Examples of solid coefficients:

Copper	from	1·000,000	expands to	1·000,017
Lead	"	1·000,000	"	1·000,029
Iron	"	1·000,000	"	1·000,012
Zinc	"	1·000,000	"	1·000,029
Glass	"	1·000,000	"	1·000,0080
Platinum	"	1·000,000	"	1·000,0088

The last is almost the same as that of glass: hence the possibility of fusing platinum into wires with glass tubes for eudiometric and other purposes. Were the coefficients different, the fracture of the glass would be inevitable during the contraction in cooling.—*Mechanics' Magazine.*

THE STEAMSHIP "EGYPT."

Our full page engraving represents the steamship *Egypt*, a splendid vessel lately built at Liverpool for the Atlantic National line of steamers.

She is 450 feet 6 inches in length, which is more than two thirds as long as the *Great Eastern;* her breadth of beam is 44 feet, and depth of hold 36 feet. She registers 5,150 tuns gross. Her engines are on the compound principle, and are of 3,000 horse power. They are supplied with steam by six double boilers arranged in two sets of three each, which carry a pressure of 75 pounds to the square inch.

She is a complete four decker. Her spar deck is flush fore and aft, the cabin entrances and skylights being the only obstructions on it. This and the deck below are plated with steel and planked with pine. The two lower decks are plated with iron amidships, where the general strain of the machinery is felt, and are also planked with pine. She carries four masts and two funnels. Her ability to spread canvas equals that of any vessel afloat, while her rate of steaming is fourteen knots an hour. The lower masts are of iron, and the lower yards and lower topsail yards are made of steel. She has steering apparatus amidships as well as aft, and is provided with five steam winches, which work the pumps, hoist the sails, and load and discharge the cargo. The saloons, staterooms, and officers' rooms are heated by steam pipes. Between the spar and main decks are accommodations for all the first class passengers, officers, and crew, besides cooking galleys, ice houses, etc.; and the entire space between the main and next lower deck is left free for the steerage passengers.

The workmanship throughout the vessel is of the highest class, and her construction is such that more than ordinary comforts are afforded to the steerage passengers.

Sensible Suggestions about Patents.

Mr. Wm. T. Hamilton, writing to the *Engineer,* gives expression to some very practical ideas on the Patent law question now before Parliament. His suggestions apply with equal force to the American Patent law, which is based on that of England. He says:

The simple system which I would propose would be that every inventor should have patent protection, as, of course, for certain proper periods, for every invention or alleged invention, no matter whence he may have taken the primary idea. I would give him protection, not only for his own original ideas, but for utilizing the abandoned ideas of others. Why not? It would hurt no one. This patent right should of course be defensible upon its being shown by any one else that he had had the same idea in practical operation prior to the date of the patent. Here commercial user would find its proper place. It would of course save to the public every useful invention now in operation; it would injure no one, while it would open a wide field for inventors.

Thus, then, the only patent question which would arise would be one of priority of practice. This would always be a simple one, even for the county court. The issue would be not whether perhaps abstract ideas were original, but whether palpable processes were identical, and which of them had been first used. Commercial usage is notorious and of easy proof. I would thus take commercial usage not as the basis of protection, but as the element by which to prove priority; such a system would have the great charm of being almost self acting. The mere existence of such a public counterpoise would keep inventors in the right path for their own sakes. What they now fear is not what is in the light, but what is in the dark. By all means let there be competent authorities to settle these questions of priority in the last resort. The judge of the county court might be stupid; or some cases might involve very nice distinctions as to the application or principles or as to identity, or as to what is or is not essential in a scientific point of view. Let there also be libraries and museums and open registries, carefully classified, with every other possible source of information, free to inventors upon their own seeking. Let our system be for affording, not for forcing instruction; for encouragement in every direction, not for prohibition in any. Do not let us degrade what has higher grounds upon which to rest into a mere notice board against trespassers, which any preliminary inquiry, if coupled with the condition of originality, could alone be.

