAY TIE.

The invention illustrated herewith is an iron tie, designed as a substitute for the wooden tie ordinarily employed, and also to provide a strong and elastic support for the rails, while constituting a portion of a permanent way.

The peculiar form of the cast iron body of the tie, clearly shown in Fig. 1, is calculated to give strength and stability, and, at the same time, to insure economy of material. At each end are formed rectangular sockets, open at the top and at the outer extremities. The lower parts of said sockets are flanged in order to retain rubber blocks, A, in the sectional view, Fig. 2, above which wooden blocks, B, are laid. On top of each of the last, the rail chair is placed. The chair is made in two parts, so as to be adjusted readily to grasp the rail between the lip and foot plate. Overlapping portions of the body, C, together with the bolts entering the wooden block, securely hold the chairs in position. Passing longitudinally through the entire tie is a truss rod, D, which is set up outside the wooden blocks with nuts and washers. The apertures through which this rod enters the metal part of the tie are made sufficiently large to allow the depression of the blocks when the rubber yields to superincumbent pressure.

It will be seen that the rubber blocks give an elastic support to the track, tending to nullify the results of jarring and compression. The wooden blocks serve a similar purpose, and may be used alone when any great degree of elasticity is not required. The chairs may be adjusted to hold rails having flanges of varying width; and owing to the firm bearing afforded by the abutting surfaces, they are retained in position with the least possible number of spikes.



The sloping contour given to the surface of the tie enables, it is claimed, the wheels of a train, in event of running off the track, to mount and pass over the ties, instead of crushing the same, as might otherwise occur.

Patented January 13, 1874. For further particulars address the inventor, Mr. George D. Blaisdell, Cambridge, Vt.

Mining in Massachusetts.

Some extremely rich mines of lead, silver, and gold have recently been discovered near Newbury, Essex county, Mass., which are now being worked with profit and with the prospect of an extraordinarily valuable yield. A single shaft 25 feet deep is now giving ten tuns per 48 hours, the ore containing all three of the above metals. The net proceeds are $110 per tun. A second shaft lately opened is being worked, and preparations are in progress for extended operations. The mine is supposed to extend for six or seven miles.

Although the above comes from the New York *Tribune*, we fear it is an over-statement.

Finely rubbed bichromate of potassa mixed with twice its bulk of sulphuric acid and an equal quantity of water will clean the dirtiest brass very quickly

COMBINED AQUARIUM AND PLANT CASE.

We illustrate herewith one of the most beautiful accessories to indoor decoration and the cultivation of taste for natural beauty that has ever been brought under our notice. It is a plant case combined with an aquarium, and must be regarded as a happy thought of its designer (a correspondent of the London *Garden*), as, of all forms of vegetable life, aquatics or sub-aquatics are best suited for indoor gardening in towns. If the best results are to be obtained, a commencement should be made by arranging suitable rock work; the kind of plants with which they should be furnished and the best material in which to grow them should then be selected. For cases like that now represented, hundreds of rare and beautiful plants are suitable, and also plants neither rare nor costly, but yet not less interesting. Many grasses, sedges, cyperus, and ferns grow well in such cases if elevated an inch or two above the water level. For submerged vegetation we have valisneria, anacharis, charas, the pigmy-blossomed water lily, the hawthorn-scented *aponogeton distachyon*, fresh green disk-shaped sheath-rooted duckweed, *pontederia crassipes*, the hollow petioles of which are swollen and filled with air, and many other equally interesting plants, all of easy culture.

In the hands of an experienced cultivator, many rare plants would thrive as well in a case like this as in a cool plant stove; and then sarracenias, cephalotus, dionæa, droseras, and even one or two of the true pitcher plants, as *nepenthes phyllamphora*, or *nepenthes gracilis*, might be added, notwithstanding their reputed carnivorous tendencies. Given a few lumps of fibrous peat and a handful of fresh living sphagnum (moss), and even the gorgeous crimson-winged disa might be induced to display its rich colors and fresh, glossy foliage. Plant life, too, may be interestingly associated with animal life. In the water may be lizards, golden and silvery carp, brown-speckled and green frogs, and a whole colony of water beetles and snails; while flitting about overhead, among the plants, may be butterflies of many hues, and a few of the most showy kinds of moths. "Are we, then, to capture such insects on the wing and introduce them? No, they must be bred in their new home, and this simplifies the whole affair, for specimens of all the more showy butterflies may be bought at almost any naturalist's, in the chrysalis state, for at the most a few pence each; and these, if placed in a little box (without a lid) of dry earth, and introduced to the plant case, will come out in due season, like other butterflies, and will delight us with their elegant forms and brilliant coloring. Even the common white speckled garden spider, added to such a case, tends to give it life and interest. This aquarium is divided into two parts; the lower one, as will be seen, for water, fish, and true aquatics; the upper one for sub-aquatics and other plants."

COMBINED AQUARIUM AND PLANT CASE.

New Process for Rendering Wood Incombustible.

An English clergyman, the Rev. Dr. Jones, has distinguished himself by inventing a process for rendering wood incombustible, for which he has obtained a patent. The wood is at the same time made impervious to dry rot and decay, so that two important ends are attained at once. Most of the old methods of preserving wood only render it more liable to fire, as was shown not long ago in the burning of the landing stage at Liverpool. Dr. Jones subjects the wood to a pickling process, in a solution of tungstate of soda and water of the specific gravity of 1·2. The tungstate is made by the addition of tungstate of lime to hydrochloric acid and salt, and it produces in the process as much chloride of lime as will pay all working expenses. The tungstate of soda, from experiments that have been made publicly and privately during the last three years, is proved to render soft woods, such as white and yellow pine, as hard as oak or teak, and it will also restore wood that has been affected by dry rot to the original condition of durability. The London *Daily News* gives the following account of some experiments recently made at Godstone to test the value of the new process:

The experiments made were three in number, and the tests were undoubtedly very severe. Two small pyramids of sticks were made, one of prepared and the other of unprepared wood. These were then well saturated with paraffin and ignited. In the case of the prepared wood, the paraffin soon burnt itself out without communicating the flames to the wood, which was only slightly charred. The other heap burnt fiercely, and in half an hour was reduced to ashes. The next experiment was made with two wooden huts, one of which had been prepared, while the other, built of ordinary Scotch fir, had not. A strong fire sufficient to ignite the houses was made in each, and the effect was about the same as in the preceding experiment. A chest containing a parchment document had been treated by the process, and was thrown into the flames when at their hight, and was taken out some time afterwards, charred indeed as to the outside, but practically uninjured in any other respect. The inside was quite cool, and the wax seals upon the document were intact. Perhaps the most important trial was that which took place with gunpowder. A government gunpowder keg which had been rendered fireproof was used for this experiment. A paper packet containing about two ounces of gunpowder was put in the bottom of the keg, and a sheet of brown paper impregnated with the tungstate was pasted over it and dried. The keg, which was open at the top, was turned upside down, and surrounded by shavings, which were lighted. A fire of petroleum and shavings was kept burning on the top for about a quarter of an hour, without producing the slightest effect on the keg. To make the trial still more complete the keg was reversed again, and lighted shavings were thrown in upon the gunpowder, protected only by a sheet of brown paper. The paper stood the test admirably, and the solution rejected the fire so thoroughly that the paper did not even show a sign of charring. The gunpowder was then taken out and exploded. The properties of his invention, Dr. Jones states, would give the navy the advantage of being always sound in hull and free from any danger of fire, whether from accident or from shot and shell. It would also be a great saving to the nation in preventing the necessity of continually docking and repairing ships.

Car Wheels.

At a recent meeting of the Car Builders' Association, the subject of discussion was "Car Wheels—the Best Method of Fitting, Flange Wear and Causes, Mileage, and Breakage."

Mr. Garey said he had been requested to ask why old wheels could not be remelted and recast. He thought there should be some process by which old wheels could be made available as material for new ones; yet wheelmakers objected to taking old ones to be used a second time in manufacture.

Mr. Jonathan Scoville remarked that, if old wheels were uniform in quality and sufficiently soft, there would probably be no objection to their use as material for new ones. But they are, in fact, never uniform, and, as a general thing, they are hard and, when melted, get still harder. In an average lot of old or returned wheels, for every hundred fit for remelting, there were three hundred that were not fit.

Mr. W. W. Snow, of the Ramapo Car Wheel Works, said that nearly all wheels are supposed to be made of charcoal iron. If these wheels, when used a second time, were remelted with charcoal, he thought they would not deteriorate; but as anthracite coal was generally used in melting, and as this contained more or less sulphur, the iron becomes impregnated with it, and the quality is impaired in proportion. He had observed that, after the sulphur was once in the iron, there was an increased tendency to absorb more of it, and that the second and third melting, and perhaps the fourth, produced nothing but common anthracite iron, unless soft charcoal iron were mixed with it at each melting.

Mr. W. R. Davenport, of the Erie Car Works, asked whether some other disposition could not be made of old wheels than putting them into new ones. Old wheels, mixed with pig iron in a puddling furnace, will give splendid results in rolled bar iron. Every railway company uses enough merchant bar iron to consume every old wheel that they have to sell. Then why should wheelmakers be expected to take old wheels when they can be sold to the rolling mills, where they can be used to advantage, and the quality of the iron improved?

Mr. Snow said his company had supplied parties with a certain number annually, who put them into plate iron, and the testimony was that such plate iron was the best of any in the market. The old wheels are first puddled, of course, and go through the regular process, which necessitates an increase in the cost of plate iron, and it would be the same with bar iron; consequently, if railroad companies give us the wheels to put into new iron, they must expect to pay more for the iron produced. That the iron is better there is no question, according to the testimony of the best iron makers in the country.

CAR WHEEL FITTING.

Mr. W. R. Chamberlain, of the Boston and Albany Railroad, said their wheels were bored out at a $\frac{3}{64}$ inch taper, and the axles turned the same and fitted under a thirty tun pressure.

Mr. Adams said that most wheel fitters try to adapt the pressure to the strength of the wheel: that is, if 40,000 lbs. are applied and it is found the wheel will not bear it, the pressure is reduced to ten or fifteen tuns. There are wheels that will stand 75,000 or 80,000 lbs., and not show any signs of fracture, while others will fracture at 25,000 or 30,000 lbs.; but of course this does not affect the question of what would be right. The wheels at the Boston and Albany road shops were fitted at about 50,000 lbs., and they had very few loose ones.

Mr. Adams had noticed that the axles of many cars had abrupt square shoulders of $\frac{1}{8}$ or $\frac{1}{16}$ of an inch, immediately back of the hub. Did not such shoulders make the axles weaker than it would to run them straight back?

Mr. Snow was of the opinion that it would be better to have no shoulder at all. If there were one, especially on a rolled axle, vibration would almost invariably cease at that point. In a hammered axle, perhaps not so much so. Iron would granulate from vibration, and this was one reason why hammered axles were considered so much better than rolled ones; and he believed that if they were turned down in the middle, better results would be realized from rolled axles.