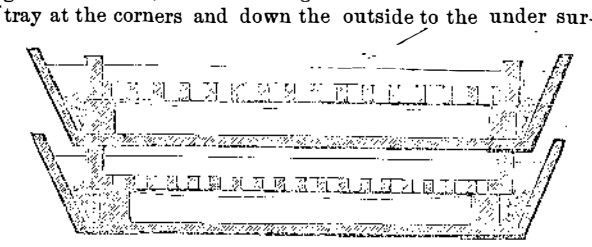
Give inventors all possible information not now accessible; give them all possible liberty, but do not meddle with them until others complain that they have taken what previously belonged to those others. Let relative rights be adjusted as all other rights; self interest will do the rest.

If England expects to maintain her inventive superiority, she must boldly open up every possible source of thought, old or new. She must break up some of the old, worn grooves in which we are now too prone—or, perhaps, too much compelled—to move. Let her, above all, give back to the inventors of the future the vast stock of thought put upon a now useless record by the inventors of the past. It would be like shedding a new light over the scene of inventive exertion.

A New and Simple Continuous Battery.

Professor Bottomley, of the Glasgow University, thus describes a new battery in use in that institution:

A shallow wooden tray, square and with slightly slanting sides, is lined with sheet lead; and this, after being electrotyped with copper, forms both the containing vessel for the liquids and the copper plate of the cell. Copper trays were used at first, but they were soon eaten through by the solution. The lead is not attacked at all. The length of a side of the lead tray is 21 in., and its depth is 3¾ in. In each corner is set a small block of wood 1½ in. high. The zinc plate, which is like a square gridiron, rests at its corners on these blocks. The zinc has parchment paper tied round its lower surface and sides. The cell is filled up with saturated solution of sulphate of zinc, and crystals of sulphate of copper are dropped in, when required, round the edges outside the parchment paper. For connecting these cells together in series, the lead lining is carried over the wooden tray at the corners and down the outside to the under surface of the bottom of it. Here it is soldered to a small squar of thick sheet tin. The cells are piled up one on the top of the other, the tin plates of the second cell resting on the first, and so on. The tin connections—a suggestion of Mr. Varley—are most excellent. Two of these cells are shown in section, Fig. 5. The resistance of each of these cells is on an average 0·19 of an ohm. They are now used at all the telegraph stations where Sir William Thomson's siphon recorder is employed.

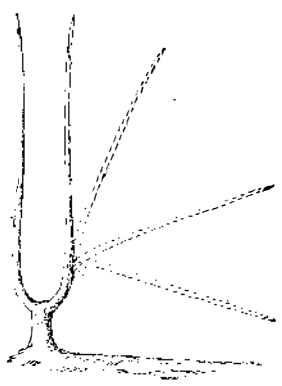


In using these batteries in a laboratory, where they are not perpetually at work, the best way of managing them may possibly be not to charge them with sulphate of copper except when they are about to be used, and only to put in as much as will do the work required. To calculate the quantity is easy; and any small excess might be worked off through a low resistance. We have been keeping them at work almost night and day. They require no attention except to be occasionally supplied with sulphate of copper crystals, and to have the sulphate of zinc that creeps up over their edges wiped away with a cloth.

At present our battery is tested very frequently, generally once in four or five days. The electromotive force and the internal resistance of each cell is determined. We have now had the greater number of the eighty cells in action for three months, and some of them for five or six months. During all that time they have been most satisfactory, the electromotive force of them having remained perfectly constant.

Increasing the Vigor of Growth in Plants.

It has been known for some time that if two branches of a fruit tree be selected, of about the same size and the same upward inclination to the horizontal plane, and one of these be bent downward toward this plane, it appears to lose its vigor, while the other gains in like ratio. It is now announced as the discovery of an ignorant peasant on the Danube, named Hooibreuk, that this law holds good only up to the horizontal position; and that if the branch is depressed still further, and below the horizontal, it becomes characterized by much greater vigor than before, and, in fact, will put out leaves and branches to an astonishing and unheard of degree. But this depends upon keeping the branches as nearly as possible in a straight line, the effect being measurably lost with a considerable curvature. In this case, only the buds which occupy the top of the arc are developed completely, at the expense of the rest which remain in their original condition, contributing neither to the extension of foliage nor of fruit. (The successive positions of the branch are illustrated in the cut.)