Mr. L. Garey said the road with which he was connected some eighteen years ago had a good many broken axles, and on examination many of them were found to be turned with a shoulder at the inner end of the hub, while many of them had a slight check at the shoulder. He then had them made without shoulders, and in no instance had they broken at that point, which, to his mind, was conclusive against shoulders at the point he had named. As to tapered wheel fits, he disapproved of them, especially for broad tread wheels running over different gages.

Mr. Chamberlain thought that 99 wheels out of 100 were bored with a tapered hole "after we had done our best," and that a strain was put on the outside end instead of uniformly along the bore. A wheel pressed on at a $\frac{1}{16}$ taper with a thirty-tun pressure will require seventy tuns to press it off again. A great many more loose wheels that were straight came over the Boston and Albany road than there were tapered.

REJECTING DOUBTFUL WHEELS.

Mr. Lobdell, a son of the proprietor of the Lobdell Car Wheel Works, of Wilmington, Del., read a paper written by his father, giving some of the results of his 40 years experience as a car wheel maker. He pressed on his wheels at a pressure of from 30 to 40 tuns, and had never had any complaints of loose wheels. Flange wear was produced by several causes, among which were mistakes in gaging and marking the wheels, and differences in the hardening of the chill. Fewer accidents were caused by broken wheels than by broken rails or other material, because more care was generally bestowed on their manufacture, and they were more thoroughly tested. His practice had been to break up all wheels that were at all doubtful, preferring to break up a hundred rather than run the risk of one doubtful one. Breakage in service resulted from inherent defects in patterns, or from reduction in weight in order to lessen the cost. The defects in the chill, he thought, were not due to the particular kind of iron used, but rather to the manner in which the ore had been smelted, or to want of care. He had got perfect wheels from hematite, magnetic, specular, and other ores, and also from mixtures of ores. All chilled wheels were liable to blotches or blisters, which of late have become more common, especially on tender wheels and others of small diameter. These blemishes, although unsightly, are not dangerous. Some specimens of wheels were exhibited by Mr. Lobdell, which had been broken through the blisters on the tread, showing that the blisters were only surface defects, and that the iron was sound underneath. One of these wheels (28 inch), made of hematite ore, had run 70,000 miles under a 32-tun engine whose speed was 40 miles an hour.

MILEAGE OF CAR WHEELS.

Mr. Washburn, of the Washburn Car Wheel Company, of Worcester, Mass., said that for the last four or five years he had been making wheels of steel, and had not been able to get a satisfactory comparative statement as to the merits of steel and iron. The iron wheels, of all makers varied very greatly. Steel wheels if perfect, he thought, would eventually take the place of iron, and their mileage would exceed that of iron, six or perhaps eight to one, and would average 250,000 or 300,000 miles; while a chilled wheel had to be a good one to average 40,000 miles. A steel wheel costing $50 would have to run from 100,000 to 125,000 miles to be as cheap as an iron wheel that would run 40,000, but probably the average of the latter would not exceed 30,000. He thought a steel wheel would run from 100,000 to 150,000 miles without turning, and would stand turning two or three times before it was worn out. He had wheels now that had run 300,000 miles and were still good.

Mr. Davenport said it had been supposed to be impossible to keep the mileage of anything but engines, but the Lake Shore road had found a way of keeping the mileage of passenger, baggage, mail, and express cars. Each conductor between Buffalo and Chicago reported what cars he took from the beginning of his trip and what cars he left at the end, and there was no difficulty in this way in getting at the mileage. The report on 1st of April last showed that the wheels removed during the previous six months had averaged over 57,000 miles, and the smallest average he believed was 54,000. These were 33 inch wheels that had run under heavy cars at a high speed. The Lake Shore, he admitted, was not as hard a road for wheels as some others. With respect to iron wheels, he had some in mind that had run 200,000 miles and were good yet. He had the means of determining the data himself. Iron wheels will make a large mileage as well as steel wheels; they are not exhausted at 40,000 miles. There may be on some roads bad wheels that make small mileage. He had nothing to say against steel wheels, but he wanted iron ones to have a fair chance. They are capable of being greatly improved, as well as steel.

Mr. Snow said the Ramapo Works sold their wheels to the Pullman Car Company on a mileage basis of 50,000 miles, receiving credit for any excess and standing the loss for those that fell short, and it was a long time since they had paid any losses. He mentioned this merely for the information of those who thought chilled wheels would not make over 40,000 miles. The lowest average for the last six months was about 59,000. He believed wheel makers could do much to improve the quality of their wheels by attention to details.—*National Car Builder.*

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

Save the scales of the forge (oxide of iron) for use in annealing hard cast iron or steel.

The best way to avoid water pipes freezing and bursting is to have a cock in the cellar, by which the water can be turned off from the entire house.

Rubber rings, slipped over bottles in packing, ensure safety against breakage.

Protosulphate of iron in powder, rubbed up with raw linseed oil, is an antidote for external poisoning by cyanide of potassium.

Leather can be made hard by saturation in a solution of shellac in alcohol.

In taking up belts, the time used in carefully cutting the belt square is always time saved.

Before washing almost any colored fabrics, soak them in water, to each gallon of which a spoonful of oxgall has been added. A teacupful of lye in a pail of water is said to improve the color of black goods. A strong tea of common hay will improve the color of French linens. Vinegar in the rinsing water, for pink and green, will brighten those colors; and soda answers the same end for both purple and blue.

To make silk which has been wrinkled appear like new, sponge on the surface with a weak solution of gum arabic or white glue, and iron on the wrong side.

The advantage in tensile strength, when holes are drilled in steel rather than punched, is calculated to be 25·5 per cent.

To test the quality of wool, take a lock from the sheep's back and place it on a measured inch. If the spirals count from 30 to 33 in the space of an inch, it equals the finest Electoral or Saxony wool grown. The diminution of the number of folds to the inch shows the inferiority.

An excellent bronze for small castings may be made by fusing together 95 parts of copper by weight and 36 parts of tin.

Paraffin is the best material for protecting polished steel or iron from rust.

Put hard sand instead of ashes on slippery sidewalks.

The parings of a bushel of apples are said to yield a quart of cider, by the aid of a hand press.

A French meter is about fifty times the diameter of a five cent piece. The same coin weighs exactly five grammes.

A cracked bell which gives a jarring sound may be improved by sawing or filing the ruptured edges so that they are not brought together by the vibration of the blow.

Photographers who use large quantities of nitrate of silver should allow all the excess of silver, acetic acid, and other matters from the plates undergoing development to run into stone jars containing fragments of zinc. By that means the metallic silver may be collected; it should then be digested with dilute sulphuric acid, washed, and dried in an oven, so that quite a large saving may result.

Lead 9 parts, antimony 2 parts, and bismuth 1 part is an alloy which expands on cooling, and which will be found useful in filling small defects in iron castings, etc.

It is said that charcoal will fatten fowls and at the same time give the meat improved tenderness and flavor. Pulverize and mix with the food. A turkey requires about a gill a day.

Lampblack and butter are used to prepare ribbons in hand stamps.

The following is a convenient table for sign painters, or others who have occasion to make lettering. Supposing the hight of the capital letters to be ten, the widths are as follows: B, F, P, ten: A, C, D, E, G, H, K, N, O, Q, R, T, V, X, and Y, eleven: I, five: J, eight: S and L, nine: M and W, seventeen: Z and &, twelve: Numerals: 1 equals five: 2, 3, 5, 7, 8, nine: 4, eleven: 6, 9, 0, ten. Lower case letters (hight six and a half): Width: a, b, d, k, p, q, x, and z, seven and a half: c, e, o, s, seven: f, i, j, l, t, three: g, h, n, u, eight: m, thirteen: r, v, y, six: w, ten.

Glycerin is an excellent coating for the interior of plaster molds.

A strong solution of sulphate of magnesia gives a beautiful quality to whitewash.

Glass can be drilled with a tool moistened with dilute sulphuric acid. This last is better than turpentine.

To wash calico without fading, infuse 3 gills of salt in 4 quarts of water. Put in the calico while the solution is hot, and leave until the latter is cold. It is said that in this way the colors are rendered permanent and will not fade by subsequent washing.

Rancid butter, pork, and lard casks may be purified by burning straw or shavings in them.

White lead rubbed up with linseed oil to the consistence of paste is an excellent application for burns.

Gelatin mixed with glycerin is liquid while hot, but an elastic solid when cold. Useful for hermetically sealing bottles.

To clean cider barrels, pour in lime water, and then insert a trace chain through the bung hole, remembering to fasten a strong cord on the chain so as to pull it out again. Shake the barrel until all the mold inside is rubbed off. Rinse with water, and finally pour in a little whisky.

A piece of paraffin candle about the size of a nut, dissolved in lard oil at 140° Fah., the mixture applied once a month, will keep boots waterproof.

Adding to the width of a belt and of the faces of the pulleys increases immensely the power of conveying force. A wide belt is always better than a narrow one strained to its utmost capacity.

Black cement for bottle corks consists of pitch hardened by the addition of resin and brickdust.

One ounce each of muriate of soda, cream of tartar, and alum, boiled in a gallon of water, gives plate a beautiful whiteness. Dip the article in the mixture, remove, and rub dry.

Soap and water is the best material for cleaning jewelry.

Awnings may be made waterproof by plunging first in a solution containing 20 per cent soap, and afterwards in another solution containing the same percentage of copper. Wash afterwards.

A handful of quicklime, mixed in four ounces of linseed oil and boiled to a good thickness, makes, when spread on plates and hardened, a glue which can be used in the ordinary way, but which will resist fire.

A good walnut stain for wood is composed of water, 1 quart; washing soda, 1½ ounces; Vandyke brown, 2½ ounces; bichromate of potash, ¼ ounce. Boil for ten minutes and apply with a brush, either hot or cold.

A piece of alum as big as a hickory nut will render clear a pail of muddy water. Dissolve the alum, stir, and allow the impurities to settle.

The length of the double whiffletree and the neck yoke for a sleigh should be just as long as the sleigh is wide from the center of one runner to the other.

Amalgam Fillings for Teeth.

J. E. E., of Pa., writes as follows: "Having noticed in the SCIENTIFIC AMERICAN several articles on fillings for teeth, I will state a case of my own. In 1854, twenty years ago, in the city of San Francisco, Cal., I had several teeth filled by a dentist. Two of them (front teeth) were rotted nearly half away and fully to the center of each tooth; so that the nerves were exposed, rendering the operation quite painful. The dentist was not quite certain that the teeth could be saved, so he filled them with tinfoil, saying at the time: "If the teeth do not trouble you you can have the tin filling removed, and have them refilled with gold foil." But the tinfoil still remains in them, apparently as perfect as on the day it was put there. I never have received the least trouble from the teeth. One advantage in tin over gold is that it, being nearer the color of the teeth, is less conspicuous, and I believe that it is in every way as good as, if not better than, gold."

Brains.