Duchesne-Toureace, in communicating these facts to *Les Mondes,* attempts to show the causes which seem to determine so great a flow of sap to the branches inclined below the horizontal line, and thinks that the explanation is to be found in the establishment of a siphon arrangement, by means of which the juice is carried over the bend from the main stem in excessive flow. Be this as it may, the fact remains, as illustrated by an experiment prosecuted by this gentleman. In early spring, when the sap was running in the vines, he took four plants of about the same size, and trimmed them so as to leave one stem to each, these being arranged vertically and obliquely upward, and horizontally and obliquely downward. He then cut off the stems and collected and measured what exuded, and found the amount from the branch inclined downward was more than three times greater than that from the others.

CAR VENTILATION.—A correspondent of the *Car Builder* calls attention to the fact that the problem of car ventilation is still unsolved. Whoever can invent a simple and effective system for the ventilation of railway cars will be likely to reap a good reward.

Correspondence.

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

Testing Turbines.

To the Editor of the Scientific American:

I have read all the efforts to illuminate the turbine question that have appeared in the SCIENTIFIC AMERICAN.

In the last one there are some noticeable points, by R. H. A., on page 228 of the current volume, who puts forth some quite curious ideas in relation to the efficiency of turbines; with some of which I must beg to differ. These differences may not be very important; they are certainly entitled to some consideration as historical facts or well demonstrated theories. It is very true that all engineers concede a difference of percentage with extreme variations of head; but what that proportionate variation in head and percentage is has never been satisfactorily determined. Natural causes are known to modify the efficiency of the same turbine under extremely high or very low heads. The extent to which some of these causes affect the efficiency may be readily computed and proved by actual test. That some turbines work much better under low than under high heads is no doubt true. Whether there are some which work the better under high heads remains to be proved.

That a properly formed turbine will work equally well under considerable variations of head, is certain. The following extract, from the report of some carefully made experiments, proves this beyond a doubt:

Head in feet.	Relative speed.	Efficiency.
11·772	·709 per cent.	·802 per cent.
11·952	·686 "	·802 "
11·995	·730 "	·804 "
12·175	·702 "	·808 "
13·016	·745 "	·804 "
14·084	·731 "	·804 "
14·410	·746 "	·803 "

In these seven experiments, the variation in efficiency is six tenths of one per cent. The variation in head was ·224 per cent, and the variation in relative speed was ·087 per cent. "That more patents are yet to be obtained before the best effects can be had" is quite novel; the utility is less apparent, though by substituting "will," for "can," the truth would certainly be told. It is very doubtful, to say the least, if results higher than have already been obtained depend on patentable devices. It is quite safe to say, that no material progress has been made, in the efficiency of first class turbines, during the last half century. It is now nearly, or quite, fifty years since Fourneyron obtained ·88 per cent from turbines "cast in one piece."