"No sound working brain," says Oliver Wendell Holmes, "without enough good blood to build it, repair it, and furnish the materials for those molecular changes which are the conditions essential to all nervous actions, intellectual and volitional, as well as those of lower grade. No good blood without a proper amount of proper food and air to furnish materials, and healthy organs to reduce a sufficient quantity of these materials to a state fit to enter the circulation. No healthy organs, strictly speaking, except from healthy parents, and developed and maintained by proper stimuli, nourishment, and use. No healthy parents—no help for it. We are, of course, applying the term healthy to the brain, as signifying much more than freedom from disease. A healthy brain should show, by the outward signs of clear, easily working intelligence, well balanced faculties, and commanding will, that its several organs, if such there be, or its several modes of action, if it works as a whole, are properly developed and adjusted by themselves and in relation to each other."

Raising Almonds in California.

Mr. Olmsted, of Carpenteria, says the Santa Barbara *Index*, has finished picking his crop of almonds. He will have from his orchard this season over five tuns of the Languedoc or soft shell almonds. Mr. Olmsted's orchard is only four years old, and of course is not yet in full bearing. His trees bore a few nuts when two years old. The third year, the average yield to the tree was about five pounds. Two rows in the orchard, covering ground equivalent to two acres, that received great care in planting and special culture, produced 2,000 pounds of dried almonds. This yield, at the wholesale San Francisco market price for the soft shell almond, will give Mr. Olmsted about $230 per acre, after paying all expenses of the year's culture, gathering, sacking, and marketing. Mr. Olmsted keeps the ground clear, cultivating nothing between the trees, nor allowing weeds to grow up to rob them. The trees should be at least twenty feet apart each way.

An Accident in a Lumber District.

On a hillside in Kingston, Tenn., a farmer was cutting logs, and his two little boys were playing near by. The logs, as fast as worked into lengths and trimmed of branches, were blocked with stones or chips to keep them from rolling off down the slope. One of the heaviest became loosened, and began to move, slowly at first, and faster as it gained momentum. The father saw that the younger of the boys was playing, unmindful of the danger, exactly in the path of the immense rolling log, but too far away to be saved by him. He shouted, and the little fellow looked up. The log was then about a hundred feet distant, and increasing rapidly in speed. The boy, dazed by fright, ran straight forward instead of escaping to one side, as he might easily have done. He fled as fast as he could, but the log soon overtook him, rolling over his body and crushing him to death.

To true a corundum wheel, adjust it in the lathe and revolve it very fast, holding a piece of corundum stone against the surface. It is said the piece will melt and unite with the wheel, making the periphery perfectly true.

A well tempered bar spring will lose much of its elastic strength by filing off a very thin scale from the surface.

THE PHYSICAL PHENOMENA OF GERMINATION.

In order that a seed may germinate, it must be acted upon by two agents—humidity and oxygen. These are necessary and also sufficient, and the truth of the assertion is susceptible to a very interesting experimental demonstration, the substance of which, together with the illustrations, extracted from *La Nature*, we now present.

It is first proposed to show that the part of the water is peculiarly to soften the husk or shell of the seed in order to render it permeable to gases. To this end the apparatus shown in Fig. 1 has been constructed by MM. Dehérain and Vesque. The shell of a seed—a bean, for example—is removed and placed behind two caoutchouc cushions, through which a central aperture has previously been made. To prevent the rubber from bulging, a ring of copper, A, is placed so as to inclose the ends of the cushions, and the latter are forced together by the screws, B E. Three screws are provided in each apparatus, so that a uniform pressure may be produced. Two tubes are next introduced, the lower of which enters the cork of a quart bottle containing only air. The upper tube enters an inverted test tube. Thus arranged, the apparatus is plunged in water, as shown in Fig. 2. The fluid penetrates the upper tube and reaches the inclosed seed shell; but the softening effect on the latter is not instantaneous, as, if mercury be poured into the tube, G, it will compress the air in the bottle, and remain stationary without driving a bubble

Fig. 1.

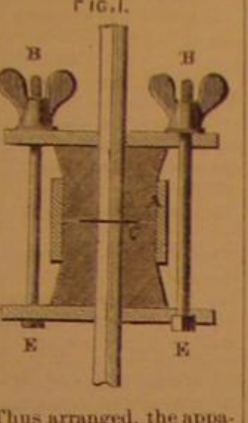
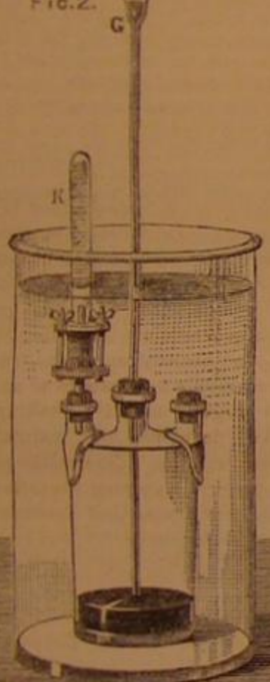


Fig. 2.



of air through the shell. The test tube, K, remains filled with water. We have thus the proof that a dry shell, or even one recently wet, is totally impermeable to gas.

If the apparatus be left quiet for two or three days, a change takes place. A fine thread of escaping gas first enters the tube, K, then, as the shell softens, a larger current; and finally the tube is emptied, the water being driven out by the entering air, thus proving the proposition which we set out to establish.

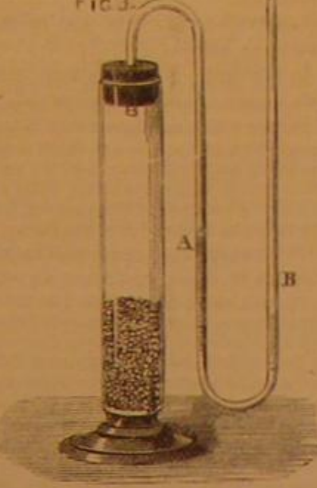
Seed which is slightly moistened by water has the peculiar property of condensing gases with which it is in contact. Grains thus treated are placed under a bell glass over mercury. During the first days of germination a sensible diminution of the volume of contained gas takes place, and this before any disengagement of carbonic acid. This condensation of air cannot take place without a quite notable production of heat, resembling that which happens when hydrogen is condensed in platinum sponge or illuminating gas in a palladium plate. It is this elevation of temperature—as the investigators conclude—due to condensation of the gases, which determines the attack of the immediate principles of the grain by oxygen; it is, figuratively speaking, the spark which causes the beginning of the slow combustion which accompanies germination, and perhaps supports it.

The phenomena which take place, then, from the moment when life begins in the seed, happen in the following order: 1. Passage of atmospheric oxygen through the envelope of the seed, already softened by water. 2. Condensation of gases in the tissues of the seed. 3. Slow combustion of the products contained in the tissues, and evolution of new substances destined to form the young organs.

It is the second point, the most important, which it is next proposed experimentally to demonstrate. In the cork of a test tube is arranged a curved pipe, to serve as a manometer, Fig. 3. The tube is filled about one quarter full with seed (cresses are specified) some hours before it is intended to show the results, and the grains are well moistened. Water is poured into the manometer, and the apparatus is adjusted until the level of the liquid is the same in both branches of the pipe.

After the lapse of a few hours, the water will be seen to ascend tube A, and to continue doing so for several hours; sometimes a few bubbles will rise through and enter the test tube, thus replacing that condensed by the seed. If the apparatus be set aside for a few days, the inverse phenomenon occurs. The seed gradually absorbs all the oxygen in the test tube without leaving a trace; but the emission of carbonic acid continuing, the water is forced back in the manometer, so that, if the whole be placed under water, a gas formed of a mixture of carbonic acid and nitrogen may be collected from the tube, B, Fig. 3.

Fig. 3.



That air and water are the only requisites for seed germination is proved in those beautiful little ornaments which may be made by sprinkling a pine burr with grass seed and suspending it over water, or by placing seed in the orifices of a damp sponge or on a piece of moist porous earthenware. The grain will germinate, sprout, and grow. This will take place even in the dark; but the plants will be yellowish white and not green, thus proving the well known fact that, while light is not necessary to growth, the plant unaffected by it can never have green foliage.

(Translated from the Official Reports upon the Exposition.)

THE VEGETABLE FIBERS AT THE UNIVERSAL EXPOSITION, VIENNA.

BY PROFESSOR DR. JULIUS WIESNER.

Number I.

Any visitor to the Exposition who attentively observed the the multitude of products from tropical lands, and especially the raw materials brought for exhibition from the English, French, Dutch, and Portuguese colonies, cannot fail to have been impressed with the richness of the display of fiberous materials, suitable for spinning, weaving, paper-making, and the like, many of which were (and are) quite unknown in commerce. The vegetable fibers on exhibition might have been numbered by the hundred.

The prodigality of Nature in this domain of production is well calculated to arouse amazement in the mind of the casual observer, whose familiarity with the vegetable fibers is limited to the qualities and uses of hemp, flax, and cotton; while to the practical mind of the specialist, viewing the subject purely from a utilitarian standpoint, the collection is chiefly an exhibit of interesting novelties of questionable industrial value. Least of all, perhaps, this imposing array would impress the botanist, who, familiar with the structure of the several orders of the vegetable kingdom, is aware that the number of plants that will afford a fine fiber, suitable for industrial purposes, is legion.

From the obvious differences in the character of threthee common textile fibers before named, it may reasonably be premised that the fiberous materials prepared from so many heterogeneous plants will vary greatly in value. A careful inspection not only verifies this presumption, but demonstrates further that many of them are of by no means trifling value, but, in everything that relates to quality and adaptability for industrial uses, will bear close comparison with cotton, hemp, or even flax. This assertion, incidentally remarked, is borne out by the fact that not a few of them have been employed from time immemorial by the native races of tropical countries for useful purposes, such as articles of dress, cords, ropes, etc., just as in Europe flax has been similarly utilized for many ages. The world's fairs, so popular in our times, afford the technologist the most admirable opportunity of becoming acquainted with the extent of our resources in the raw materials and products in which he is interested; and as an illustration of their utility in relation to the subject of this communication, it may be remarked that the former expositions at London and Paris contributed materially to the introduction of several now highly prized textile fibers—such as jute and China grass—as articles of European commerce and industry. It appears to us, however, that at Vienna the opportunity for extending this precedent was not properly appreciated.

We shall now invite attention to such of the raw materials of this class as appear to us to be deserving of introduction in our domestic industries.

At the time of the preparation of our report upon the Paris Exposition of 1867, the jute fiber—the inner fiberous bark of *corchorus capsularis*—was comparatively little known. At that time, we dwelt with emphasis upon the importance of the jute industry, illustrating our comments by reference to the unexpected and extensive proportions which jute consumption had assumed in England. To preach the value of jute to-day would be labor lost and unnecessary, since the progress of its manufacture in our midst affords the best evidence that it has received due appreciation.

It may be of interest, in this connection, to note the fact that spun and woven jute may be completely bleached; the practicability of this was formerly denied. The bleached product has not only a white color, but also a fine luster, possessing, in these particulars, decided advantages over hemp. The greater bulk of the jute of commerce is brought from India and neighboring islands, its native home. Of late years, however, the attempt has been made, with promising results, to introduce the culture of the jute plant into other tropical countries. As instances of these endeavors, the Exposition contained jute from Algeria, French Guiana, the Mauritius, and other localities.

The introduction of the China grass (tschu-ma)—the inner bark fiber of *Böhmeria nivea*—into the textile industries of Europe, does not keep pace with that of jute. This is to be attributed partly to the fact that fabrics woven of this fiber, although decidedly inferior to silk both in point of luster and durability, are more expensive than cotton goods of equal quality, and partly to the circumstance that European manufacturers have yet to master the mode of properly manufacturing this material, and thus far have been unable to produce, from the crude bark of *Böhmeria*, the fine, lustrous, long-stapled fiber that is sent abroad from China under this name, either in the fibrous state or woven into its reputed product, the grass cloth. The future of the China grass in Europe will depend largely upon its price. If, by the extensive and systematic cultivation of the plant, the crude fiber is placed upon the market cheaply, and this is supplemented by the acquisition of the skill now wanting in its preparation, its superior qualities—as compared with cotton—cannot fail to secure for it a wide field of usefulness. The cultivation of the *Böhmeria nivea* is spreading quite rapidly. Besides the exhibits of China and Japan, samples of this fiber were displayed from the East Indies, North America, Martinique, Jamaica, Trinidad, Queensland, the Mauritius, and Algeria; and the reports from these countries, as to the facility with which the plant adapts itself to climatic conditions, are generally quite favorable.

A material closely related in character to the China grass, for which indeed it is often mistaken, is the ramie fiber, the inner fiberous bark of *Böhmeria tenacissima*, a native of the south and east of Asia, where it has been cultivated from a remote period. The fiber is coarser, and (in prepared condition) shorter, and less lustrous than that of the China grass. In England, handsome and lustrous goods, both white and colored, are woven from the fiber, but they are inferior to the China grass products. The importance of the ramie, in our estimation, consists rather in the nature of the fiber itself than in the fine, cotton-like product that may be obtained from it. Whoever has seen the unusually strong and handsome ropes and cordage, made of this material by the natives of India, and is furthermore acquainted with the fact that the raw ramie fiber far surpasses hemp in point of durability and tenacity, will be forced to admit that its introduction into these last named industries will mark an era of decided progress. The acclimatization of the ramie has lately been attempted in a number of countries, among others in Central Europe. Concerning many of these experiments, nothing positive may be stated, although the specimens on exhibition from various tropical regions were not appreciably inferior to those from the land of its nativity.

Similar in this respect to the ramie is the so-called New Zealand flax, an article known in Europe, and especially in England, for a number of years. It is an extremely strong, tough, and (even in a wet condition) durable fiber, prepared from the leaf of *phormium tenax* (the New Zealand flax lily). It is possible to manufacture from this material woven fabrics that may be used either bleached or unbleached, as many of the New Zealand exhibits demonstrated. But of vastly more importance than these are the wonderfully firm and tenacious ropes, cords, twine, and the like that are prepared therefrom. *Phormium tenax* is cultivated in New Zealand, Australia, the East and West Indies, the Mauritius, Réunion, and Natal; and quite recently its introduction into the south of Europe has been attempted, though with indifferent success.

Precautions in Case of Fire.

An excellent set of rules for guidance for the prevention of and in case of fire, by Dr, Hall, may be briefly summarized as follows:

Keep all doors and windows of the structure closed until the firemen come; put a wet cloth over the mouth and get down on allfours in a smoky room; open the upper part of the window to get the smoke out; if in a theater, keep cool: descend ladders with a regular step to prevent vibration. If kerosene just purchased can be made to burn in a saucer by igniting with a match, throw it away. Put wirework over gaslights in show windows; sprinkle sand instead of saw dust on floors of oil stores; keep shavings and kindling wood away from steam boilers, and greasy rags from lofts, cupboards, boxes, etc.; see that all stove pipes enter well in the chimney, and that all lights and fires are out before retiring or leaving place of business; keep matches in metal or earthen vessels, and out of the reach of children; and provide a piece of stout rope, long enough to reach the ground, in every chamber. Neither admit any one if the house be on fire, except police, firemen, or known neighbors; nor swing lighted gas brackets against the wall; nor leave small children in a room where there are matches or an open fire; nor deposit ashes in a wooden box or on the floor; nor use a light in examining the gas meter. Never leave clothes near the fireplace to dry; nor smoke or read in bed by candle or lamp light; nor put kindling wood to dry on top of the stove; nor take a light into a closet nor pour out liquor near an open light; nor keep burning or other inflammable fluids in rooms where there is a fire; nor allow smoking about barns or warehouses.

In "butting" or meeting belts, the crossings of the lacings should be on the outside.

DECISIONS OF THE COURTS.

United States Circuit Court.--District of Massachusetts.

PATENT INSTANTANEOUS GLUE.—THE MILLIGAN AND HIGGINS GLUE COMPANY *vs.* GEORGE UPTON.

[In equity.—Decided October 6, 1874.]

The plaintiffs in this case are the assignees of Emerson Goddard's patent, Oct. 4, 1868.

What the patentee claimed in that patent is "instantaneous glue," in which claim he especially includes gelatinous or glutinous substances called glue, produced by the process of disintegrational fine cutting akin to rasping, by which the particles are made thin, scale-like, curling, and are thoroughly fractured, so that they form a loose, incompact mass, readily permeable to and solvent in hot water. *

Respondent denies the charge of infringement, and sets up several other defenses upon the merits, as follows: 1. That the original patent was not the proper subject of a surrender, as it was neither inoperative nor invalid, and that it was not lawfully reissued, as the reissued patent is not for the same invention as was the original patent. 2. That the alleged improvement was not, at the date of the assumed invention thereof, the proper subject of invention, nor a novelty proper to be secured by the grant of valid letters patent. 3. That the alleged invention, before the alleged making or discovery thereof, was known to and used by the several persons named in the answer, and was described in the several mechanical and scientific works therein mentioned. 4. That neither the patentee nor the complainant ever used or employed the process or the mechanical instrumentalities, or the mode of operation described in the specification. *

Held by Judge Clifford:—

Neither reissued nor extended patents can be impeached in suits upon them for fraud in obtaining them.

The granting of a reissue is conclusive to its validity, unless it appears from a comparison of the papers that the invention is not the same with the one originally patented, or that the Commissioner has exceeded his authority in granting it.

The complainant's original patent claimed glue reduced to minute shavings by a rasping process performed in a machine constructed to give the glue such a form and no other. His reissued patent described the same process and machine, and claimed the product. It was held valid, although it also contained amendments evidently intended to cover glue reduced to fine particles by crushing or other means.

In order to sustain a patent for a manufacture, it is essential that invention or discovery must have been exercised in producing it. It is not enough that it is a new article of commerce.

There is no invention in reducing an article of bulk to minute fragments, when it is not improved by adding some new ingredient, or by subtracting one or more.

Comminuted glue, or glue reduced to fine particles, does not differ in its qualities from flake glue, and a patent for it is void.

Bill dismissed with costs.

[Walter Curtis, Esq., for complainant.
G. L. Roberts, Esq., for defendant.]

NEW BOOKS AND PUBLICATIONS.

OUTLINES OF PROXIMATE ORGANIC ANALYSIS, for the Identification Separation, and Quantitative Determination of Organic Compounds. By Albert B. Prescott, Professor of Organic and Applied Chemistry in the University of Michigan. New York: D. Van Nostrand, 23 Murray and 27 Warren streets.

The author of this work points out, with much truth, that the rapidly extending list of known organic compounds gives great importance to the evelopment of analytical science, [which has for many years been sorely taxed to find means of separating the constituent parts of the products of modern discovery, and of identifying them by their reactions and other characteristic indications. The book is a compendious, well arranged treatise, the definitions and instructions being singularly clear and concise.

SHEEP: THEIR HISTORY, MANAGEMENT, DISEASES, AND NATIONAL VALUE; with Remarks on the Transit of Stock. By William Read, Wool Broker. Edinburgh, Scotland: William P. Nimmo.

This little book, written to wake up the British wool grower to the importance of cultivating and extending his important industry, contains much valuable information on sheep and the raising of the useful animals for meat as well as for wool. It may be studied with advantage by our farmers, and read with interest by lovers of natural history.

PHILOSOPHIC REVIEWS. By Lawrence S. Benson, Author of "Benson's Geometry" and other works. Price $1.25. New York city: J. S. Burnton, 149 Grand street.

The first of these essays is entitled "Darwin Answered, or Evolution a Myth," and in it the author launches thunderbolts against "those who deny a Creator," thus making the very common error that the theory of development attempts to get rid of a First Cause. The second essay is a refreshing specimen of the circle squarer's art. He holds that the area of a circle is exactly three times the square of the radius; and the well known fact that a polygon equal to $3R^2$ can be drawn in a circle, and leave a large fraction over, produces no effect upon his faith. After this, we can hardly suppose that the letter on mensuration by weight, published on another page of this issue, wil succeed in converting our author to a belief in truth as it is arrived at by inductive reasoning.

THE TRANSMISSION OF SOUND BY THE ATMOSPHERE. By John Tyndall, F.R.S. Also GIGANTIC CUTTLE FISH, by W. Saville Kent, F.Z.S. Price 25 cents. Boston, Mass.: Estes & Lauriat, 143 Washington street.

The first of these essays is well known to our readers, having been already criticised and commented on in our columns. The second paper is an interesting and exhaustive description of the octopus species, whose appearance and characteristics have lately excited the interest and sometimes the horror of our readers.

REPORT OF THE PROPOSED ENLARGEMENT OF THE MONTREAL WATER WORKS, with a History of the Works up to the Present Date. By Louis Le Sage, Superintendent. With Photographic Illustrations, Maps, and Plans. Montreal, P. Q.: J. Starke & Co., St. François Xavier street.

This is an elaborate account of some of the most important arrangements or water supply ever organized on this continent. The writer estimates that, n nine years' time, a daily supply of 16,000,000 gallons will be needed; and he describes a plan, financial as well as practical, by which this quantity can be obtained.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From December 1 to December 17, 1874, inclusive.