It is very true, in nine cases out of ten, that we "by no means" get what is claimed as the proportion of the whole power of the weight of the water." The philosophers have said that "action and reaction are equal." Many inventors, with more enthusiasm than common sense, have in consequence claimed that water has a double force, impulse and weight; and that it has really twice the power in it, under any given head, that it has ever been credited with. Hence the great variety of contrivances to use the impact, impulse, percussion, or blow of the stream of water upon one set of floats, calling it direct action; whilst upon another set in the same machine, they attempt to use the weight, backward pressure, or spirt of the water, calling it reaction. In this sense, not even 30 per cent of the sum of the forces has ever been utilized. All intelligent persons now concede that the total force of a stream of water is directly as the weight and the fall. It is believed that turbines do not act on the impact or the reaction principle; but that the action is simply a direct, gentle, and gradually increasing pressure upon the buckets of the turbine. How the results of tests can be called speculation, I am at a loss to know. We have all the evidence that any reasonable man ought to ask for. Overshot wheels have actually raised, from mines, 70 per cent of as much water as was required to drive them, the total loss in all of the machinery being 30 per cent Certainly one third of this must have been in the pumping machinery. It has been equally well demonstrated that the overshot has utilized 86 per cent of the total power of the water used upon it. It is, however, no sign that all overshots utilize 86 per cent because one has done so. Nor is it any sign that all Fourneyron or all Jonval turbines utilize 80 per cent, from the fact that their inventors got that result. There are all grades of these famous machines, from 30 per cent ones to 80 per cent ones. Because a small turbine was "accurately and nicely constructed" is no evidence that it was accurately and properly designed for the purpose to which it was applied. The test proves, positively, that this feature was sadly wanting, or else the pumping machinery was defective. It is quite possible that both were ill adapted to the purpose, whereas an hydraulic engine is the most simple and effective method of utilizing the force of a stream of water, to force a portion of the same to a greater hight than the fountain head. A turbine, with the necessary gearing, is quite the reverse of simple when applied to the raising of water.

The similarity between a rotary steam engine and a rotary hydraulic engine is quite discernible; and one is about as effective as the other; but between the turbine and any rotary engine yet before the public, there is a vast and a radical difference, from my point of view. Nor is it the aim of all inventors of turbines to imprison the water until no more work is left in it. In one turbine at least, the water is, as much as is possible, left to its own natural course after entering the turbine, except in regard to its velocity alone. The inventor, in this case, has always allowed at least 8 per cent of the total force to be left in the water, at the instant of leaving the edge of the bucket. His theory is the expansion one for all fluids. The water is received upon the bucket of the tur-

bine at the highest attainable velocity without shock; then it is retarded in an accelerated ratio, and expanded in volume in like manner, until the moment it reaches the edge of the bucket, as above, with 8 per cent of its living force yet remaining, the 92 per cent having been expended in reaching and urging forward the turbine. A reasonable allowance of 12 per cent, for loss in reaching the bucket and friction of the machine, leaves 80 per cent as the efficiency of the turbine.

To force back 90, or even 80 per cent of the water used, by any machine, is simply out of the question for the reasons shadowed forth in the foregoing. If 70 per cent can be forced back, it may be considered excellent work. A system of weight and measurement, by proper apparatus and competent persons, is, however, infinitely superior. It tells the whole story, "The truth, the whole truth, and nothing but the truth."

A. M. SWAIN.

Metallic Roofs in Thunder Storms.

To the Editor of the Scientific American:

A communication in the last SCIENTIFIC, signed John Wise, has the passage: "While I am not prepared to say positively that a metal roofed building cannot be injured by a stroke of lightning, I have never found one so roofed, in my fifteen years' investigation, that has been injured by a thunderbolt," etc.

Will you do your subscribers the favor to give your views as to whether a metallic roof is a protection against lightning?

Wilmington, N. C. L. M.

[Answer: A metallic roof upon a building, if connected with the earth, is undoubtedly a protection against the injurious effects of lightning. Even when lightning rods are not used, a connection is generally established, between the roof and the earth during a thunderstorm, by the water spouts or the wet walls of the building. A metallic roof, if it were insulated from the earth would be a source of danger, and not a protection.—EDS.

THE INTERNATIONAL EXHIBITION OF 1872.

The second of the series of international exhibitions at South Kensington (London) was opened on the 1st of May. The leading features of this year's exhibition are cotton fabrics and paper, and the machinery used in the manufacture of those goods.