BALE BAND TIE.—R. Terrell, New Orleans, La.
BORING GUN BARRELS.—J. L. Kerr, Alleghany, Pa.
BUTTON HOLE SEWING MACHINE.—J. McCloskey, New York city.
CARBURETTER.—J. F. Lockwood *et al.*, St. Louis, Mo.
CARRIAGE SPRING.—F. H. Simpson, South Windham, Conn.
CLIPPING HORSES, ETC.—J. H. Small, Buffalo, N. Y.
CONDENSER.—E. O. Brinkerhoff, New York city.
CONDENSING METAL, ETC.—J. B. Tarr, Fairhaven, Mass.
COOK STOVE AND FURNACE.—T. J. Whitehead South Paris, Me.
DISTILLATION.—R. C. Brooks *et al.*, San Francisco, Cal.
DRAWING COMPASS.—W. Smith, Boston, Mass.
DRAWING IMPLEMENT.—W. Smith, Boston, Mass.
FEATHER DUSTER.—A. D. Griswold, New York city.
FIRE EXTINGUISHER.—H. S. Parmelee, New Haven, Conn.
FURNACE GRATE, ETC.—S. L. Wiegand, Philadelphia, Pa.
GOVERNOR.—A. R. Klein, New Jersey.
GOVERNOR.—J. Judson *et al.*, Rochester, N. Y.
IRON AND STEEL.—C. I. Eames, N. Y. city.
KNITTING MACHINERY.—E. Tiffany, Bennington, Vt.
LAMP.—R. Hitchcock *et al.*, Watertown, N. Y.
LAMP WICK.—H. Halvorson, Cambridge, Mass.
MAKING ICE, ETC.—J. M. Beath, San Francisco, Cal.
METAL TUBING, ETC.—G. J. Brooks, Brattleboro', Vt.
PORTABLE FORGE.—W. P. Kellogg, Troy, N.Y.
PROTECTION FOR FIRE, ETC.—J. A. Coleman, Providence, R. I.
RAILWAY COUPLING.—C. L. Horack, New York city.
RAILWAY WHEEL.—R. N. Allen, Hudson, N. Y.
REAPER AND MOWER.—W. A. Wood, Hoosick Falls, N. Y.
REFRIGERATOR.—J. J. Bate, Brooklyn, N. Y.
SACK SEWING MACHINE.—A. J. Gove, San Francisco, Cal.
SACK SEWING MACHINE.—H. P. Garland *et al.*, San Francisco, Cal
SHAFT COUPLING.—S. Stuart, New York city.
SHUTTLE.—J. H. Le Moyne, Boston, Mass.
SKATE.—J. L. Plimpton (of New York city), London, England.
SORTING NAILS.—J. Coyne, Pittsburgh, Pa.
SPRING MOTOR.—N. Jenkins, New Haven, Conn.
STEAM ENGINE.—W. B. Reaney, Philadelphia, Pa.
SURFACING TEXTILE FABRICS.—W. Bell, New York city.
SUSPENDER.—J. W. Wattles, Massachusetts.
TEMPERING STEEL AND IRON.—J. F. Simonds *et al.*, Fitchburg, Mass.
TRANSMITTING ROTARY MOTION, ETC.—F. H. Simpson, South Windham, Ct.
TREATING HYDROCARBONS.—G. H. Smith (of New York city), London, England, *et al.*

Recent American and Foreign Patents.

Improved Combined Cylinder and Sectional Boiler

John F. Taylor, Charleston, S. C.—The object of this invention is to provide a steam boiler in which the advantages of a cylinder boiler are retained, while the objections to it arising from the waste of heat are obviated. It consists in combining a wrought iron cylinder boiler with a cast iron sectional boiler, which latter encompasses the cylinder in the place of the masonry, and utilizes a great deal of the waste heat by heating the feed water, which is first admitted to the sectional boiler, the draft from the furnace being so directed among the portions of the sectional boiler as to secure the greatest possible effective power of the fuel.

Improved Automatic Signal Telegraph.

Joseph W. Kates, Richmond, Va.—The object of this invention is to provide an automatic signal telegraph, to be used in hotels, public departments, large business establishments, etc., which shall transmit to a central supply station the most frequently recurring wants of the establishment, and the operation of which shall be so simplified as to be adapted to the ordinary intelligence of persons unskilled in telegraphy. It consists in a series of non-conducting perforated tapes, each perforated to represent its peculiar want. Said tapes are wound around a grooved drum which is on the same shaft with the mainspring of a clock gearing, the said clock gearing, drum, and tapes being so relatively arranged that a withdrawal of the tapes winds up the spring of the clock gearing; and the reaction or retrograde motion of said spring, when the tapes are released, winds up the said tapes upon the drum, and sends the line current through the perforation in the tapes by means of conducting rollers, between which the said tapes pass.

Improved Washing Machine.

John S. Shrawder, Fairview, Pa.—This invention consists in a reciprocating washbox having front and rear ribs, and reversely notched side rubbers rigidly attached thereto. It enables the ordinary washing to be done with unusual facility, while its work is very thorough and effective.

Improved Cotton Scraper.

George W. Beard, Grenada, Miss.—This invention relates to the shape of and mode of attaching scrapers to a plow, and consists in making the cutting edge come to a point at the middle of front, and form an angle with the sloping upper and lower edges; also in the arrangement of the scraper with respect to the plow, so that what the former shaves from the sides of the row will be transferred to the share and moldboard, turned with the furrow slice, and discharged into the middle space between the rows.

Improved Anti-Friction Metal.

Jeremiah K. Guile, Rochester, N. Y., assignor to himself and Joseph B. Champion, New York city.—This is an improved anti-friction metal for journal boxes and other bearings which, it is claimed, will not heat from friction, and will take a high polish. The invention is prepared of zinc, tin, antimony, glass, slaked lime, and borax. The entire journal box is made from the alloy. The inventor submits reports of United States naval engineers detailing extended tests, which show that the use of the metal tends largely to reduce friction as well as to save oil.

Improved Ore Separator.

Benjamin F. Day, of Tamaqua, Pa.—This invention relates to machines for separating coal from slate, and ore from other materials, when there is a difference in the specific gravity; and consists in exposing the coal or ores to the action of an ascending current of water moving with sufficient velocity to carry forward the coal or lighter material while the slate or ores of greater specific gravity pass down through the column of water. In this manner the desired separation is automatically and completely effected.

Side Bar and End Spring Connection for Vehicles.

Ephraim Soper, Brooklyn, E. D., N. Y.—This is a flexible coupling, of leather or other substance, arranged in the form of a strap, attached to the bar and looped around the bolt of a clip attached to a spring for coupling the side bar to the spring. The torsion caused by the lengthening or shortening of the spring will thus be expended on the flexible coupling, and the bars will be free to work without being exposed to the torsion to which they are subject when clipped directly to the springs, as in the common way.

Improved Step Ladder.

Orange M. Sweet, Forestville, N. Y.—In this ladder the standard is adjusted to the main body of the ladder by a hinged brace, which slides by a pivoted sleeve with fastening clamp screw along a guide rod connecting two middle steps. This renders the ladder light and easily adjusted, while sufficiently strong.

Improved Feed Bag for Horses.

Thomas Medley, New York city.—This is a horse's feed or nose bag made of coarse horsehair, twisted into strands and woven into a reticulated cloth. By the construction, the meshes of the cloth are of such a size as to allow air and the dust from the grain to pass through readily, while the grain itself will be held securely.

Improved Straw Cutter.

William Boyce, Lowell, Mich.—The hood is hinged to a lid, which is fastened to the long pivoted arms. The hood folds forward, and the lid folds to the rear with the hood, leaving the entire top of the cutter exposed, so that the front parts may be conveniently reached for repairing, and the feed inspected at any period of the cutting process.

Improved Tether.

Morgan & McAfee, Talbotton, Ga.—This invention consists of a long elastic pole with a hitching line attached to the small end, the pole being attached by a crotch at the butt. A suspending wire is attached thereto, and another is secured a short distance above to a strong stake driven in the ground, so that it projects upward and outward from the stake, and at the same time revolves around the stake in such manner as to form an efficient mode of fastening stock to a center, around which they may graze without twisting the rope or becoming entangled in it.

Improved Chuck.

George R. Stetson, New Bedford, Mass.—In this improved chuck, the radial guide ways for the jaws are extended longitudinally through the solid body portion parallel with the axis, and drivers are arranged therein for working the jaws. Said drivers are connected with the jaws by a flange on the side of one in a radial groove in the side of the other, so as to allow of radial motion to the jaws at the same time that they are moved longitudinally. They are also geared by screw threads on the outer edge and threads upon the inside of a ring turning upon the body of the chuck, to be moved forward and backward for driving the jaws.

Improved Forming Block for Fur Goods.

Jefta Popovits, New York city.—The object of this invention is to stretch the waist and back parts of fur garments, so as to impart an enlarged and rounded shape to the same without cutting and sewing up the parts. It is a forming block, of pyramidal shape, resting on its largest side, and having trapezoidal top and bottom sides, and triangular connecting sides of steeper inclination. The fur is stretched in wet state over the body of the block, and retained thereon by suitable fastening straps until completely dried.

Improved Earth Auger.

John Pickle, Kosciusko, Miss.—This invention relates to an earth borer, that cuts and lifts the earth readily from the bore hole; and it consists of a hollow cylindrical body, provided at its inner circumference with projecting and adjustable side-cutting blades, together with intermediate blades twisted toward the center, to form a diametrical connection with the side cutters for cutting and lifting.

Improved Metallic Shutter.

Fisher F. Fletcher, Sioux City, Iowa.—This invention contemplates the manufacture of a single sheet shutter, paneled and braced so as to possess the necessary strength with only a weight of about twenty-five pounds. A continuous sheet is reinforced on the margin or edges by riveted strips, and braced in the middle by a raised panel.

Journal Bearing for Cylinders of Chromatic Printing Presses.

Elié Gaiffe, Paris, France.—This invention consists in the adjustment of the engraved cylinders with reference to the presser roller, for the purpose of securing accurate registration of the different colors. The journal of the engraved cylinder is adjusted horizontally to the presser roller through a set screw, and is adjusted vertically by like means, the pivoted bearing of the journal preventing the change in its vertical adjustment from necessitating any change in its lateral adjustment, as the pressure of the set screw is always transmitted direct to the journal, whether the latter be in a right line or otherwise. A cushion renders the pressure of the cylinder always elastic and uniform.

Improved Envelope.

Thomas H. Bomar, Spartanburgh, S. C.—This envelope is made with two folding sides, one of which is pasted down to narrow flaps after they are turned inward on a central portion, thus forming a pocket for the letter, leaving one of the end flaps ready to be turned over on one side, upon which is written or printed the name and address of the sender of the letter. When the envelope is returned to the writer, the addressed portion with its flap is torn off, which still leaves a perfect envelope, having the name and address of the writer plainly written or printed on the outside.

Improved Fare Box.

Patrick J. Stokes, New York city.—The opening and closing mechanism attached to the inner side of the fare box cover consists of pieces of sheet metal which are pivoted to the cover, so that they may be turned in order to make holes in them correspond in position with the holes in the cover. A spring fastened to the cover has a hook at its end, which prevents the movement of the pieces until a wedge which is pivoted to the cover is pushed down to force the spring outward. This is done when the cover is closed down and placed in the case, so that catches will engage with and turn the pieces and open the apertures. When the box is withdrawn, the pieces are turned in the opposite direction to close the apertures.

Improved Sliding Stem Valve.

Jabez Stone, Waterford, N. Y., assignor to George W. Eddy, same place.—Upon one side of the upper part of the valve stem are formed rack teeth, into which mesh the teeth of a pinion. The shaft of the pinion works in bearings in a chamber which is formed upon the upper end of an arm, upon the lower end of which is formed a collar, which passes around a neck formed upon the upper part of a cap, just below the stuffing box. This construction allows the stem chamber and collar to be turned freely in any direction to bring the handle attached to the shaft of the pinion into any desired position to avoid obstructions, or to enable it to be conveniently reached by the engineer.

Improved Necktie Plate.

Martin Drennan, Brooklyn, N. Y.—This is a little frame having three vertical parallel looping holes, and one horizontal opening at right angles to and below the others, for forming various bows, knots, and ties of scarfs for neck wear. There are slots adapted for attaching the frame to a belt, to be worn as a buckle, and it is provided with a pin for fastening it to the dress.

Improved Lamp Chimney.

Thomas W. Parker, Griggsville, Ill.—Each of the longitudinal halves of a glass lamp chimney is provided with corresponding notches in one of the adjacent edges. A spring clamp having a lug is adapted to fit into said slots. Expansion of the chimney from heat is thus permitted, and yet its parts are held firmly together, and lengthwise movement of one on the other is prevented.

Improved Mashing Process for Breweries.

John C. G. Hüpfel, New York city.—This is an improved mashing process for breweries, consisting in the admixture to the common bruised malt of a suitable quantity of finely ground and bolted malt, to be mashed therewith for the purpose of imparting a stronger malt taste in the beer produced, without interfering with the drawing-off of the worts from the mash tub.

Improved Manufacture of Striping Brushes.

Thomas J. Elder, Lanark, Ill.—This invention consists in making the handles of the brush of two pieces of wood, which clamp the hair, and are held together by means of glue. Wide pieces of thin wood are used with the grain running in the same direction with the strands of hair, so that, when desired, the wide pieces may be broken into a number of smaller sections, forming brushes of less width adapted to the different styles of work.

Improved Ore Roasting Furnace.

Ernst Heilgendorfer, Belmont, Nev.—The ground ore is fed through a hopper into a heater, through which it is gradually transferred by a screw, while a furnace is heating it. Having arrived on a sieve, the ore is quickly spread over the surface thereof, so as to cause its particles to be subdivided in passing through the reticulations. The particles thus pass down from the sieve in numerous little streams, so that the hot gases act readily on all sides of each particle.

Improved Cutting Apparatus for Harvesters.

Charles K. Myers, Pekin, Ill.—An arm having a crosshead and bent end is secured to the under side of the sickle bar. It also passes through and works in a long notch in the upper side of the middle part of the finger bar. In the turned-down rear part of this arm is formed a square hole to receive the head of another bar, by which the sickle bar is driven. The sides of the head of the driving bar are rounded off, so that the said head may fit snugly in the square mortise of the arm, at whatever angle the said driving rod may be.

Improved Horse Hay Rake.

Amos W. Coates, Alliance, O.—This invention consists in pivoting a foot lever over a front-closed and rear-open box, so as to enable the usual toggles to be easily operated by the driver without stooping or changing his position. This construction enables the operator to run the teeth of the rake high or low, according to the evenness or unevenness of the ground in different parts of the same field.

Notes & Queries

E. will find details of the process of transferring engravings to glass on p. 298, vol. 31.—J. R. M. will find a rule for calculating speeds of pulleys on pp. 26, 73, vol. 25.—L. K. Y. can make a copper dip by the process described on p. 90, vol. 31.—G. H. B. will find formulæ for calculating the horse power of an engine on p. 16, vol. 29, and p. 54, vol. 30. For a process for making ether, see p. 34, vol. 31.—T. F. S. can calculate the supply of water through his pipes at any given head by the formulæ given on p. 48, vol. 29.—A. M. can refine rosin oil by the process given on p. 266, vol. 31.—C. H. F. can remove inkstains from woolen fabrics by the method described on p. 139, vol. 29.—A. S. T. can temper tools for cutting granite by the process given on p. 202, vol. 31.—W. H. will find a good recipe for mucilage on p. 202, vol. 31.—A. M. and H. A. do not send sufficient data.—G. H., J. F. S., and many others should refer to p. 48, vol. 29, as to friction of water in pipes.—C. F. S. will find directions for making rubber stamps on p. 156, vol. 31.—G. D. F. will find a method of softening paint brushes on p. 75, vol. 28. The manufacture of plaster of Paris from gypsum is described on p. 399, vol. 29.—C. A. S. will find the details of engineers' pay in the navy on p. 394, vol. 31.—J. W. will find how to ascertain the radius of an arc, when chord and hight are known, by varying the formula given on p. 139, vol. 31.—C. A. H. will find directions for making molds for small castings on p. 266, vol. 24.—J. B. can ascertain the lifting power of hydrogen by referring to p. 74, vol. 31, and can calculate accordingly for other gases.—G. F. L. will find the recipe for a hair stimulant on p. 363, vol. 31.

(1) C. C. S. asks: Which has the most strength, a ¾ inch bar of iron with a ⅜ inch hole in it, or a solid bar of ¾ inch iron? A. The solid bar.

(2) G. H. B. asks: 1. Are cannon ever molded of wrought iron, so as to retain their malleability? A. No. 2. Is wrought iron ever run into molds? A. No.

(3) V. L. W. asks: If an engine will do less work with 40 lbs. of steam, will it be better to carry just 40 lbs., or would it be better to let it go up to about 50 or 55 lbs., in order to have dry steam? A. If the steam of a higher pressure is wire-drawn down to 40 lbs., it is better to carry only the latter pressure; but in an engine with an automatic cut-off, the higher pressure would be the best.

(4) E. C. H. asks: What becomes of the exhaust steam when an engine running at full speed is reversed? Does not the engine pump air into the boiler? A. No.

Is it at all probable that, during the great conflagration of Chicago, providing the wind was favorable, that the smoke or scent of fire would be observed in the vicinity of Philadelphia? A. No.

Is the 1,000 foot tower all a hoax, or is to be erected for the Centennial? A. Address the designers.

What kind of joint should be used to close the blow-off port of a boiler by a cap, so to make the most serviceable and reliable joint? A. It is sufficient to screw on the cap.

(5) Z. says: I read in Ganot's "Physics," p. 390, that "as a gas is increased $\frac{1}{273}$ of its volume for each degree C., it follows that at a temperature of 273° C. the volume of any gas, measured at zero, is doubled. In like manner, if the temperature of a given volume at zero were lowered through 273°, the contraction would be equal to the volume, that is, the volume would not exist." It appears to me that, if the volume is doubled for every 273° of heat, it would be reduced one half for the same number of degrees of cold. Therefore at −273° the volume would be ½ of what it would be measured at zero. At −273°×2 it would be about ¼; at −273°×3 it would be ⅛. If this be correct, there appears to be no more reason for placing the zero of temperature at −273° C. than at any other point in the scale. A. If the gas is heated 1° C., its volume is increased $\frac{1}{273}$. Similarly if it is cooled 1°, its volume is decreased $\frac{1}{273}$; if cooled 2°, the volume is decreased $\frac{2}{273}$, and so on; so that on being cooled 273°, the volume is decreased $\frac{273}{273}$.

(6) C. F. O. Jr. says: A boiler whose dimensions are 9 feet long and 2 feet 6 inches diameter, with a steam dome 20 inches in diameter and 24 inches high, the shell being $\frac{5}{16}$ inch thick, and the heads ¼ inch thick: made of the very best C. H. No. 1 Pennsylvania iron (except the sheets at the bottom half of the boiler and the back head, which are of Eureka or Sligo fire-box iron) is to be used for supplying a steam heating apparatus with steam at 20 lbs. pressure. It is to be tested to a hydrostatic pressure of 50 lbs. to the square inch. Is not this high pressure injurious, and will it not weaken the boiler materially? A. If the test is properly performed, by filling the boiler with water and heating it, we do not think that any material injury will result.

(7) M. H. K. asks: What is the simplest mechanism which I can use to turn a light machine, very rapidly if possible, using an air pressure from a fan? I would like to have the air enter at the center and discharge at circumference of the motor. A. Something on the plan of the Barker mill would no doubt serve the purpose.

(8) G. C. P. Jr. asks: What is the cause of the thumping noise in engines? A. Probably water in the cylinder and pipe.

(9) W. S. S. says: 1. I want to make a cylinder casting with ports about $\frac{1}{16}$ inch wide. What can I make the cores of so that I can clean the ports out easily? A. Of baked clay and sand. 2. Would it do to make the patterns as for large cylinders? A. Yes. 3. Would ports $\frac{1}{16}$ inch by 1¼ inches be large enough for a cylinder 1¼ inches by 3 inches? A. Yes.

(10) C. S. asks: I want to use 2 horse power; could I not get it from a 10 horse engine as cheaply as I could from a 2 horse engine? A. In some cases, the large engine might be run as economically as the small one, but in general, no.

What pay do locomotive engineers and firemen get? A. Engineers from $80 to $100 a month, firemen from $40 to $60.

How is acid made out of wood, for setting the colors in cloth? A. It may be prepared by treating nutgalls with ether.

(11) G. B. asks: Does it make any difference as to the safety of a bridge whether a train is run over it at the usual or at reduced speed? A. It is safer to cross the bridge at a reduced rate of speed.

(12) C. B. W. asks: 1. What is meant by a sniffing valve? A. A blow-through valve attached to an engine for the purpose of expelling the air. 2. What is an equilibrium valve? A. It is a valve which can be moved without being affected by the pressure of the steam. 3. What is a gridiron valve? A. A cut-off slide valve with several ports. 4. What is multiple gearing? A. A train of gear wheels.

(13) R. O. B. asks: Is the odontograph applicable to internal epicycloids as well as to all other forms? I have tried in vain to adapt it to the above-named gearing; and if it can be applied to wheels gearing internally, I want the process and also the radii of a pair of wheels so gearing, so as to occupy a space 24x16 inches and 1½ pitch. A. The odontograph can be used as you suggest. You will find an explanation of the method and a very good summary of the rules for proportioning wheels in the article on gearing in Appleton's "Dictionary."

(14) G. S. asks: How much will a brass tube expand in length when heated from the temperature of cold water (as it comes from hydrants) to that of boiling hot water, the tube being 1¼ inches in diameter and the bore 1 inch, and the tube being 1 foot long? How long a tube would be required to expand ⅛ inch in length? A. It will expand about $\frac{16}{10000}$ of its original length. From this you can readily calculate the requisite length. 2. What hard metal expands most, and how long a tube of that metal expands ⅛ inch in length? A. Zinc expands $\frac{22}{10000}$ of its original length.

(15) C. F. asks: Is there a rule by which I can ascertain the power exerted by a pump, say with three plungers of ⅞ inch diameter and 4 inches stroke, driven at the rate of 50 strokes per minute by a 6 inch belt? A. It must be determined by experiment.

(16) C. N. says: 1. I am making an engine, to run a jeweler's lathe, of 1 inch bore and 1½ inches stroke. Will such a cylinder be large enough, and will $\frac{1}{16}$ inch be enough cushion? A. The dimensions will answer very well. 2. At what point should steam be cut off? A. Three fourths of the stroke.