The process of envelope manufacture is illustrated by a series of machines by Messrs. Dickinson & Co., of the Old Bailey. The first is a Tidcombe paper cutting machine, which cuts the continuous paper from reels into sheets of the required size. The apparatus will cut five or six thicknesses of paper from reels at the same time, by which means the necessity for collecting single sheets, and the employment of collectors during the night hours, is avoided. The paper, after having been cut into sheets 30×22 inches by the Tidcombe machine, is placed between plates of brass and submitted to a pressure of from twenty to thirty tuns in an adjoining press. By this means it receives a glazed surface, and the sheets are then passed to the adjacent envelope cutting machine, which is one of Hughes and Kimber's. From this machine, the blanks are passed on to the next department, where they are gummed and placed to dry in a rack heated by a steam coil. When dried, the gummed blanks are passed to the relief stamping counter, where there are three machines and as many operators manipulating them. The folding is effected by means of three folding machines, mourning envelopes being previously black bordered in a machine by Mr. J. Parkins. Finally, the perfect envelopes are banded, labelled, and packed in card boxes, which are made at a stand close by.

Near Messrs. Dickinsons' interesting series of exhibits is a handy little envelope folding machine by Messrs. R. Fenner & Co. The uppermost blank of a pile is raised by a pneumatic mouthpiece, working vertically, and the end is seized by a pair of tongs having a horizontal traverse, and by which the blank is drawn under a plunger, which, descending, carries it into the interior of the machine, where it is folded and embossed in relief, the edges being gummed just before the descent of the plunger. Messrs. Goodall & Son exhibit a neat machine for a similar purpose, in which a revolving table with three plungers is used. This machine gums the envelope and works two dies at one stroke, one with the maker's name and the other with the monogram or device on the outside of the envelope. The remaining apparatus in this gallery are those used in ruling account books, marbling paper and book edges, embossing and lettering in gold, etc., Messrs. Letts exhibiting all these processes.

On the ground floor of the eastern range, the ceramic display of last year is replaced by an array of musical instruments and jewelry, the latter being of a very costly character, the exhibits of one firm being, in one case, valued at $400,000, and in another, at $100,000.

In the eastern portion of the range of building are placed the stationary exhibits, which range from a sheet of brown paper to a gorgeously appointed valentine, and from a penny account book to a banker's ledger of gigantic proportions.

In the western portion of this building are several models of machines relating to the paper manufacture. Mr. T. H. Saunders, of Upper Thames street, sends a roll of continuous paper, as supplied to the *Times* for printing with the Walter machine. The paper is 2¾ miles in length, and weighs 634 pounds. Mr. Saunders also exhibits a sheet of parchment paper, which is carrying a weight of 5 cwt., and is stated to be capable of sustaining 9 cwt.

This portion of the exhibition is devoted to those articles which come under the head of scientific inventions, of which there are several deserving of notice. Amongst the most striking is a full size model section, taken transversely, of a gun, designed by Mr. Bessemer, to carry a 5 tun projectile. The bore has a diameter of 30 inches, the metal being only 8 inches in thickness. The gun is on Mr. Bessemer's continuous low pressure principle, and will be 60 feet in length. The inventor is having one made a quarter full size, with which he intends experimenting. Mr. Bessemer also exhibits a model of the projectile to be fired by his big gun, as well as models of the Woolwich 12 inch 35 tun gun, in transverse section, and its projectile.

At the northern end of the machinery annexe is a Walter printing machine, on which the *Mail* is printed three times a week. At this point, also, M. Charles Kastenheim exhibits a set of type setting and distributing machines, as used in the *Times* office.—*Engineering.*

Wire Cut Bricks---An Interesting Patent Suit.

An improvement in brickmaking machinery, which is coming extensively into use both in this country and England, consists in forcing the clay from the machine in the form of a rectangular mass or block and then dividing the block by means of wires into bricks of the proper size. Bricks are thus more quickly made, and are found to be of better quality and truer shape than when separately pressed in molds in the ordinary manner.

In this connection, we present the report of a recent patent suit in England, which contains some interesting information concerning wire cut bricks and machinery for their production.