(17) N. A. J. asks: How can I ascertain the number of acres in a triangular piece of land? My method is to add the three sides together and take half their sum. From this take the three sides severally, and multiply the half sum and the several remainders together and extract the square root of the product. Am I right? A. This method is correct.

(18) A. G. C. asks: In a plain slide valve engine, is it better to have an extra large steam chest? A. No.

(19) H. M. asks: What is the weight of 1 cubic inch lead, wrought iron, and cast iron, respectively? A. Average: Lead 0·410 lb., wrought iron 0·282 lb., cast iron 0·261 lb.

Can you give me a rule for finding the side of an inscribed hexagon, also of an inscribed octagon? A. Side of hexagon = radius of circumscribing circle. Side of octagon = 0·7654 × radius.

What is meant by squaring the circle? A. Finding a square of the same area.

What is meant by the pitch of a propeller? A. See p. 240, vol. 31.

(20) H. H. asks: In what does indicated horse power of an engine differ from horse power? A. Indicated horse power is that due to the pressure of the steam, and includes the power required to overcome the friction of the engine. Effective horse power is the power available for useful work after deducting that consumed by prejudicial resistances.

(21) A. S. P. asks: 1. Does compressed air press equally in all directions? A. Yes. 2. What is the pressure per square inch of 1, 2, and 3 atmospheres respectively? A.

1 atmosphere, average,	14·685	lbs.	per square inch.
2 " "	29·370	"	" "
3 " "	43·055	"	" "

What is the weight of a cubic foot of water? A. A cubic foot of distilled water of maximum density weighs 62·425 lbs.

(22) M. E. H. says: I have kept a gun in such good order that I have worn all the varnish off. It is now so bright that, when the sun shines on it, it is almost impossible to shoot well with it. How can I revarnish it? A. Try chloride of antimony, mixed with olive oil, heating the gun barrel slightly.

(23) G. & Co. ask: What is the rule for gaging casks? A. The rule varies considerably, according to the kind of cask. You will find a good summary of rules and methods, in Haswell's "Mensuration." A general method is to ascertain the mean diameter by a number of measurements taken at close intervals, and then treat the cask as if it were a cylinder with this (mean) diameter.

(24) H. M. says: 1. Are half inch oak boards thick enough for the planking of a boat 20 feet long? A. Yes. 2. Would screws do in place of rivets, provided I countersink the head and putty them over? A. No. 3. Would an engine with a cylinder of 3 inches bore and 6 inches stroke, under 50 lbs. pressure of steam, be large enough to run the said boat? A. Yes. 4. What power would the above sized engine, running 300 revolutions per minute, give? A. Between 1½ and 2 horse power. 5. What sized screw would it take to run the above boat? A. One of 2 feet diameter and 3 feet pitch.

(25) G. E. P. asks: Who was Euclid? A. A celebrated geometer, who lived in Alexandria, about 300 B. C.

(26) W. M. W. asks: 1. Is the coating on enclosed pills all sugar? A. It is principally sugar. 2. What is mixed with sugar for coating pills? A. M. Garot recommends 10 parts gum tragacanth and 2 parts water. This is screened through fine linen, and mixed with 20 parts of sugar of milk. It is spread out in thin layers, and, when dry, pulverized. The pill is first dipped in water and then powdered over with the above compound. Pure gelatin is sometimes used for this purpose, also mixtures of gum, sugar, and starch. M. Calloud gives the following recipe, and the mixture is claimed by him to be less hydroscopic than any of the foregoing: Boil together 1 part flaxseed, 3 parts white sugar, and water sufficient to make a thick mucilage. Evaporate to dryness, pulverize, and dip the pill in on the point of a pin, to which is to be given a rotary motion.

(27) S. A. asks: Can a person be cured who is suffering from trichinæ? A. Yes, if discovered in proper time, that is, before the trichinæ have passed from the alimentary canal. 2. What are the symptoms? A. The symptoms are diarrhœa and abdominal pains, followed by muscular pains. "These symptoms occur within a few days after the ingestion of trichinous meat, that is, as soon as the young worms have been produced and become developed sufficiently to begin to migrate towards the muscles. It is not difficult to understand that the aggregated punctures of the mucous membrane by these parasites should occasion notable disturbance, when it is considered that the trichina which have been found to be contained in half a pound of meat may be sufficient to give birth in a few days to a brood numbering 30,000,000. It is stated that peritonitis may be produced by the passage of worms into the peritoneal cavity. The secondary symptoms relate to the muscles. Pains resembling those of muscular rheumatism are occasioned by the entrance of the trichinæ in the muscles. Certain of the muscles become contracted, in some cases, and their extension occasions great suffering. Constitutional disturbance, more or less marked, accompanies both the primary and secondary symptoms. The general symptoms are not unlike those of typhoid fever, for which the disease is liable to be mistaken. Œdema of the face or lower extremities is apt to occur, and sometimes anasarca. Sweating is generally prominent as a symptom. Death takes place in a certain proportion of cases, after a protracted period of suffering and exhaustion, being often preceded by coma. The danger, *cæteris paribus*, is proportionate to the abundance of trichinæ generated within the alimentary canal. If the number be not sufficient to cause death from the amount of local and constitutional disturbance which they occasion, recovery takes place very slowly, the illness lasting for several weeks or months. The trichinæ become encapsulated in the muscles, thereafter remaining quiescent, leaving the muscles more or less impaired. An accumulation of a larger number of cases than is at present practicable is necessary to furnish data for a complete clinical history of the disease, and for determining the relative proportion of deaths and recoveries." 3. Do not trichinæ sometimes infest fowls? A. We do not remember such an occurrence. 4. How long can a person live with them in his body? A. That depends upon the constitution. 5. Can the disease be taken any way but through the stomach? A. Not that we are aware of.

(28) G. R. L. C. asks: 1. What kind of a curve is the tractrix? A. A tractrix is a transcendental curve in which the distance between every point of tangency and a fixed line, measured on the tangent, is the same. 2. Is there an equation for the tractrix? A. If x and y are rectangular coordinates, and h the constant, the equation, referred to the center, is $x = h \times \log.\left(\frac{h + \sqrt{h^2 - y^2}}{y}\right) - \sqrt{h^2 - y^2}$

(29) S. and D. ask: Were potatoes first found in Ireland or America? A. The common potato is a native of America, and was introduced into Europe by Sir Walter Raleigh.

(30) R. J. K. asks: I wish to prevent pine logs from fouling the water in wells. Has burning or charring ever been tried for such a purpose? A. Yes. The plan is frequently used, and is often efficacious.

(31) H. W. J. says: I have the following idea for a planer: On the sides of the lathe bed are bolted two arms, with a cross piece at the top, to which is attached the slide rest in a vertical (as compared with its usual) position, with the upper slide reversed; then a bed is made which moves on the lathe bed and is operated by a toggle arm connected at one end with the lower part of the head stock, the other end being connected with the traversing planer bed. Will this succeed? A. It will work very well. There is a somewhat similar planer in the market, which can be attached to a vise.

1. I wish to build a model engine of 2 inches stroke and 1 inch diameter. How would a boiler 1 foot high by 10 inches diameter, with 1 tube 3 inches in diameter, answer? A. The boiler is rather too small. 2. Of what thickness of metal should the boiler (of iron or copper) be? A. Make it ⅛ of an inch thick.

What is the plane line of a governor? A. The line joining the centers of the balls.

What books can you recommend on turning? A.

See "The Lathe and its Uses," and Knight's "Mechanism and Construction."

(32) N. N. B. asks: Does the north pole rise and the south pole sink from December 21 to June 21 (thus giving us the seasons), and vice versa from June 21 to December 21? Cannot it be properly said that the earth has three motions, namely, its diurnal rotation, its annual revolution, and its polar inclination? A. The earth's equator is always inclined 23° 17' to the plane of its path round the sun. To illustrate this, make two balls of wood or cork representing earth and sun. Put a wire axis through the earth at an angle of 23½° into the pivot of a hanging weight, fastened to a stick which turns in a vertical plane around the sun. The action of gravity will then keep the cork earth's axis continually pointing in the same direction.

(33) F. G. S. asks: How can I make a white paint that cannot be softened by alcohol? A. Mix any powdered white pigment with water glass.

Is there an optical instrument in use by which I can measure distances at a glance? A. Take a spy glass, a wooden rod, and a fat spider. Toss the spider from hand to hand to make him spin. Wind the thread spirally on a forked stick or wire. Gum two parallel spider lines on a ring of metal or card board, and place this ring in the focus of the terrestrial eyepiece. Mark the space included between the spider lines on the rod, 100 feet distant. Then as the space on rod included between the spider lines at 100 feet is to the space included at an unknown distance, so is 100 feet to the distance required. Simpler methods are described in Wingate's "Manual of Rifle Practice."

(34) A. F.—The sun's amplitude at summer solstice depends upon the obliquity of the ecliptic, and not upon his distance, as you suppose.

(35) A. S. asks: Is there any means by which I can render canvas or heavy muslin air-tight, so as to make a pair of bellows? A. Yes. See p. 379, vol. 30. In the end, leather would be much the cheapest.

(36) J. F. and others ask, in reference to S. E. S.'s query as to where he would arrive if he took a northeasterly course: Will you please explain how a man would arrive at the pole by traveling this course? It is our opinion that he would not, but would travel in a spiral direction, approaching nearer and nearer, but never reaching the pole. A. S. E. S. would come nearer to the pole than any of the north pole expeditions, because if he kept sailing he would be nearer than any conceivable distance; and unless we suppose his ship to be an inconceivably small one, some part of it would eventually reach the pole.

(37) P. M. C.—The moon's axis, during the eclipse, was very much inclined to the horizon, the latter being inclined to the equator, besides the inclination caused by the obliquity of the ecliptic and the inclination of the moon's orbit. These three causes, with the moon's motion from west to east, account for all correct observations.

(38) F. A. W. says, in reply to S. C. H., who asks as to the philosophical reason that a circular saw cuts better at a certain speed than it does if run faster: Circular saws of over 40 or 50 inches in diameter are or should be hammered to run at a certain speed. This is more important when the speed is as high as from 700 or 900 revolutions per minute. If a saw is so hammered as to do good work at 300 or 400 revolutions per minute, it will not do as good work at 900, for the reason that the high speed expands the outside or rim, causing it to dish, or "flop around," as sawyers sometimes express it. In such cases, and when it is inconvenient to reduce the speed, it will be necessary to guide the saw out of the log so as to cause the central part to rub against the log enough to heat it slightly, thus expanding the portion that needs hammering. An expert sawyer can in this way manage indifferently well, though at an expense of considerably more power. A large saw, to run well at high speed, should be hammered in the center part until it is slightly dishing, or, as it is variously expressed, "loose at the eye," or "rim-bound." It may be loose at the eye when it is the reverse of rim-bound, namely, too open at the rim, which is the most frequent trouble with such saws, and they all become so eventually from use, and then they should be re-hammered. I would not advise any one that has not had previous experience to undertake to hammer one, for the operation is a very delicate one, and requires considerable skill. A. We have known of several cases in which large saws seemed to do equally well under considerable changes of velocity, and we imagine that saws are quite as often run at different speeds as at those recommended by the makers. Within limits, however, our correspondent's views are quite correct.