MURRAY *vs.* CLAYTON.—By his specification the plaintiff claimed:—"Particularly cutting the clay into the form of bricks by forcing the clay forward by means of a pushing board or otherwise against a series of fixed wires, so arranged that the clay is pushed or forced past the wires on to a 'moveable board' provided with handles, so that 12 or any other convenient number of bricks may be removed at the same time." The defendants denied the validity of the plaintiff's patent mainly on the ground that the invention had been anticipated by a patent known as Dahlke's, which was founded on an invention made in Germany by one Sachsenberg, and by a machine which the defendants themselves made after Sachsenberg, with some variations. The Vice Chancellor was of opinion that the defendants had made out their case, and he dismissed the bill. The plaintiff appealed. Lord Justice James said that the case had occupied a long time, but when the real questions between the parties came to be eliminated from the mass of the evidence, they did not require any very long time for discussion nor present any great difficulty in determination. The plaintiff had given the usual *primâ facie* evidence of his being the first inventor, and he had produced, in favor of the novelty and practical utility of his invention, a mass of evidence greater than his Lordship had ever witnessed in any similar case. There was the evidence of brickmakers, engineers, Government contractors, who had not been cross examined. One of these witnesses said that bricks made by the plaintiff's machine were worth 50 cts. per thousand more than other bricks. All this evidence was practically uncontradicted. Then came the question whether the invention was novel *de jure* as well as *de facto*—that is, whether it had been anticipated. His Lordship was of opinion that the plain meaning of the plaintiff's specification was that he claimed the machine, the combination which enabled him to effect the result, so that by one or more turns of the wrist he could cut a mass of clay into a number of bricks without their being touched by the hand of the operator. The question was whether that had been anticipated in any manner. The only things relied upon to show that it had been anticipated were Dahlke's patent and the machine made at the defendant's works, and known as the German machine. As to Dahlke's invention, it was for a thing so substantially different from the plaintiff's in principle and in all its details that, if it were made now, it could not be considered in any respect an infringement of the plaintiff's patent. The only thing common to the two was the division of the clay by a cutting wire. After leading a fruitless existence of three years, Dahlke's patent was suffered to expire. As to the machine made at the defendants' works, which they made in 1864 after the German description of Sachsenberg's machine, substituting a table for rollers, there was a mass of evidence. It appeared that this machine was made at the defendants' works, and was exhibited at work at their shop to a great number of engineers and brickmakers. It did not appear to have been made for sale, but it was a working specimen. Of all those witnesses who saw it at work, not one said that he thought it a machine of the slightest utility. The evidence on the other side showed that it was an entire failure, that it was useless for any practical purpose whatever; the labor in working it was too great. The merit of every invention of this kind was that it saved labor. His Lordship was aware of no case where the exhibition of a useless machine had been held to affect the rights of a patentee who had made a useful machine, though there might be some similarity between the two. If there were defects in the German machine which the plaintiff cured, though he did not know of that machine, he would be entitled to maintain his patent. His Lordship thought it impossible that stronger evidence should be produced than had been produced here of the novelty of the plaintiff's invention. It was so simple, and so well calculated to effect the object intended, that the only wonder was that people had gone on for thousands of years making bricks without hitting upon it. With regard to the question whether the defendants had infringed the plaintiff's patent, it appeared to his Lordship that the defendants' machine was a mere transposition; they moved the wires against the clay instead of moving the clay against the wires, as the plaintiffs did. There was nothing but a colorable variation, and it was plain that the alteration could only have been made for the purpose of evading the plaintiff's patent. The object was effected by means of a much larger expenditure of power. But as was said by Lord Hatherley, in the case of "Daw *vs.* Eley," a clumsy invention might be an infringement, though it would not have been an anticipation. On the whole, his Lordship was of opinion that the plaintiff had made out his case; that he was the first inventor of a new and very valuable invention: and that the defendants had failed to make out that there had been any anticipation of it. It was proved also that the defendants had committed an infringement, and there must be a decree for a perpetual injunction against them, and they must pay the costs of the suit.