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

A. J. R.—It is impossible to say whether a stone is lithographic, or suitable for printing from, from a small fragment.—H. C. T.—We have examined your queer specimen, but must request, before answering your questions, to know whether it is a manufactured or a natural product. How and where was it found? Is it genuine? If natural, has anything been done to alter it?—J. H. A.—The specimens contain iron pyrites in quartz.—We have received two specimens in an envelope, without any letter. No. 1 is magnetic pyrites or pyrrhotine, containing 40 per cent of sulphur and 60 per cent of iron. No. 2 is a mixture of small scales of black mica, carbonate of lime, and a rock composed of silex, iron, and magnesia.

J. C. C. asks: If it is high water at the Battery, New York city, at noon, how high will the tide be at Albany?—A. B. asks: What is the source of the disagreeable odor of corduroy, when that fabric becomes wet from any cause?—J. H. M. asks: How is the oil finish put upon melodeons and sewing machines, and what kind of oil is used?

COMMUNICATIONS RECEIVED.

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

On the Crystallization of Carbon. By C. T.
On Hydrophobia. By C. R.
On a Suicidal Scorpion. By J. B. T.
On the National Currency. By ——.
On Fruits and Electricity. By N. B.
On a Withdrawn Charge. By C. G. F.
On Gas Machines. By W. H. E.
On Smoke Consumption. By O. F. M.

Also enquiries and answers from the following:
S.—L. W.—J. B.—M.—H. V. M.—T. A. J.—A. J. N.—W. H. N.—H. T.—J. T. N.

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 enquiries analogous to the following are sent: "Who sells the best garden seeds? Where can tobacco paper for fumigating greenhouses be obtained? Are there any agencies for imported raw silk in New York city? Who publishes the best work on electroplating? Whose book on mechanical drawing is considered the best?" All such personal enquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

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Mat wooden, W. Grout (r)	6,186
Mill, grape, W. McLucas	157,925
Mop head, C. B. & J. J. Clark	158,033
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Motion, transmitting, G. H. Cliff	158,035
Mower, lawn, L. J. Youngs	158,162
Nut lock washer, G. C. Thomas	158,149
Ore washer, W. B. Frue	158,057
Organ treadle, W. Murphy	158,000
Oven, baking, J. M. Case	158,028
Oyster refrigerator, J. C. Jones	158,089
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Paper barrel machine, C. V. Mottram	157,970
Paper box, E. D. F. Shelton	158,134
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Paper barrel head, C. V. Mottram	157,971
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Pawl and ratchet, E. M. Krum	157,997
Pegging machine, E. P. Richardson	157,929
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Pin, safety, L. E. Andrews	157,981
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Plant shelves, hanger for, W. Higgs	158,082
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Plow, gang, R. Hance	158,069
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Pump valve, R. J. Gould	157,963
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Purifier, middlings, C. Custer	157,958
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Sewing cabinet, S. R. Ruckel	[illegible]
Sewing machine treadle, E. Pairo	[illegible]
Sewing machine tuck creaser, Sampson & Muther	157,935
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Wagon running gear, J. Skeen	158,139
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Washing machine, T. E. McDonald	157,922
Watch case lifting spring, C. L. Thiery	157,914
Watch center pinion, D. Gruen	157,913
Water wheel, turbine, O. N. and A. J. Angell (r)	6,178
Water wheel, turbine, S. T. Teachout	157,147
Welt trimmer, M. A. Tyler	157,947
Window screen, L. S. Thompson (r)	6,179
Wrench, D. McFarland	157,968
Yokes, tongue ring for neck, S. D. Bingham	158,018

EXTENSIONS GRANTED.

30,910.—PAPER FOLDER.—C. Chambers.
30,925.—BUTTON HOLE CUTTER.—F. C. Leypoldt.
30,929.—TOBACCO CUTTER.—W. H. Pease.
30,951.—SPINNING FRAME CYLINDER.—R. Plews.
30,961.—MOWING MACHINE.—J. Ten Brook. Two patents
30,971.—WATER WHEEL.—N. Johnson.
30,993.—WOOD PLANING MACHINE.—H. D. Stover.
30,001.—STRAW CUTTER.—W. Gale.

DISCLAIMERS FILED.

30,925.—BUTTON HOLE CUTTER.—F. C. Leypoldt.
30,961.—MOWING MACHINE.—J. G. Dunham.
30,993.—WOOD PLANING MACHINE.—H. D. Stover.

DESIGNS PATENTED.

7,937.—CARPET.—R. Allan, Yonkers, N. Y.
7,938 and 7,939.—CARPETS.—J. Barrett, New York city.
7,940.—WALL PAPER.—J. O. Craig, Philadelphia, Pa.
7,941.—VASE.—W. G. Fletcher, Boston, Mass.
7,942.—SARDINE BOX.—A. Godillot, New York city.
7,943.—PICTURE BORDER.—W. T. Murphy, Brooklyn, N. Y.
7,944.—COFFIN HANDLE.—W. M. Smith, W. Meriden, Conn.
7,945 to 7,947.—CARPETS.—T. J. Stearns, Boston, Mass.
7,948.—GLASSWARE.—J. Bryce, Pittsburgh, Pa.
7,949.—SMOKING PIPE.—A. L. Dickinson, Englewood, N. J.
7,950 to 7,953.—OILCLOTHS.—C. T. Meyer *et al.*, Bergen, N. J.
7,954 and 7,955.—STOVES.—N. S. Vedder *et al.*, Troy, N. Y.
7,956.—PIPE STEM.—J. W. Fleischmann, W'msburgh, N. Y.

TRADE MARKS REGISTERED.

2,128.—FEATHER TICKING.—Bliss *et al.*, New York city.
2,129.—METALLIC POLISH.—D. D. Cornell, Hyde Park, Ill.
2,130.—DRAWERS.—J. J. FitzPatrick, Philadelphia, Pa.
2,131.—FLOUR.—Lyon & Co., Boston, Mass.
2,132.—STREET LAMPS.—J. W. Bartlett, New York city.
2,133 to 2,135.—SPICES.—E. R. Durkee & Co., N. Y. city.
2,136.—SAUCES.—Johnson *et al.*, New Haven, Conn.
2,137.—BOOTS.—S. W. Rosenstock & Co., S. Francisco, Cal.
2,138.—BAKING POWDER.—D. S. Thompson, Chicago, Ill.
2,239.—GAUNTLETS.—Wade & Shults, Johnstown, N. Y.
30,961.—MOWING MACHINE.—J. Ten Brook.

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On application for Design (14 years)	$30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA,

DECEMBER 11 to DECEMBER 23, 1874.

4,187.—W. M. Conger, Newark, Essex county, N. J., U. S. Improvements in metallic shields and supports for use under stoves and analogous articles of metal, and in machines for producing such metal work by spinning, called "Improvements in Metallic Shields and Supports for Use under Stoves and Analogous Articles of Metal, and in Machines for Producing such Metal Work by Spinning." Dec. 17, 1874.

4,188.—S. G. Smith, Hollis, York county, Me., U. S. Improvements in machines for removing snow from railroads, called "Smith's Improved Machine for Removing Snow from Railroads." Dec. 18, 1874.

4,189.—A. Webber, Detroit, Mich., U. S., and A. McCormick, London, Ont. Improvement in carriage springs, called "Michell's Carriage Spring." Dec. 18, 1874.

4,190.—W. Irvine, Rochester, Monroe county, N. Y., U. S., and S. Trees, Toronto, Ont. Improvements on horse collars, called "Irvine's Adjustable Horse Collar." Dec. 18, 1874.

4,191.—G. D. Chisholm and S. Douglass, East Flamboro, Wentworth county, Ont. Useful device for preventing horses from jumping, kicking, or running away, called "Chisholm's Device for PreventingHorses from Jumping, Kicking, and Running Away." Dec. 1874.

4,192.—H. S. Cole, Milwaukee, Wis., U. S. Improvements on a machine for regulating the supply of water to steam boilers, and for sounding an alarm whistle when the water therein becomes dangerously low, called 'Cole's Water Regulator and Alarm for Steam Boiler." Dec. 18, 1874.

4,193.—J. F. Gordon, Rochester, Monroe county, N. Y., U. S. Improvements on self-binding grain harvesters, called "Gordon's Self-Binding Harvester." Dec. 19, 1874.

4,194.—D. Bissell, Detroit, Wayne county, Mich., U. S. Improvements on leg splints, called "Bissell's Leg Splint." Dec. 19, 1874.

4,195.—J. F. Gordon, Rochester, Monroe county, N. Y., U. S.—Improvements on self binding grain harvesters, called "Gordon's Self Binding Grain Harvester." Dec. 19, 1874.

4,194.—D. Bissell, Detroit, Wayne county, Mich., U. S. Improvements on leg splints, called "Bissell's Leg Splint." Dec. 19, 1874.

4,195.—G. C. Surls, Rochester, Beaver county, Pa., U. S. Improvements in furnaces for burning kilns, called "Surls' Patent Kiln." ,Dec. 22, 1874.

4,196.—J. J. Fitzpatrick, Philadelphia, Pa., U. S. Improvements in drawers for men and boys' use, called "Fitzpatrick's Patent Improved Crotch Drawers." Dec. 22, 1874.

4,197.—J. Nelson, Sunderland, Durham county, England. Improvements on machine for cutting and finishing the ends of studs and bolts, called "Nelson's Machine for Cutting and Finishing the Ends of Studs and Bolts." Dec. 22, 1874.

4,198.—J. H. Weare and N. Weare, Cincinnati, O., U. S. Improvements on cooking utensils, called "Weare Brothers' Improved Cooking Utensil." Dec. 22, 1874.

4,199.—S. S. White, Philadelphia, Pa., U. S., assignee of J. W. Gilbert, same place. Improvements on hand pieces for dental engines, called "Improvements on Dental Hand Pieces." Dec. 22, 1874.

4,200.—J. W. Dunn and G. B. Boyle, Niagara, Lincoln county, Ont. Improvements in the method of heating and protecting steam boilers, called "The Royal Arch Flue and Hot Air Attachments to Furnace Doors." Dec. 22, 1874.

4,201.—F. D. Brodhead, Boston, Mass., U. S. Improvements on cans, called "Brodhead's Sectional Can." Dec. 22, 1874.

4,202.—W. Jones, Philadelphia, Pa., U. S. Improvements on bed springs, called "Jones' Compound Bed Spring." Dec. 22, 1874.

4,203.—G. Huntington, Brantford, Brant county, Ont. Extension of No. 192, called "Huntington's Clothes Washer." Dec. 20, 1874.

4,204.—A. N. Christie, St. Louis, Mo., U. S., and Hon. Sir A. T. Galt, Montreal, P. Q. Improvements on smokestacks of railway locomotive engines, called "Improved Spark Arrester." Dec. 28, 1874.

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