Polarized Light.

We have all noticed that when the sun shines directly through a window hung with figured muslin curtains, the reflection of the pattern of the curtains in the window interferes with the prospect.

When this reflected image is viewed through a Nicol's prism, it disappears when the prism is rotated, leaving the prospect unobstructed; the experiment is very interesting, and can be performed by any one who has a polariscope attached to a microscope, and it is only necessary to observe that the image is viewed at the proper angle. The effect will possibly be best when the sun's rays make an angle with the curtains and the glass nearly coinciding with the polarizing angle. (In my case, the angle was 36° 52'.)

Tyndall has mentioned a case in which the haze obstructing the view of a mountain top was rendered transparent by the Nicol.

The readers of *Nature* have probably observed how completely the leaves of the ivy polarize light; viewed through the Nicol and a pink selenite, the plant appears covered with blossom.—*R. S. Culley, in Nature.*

Hunting Truffles.

As the annual gathering season comes round, the truffle hunters, who lease of the proprietors of the woods the right to dig for these delicacies, commence their operations. To discover the whereabouts of the truffles, small dogs, trained for the purpose, are used. The education of the dogs consists in hiding under the soil a wooden shoe filled with earth, and containing a piece of truffle and a piece of bacon. The smell of the latter attracts them, and causes them to scratch up the shoe to get at the morsel of food. By degrees they confound the two scents, and cannot perceive that of a truffle without thinking of the bacon, and digging up the earth.

Twenty dollars is about the price of a good truffle dog. Dogs of the sporting breeds are never trained for the purpose, as they would be liable to hunt game instead of truffles, if the former happened to fall in their way. When the trained dog comes on the scent, the truffle hunter proceeds to hoe up the ground pointed out by the animal as the bed of the truffles. In the south of France, a certain species of lank lean pigs are trained and employed in the same manner as the dogs in more northern districts.—*Once a Week.*

Improvement in Gig Saws.

Mr. Henry W. Bullard, of Poughkeepsie, N. Y., has lately patented an ingenious and useful improvement, applicable to gig saws and other mechanisms. It consists of a device to regulate the extent of throw or stroke of the saw, and is so arranged that, by merely pushing a lever, the stroke of the saw may, at any moment, be increased or diminished, at the will of the operator, without stopping or changing the driving belt. This result is accomplished by shifting the crank pin to which the saw is attached. The crank pin is so arranged that it can be made to slide in or out from the center of the head or pulley to which it is attached; and this movement of the crank pin may be made while the saw is in full operation. The invention has been in practical operation for more than a year past, and its excellence is fully established. No gig saw machine is complete without it.

Available Nitrogen.

P. P. Deherain (in *Comptus Rendus*) advances a somewhat novel theory of the reduction of atmospheric nitrogen to an available form for the support of plant life. He endeavors to prove that the free nitrogen of the atmosphere is brought into combination during the oxidation of organic matter in the soil. To demonstrate this, he dissolves glucose in a dilute solution of ammonia in water, placed in a large flask filled with a mixture of equal parts of nitrogen and oxygen. Having closed the flask, he heats the mixture gently for one hundred hours, at the end of which time the whole of the oxygen has disappeared, and 5·9 per cent of nitrogen has been taken up. The same process with humic acid and potash shows a loss of 7·2 of nitrogen. If these results are confirmed by subsequent experiments, they will throw light on the hitherto obscure subject of the production of nitric acid.

EVERY young man, after he has chosen his vocation, should stick to it. Don't leave it because hard blows are to be struck, or disagreeable work performed. Those who have worked their way, up to wealth and usefulness, do not belong to the shiftless and unstable class, but may be reckoned among such as took off their coats, rolled up their sleeves, conquered their prejudices against labor, and manfully bore the heat and burden of the day. Whether upon the old farm, in the machine shop or factory, or the thousand other business places that invite honest toil and skill, let the motto ever be: Perseverance and Industry.