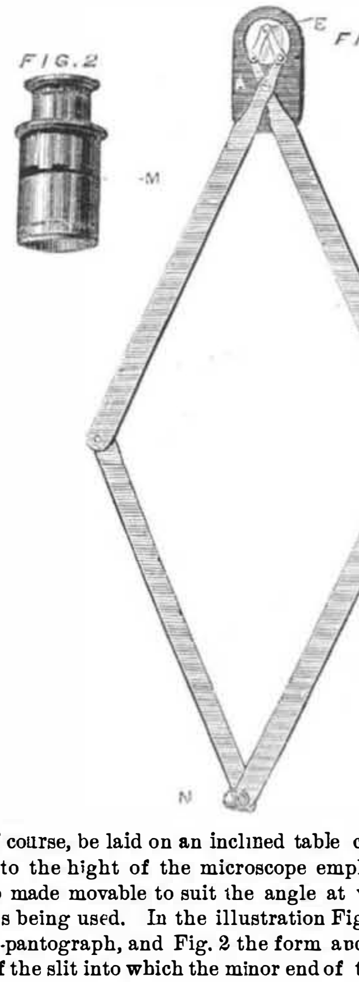
Copying from the Microscope.

One of the latest inventions for rendering the copying of an object as seen in the microscope both accurate and easy was recently described, by Mr. Isaac Roberts, F. G. S., to the Royal Microscopical Society, and an illustration was published in their *Journal*. The instrument consists essentially of two parallelograms, having their major and minor sides and angles respectively proportioned in all positions in which the instrument can be placed. The major and minor sides rotate freely about the common center or fulcrum, which is fixed to the eyepiece of the microscope in the focus of the eye-lens. A pencil is attached to the major end joint of the instrument, and a small glass disk, ruled with a micrometer-lined cross, is attached to the minor, or eyepiece, end joint, in the position where pointers are placed. To see both cross and object at the same time, similar focussing is necessary to that which is employed to see an object and a pointer. When drawing, the hand merely moves a pencil over the paper, and at the same time and by the same action guides the micrometer cross lines over the field where the object appears in the microscope. The drawing paper



should, of course, be laid on an inclined table capable of adjustment to the hight of the microscope employed, the top being also made movable to suit the angle at which the microscope is being used. In the illustration Fig. 1 represents the micro-pantograph, and Fig. 2 the form and approximate position of the slit into which the minor end of the micropantograph and its support, shown at the top of Fig. 1, are inserted. In Fig. 1, E is a glass disk with micrometer cross lines ruled upon it. It is cemented over a small hole drilled through the center of the rivet forming the joint of the minor extremity. A is a center, or fulcrum, around which the parts of the instrument freely move. N is a holder for a drawing pencil, placed over a hole drilled through the rivet forming the joint of the major end of the instrument. In Fig. 2, M s a slit for the insertion of the minor end of the micropantogra h, with its support shown behind E A in Fig 1. The instrument being firmly fixed in position in the eyepiece to draw any object, it is only necessary to place the eyepiece in the microscope, adjust the drawing table to the hight and inclination of the plane of the pantograph, and with the right hand forefinger and thumb guide the pencil with slight pressure over the paper, at the same time looking through the eyepiece at the object and guiding the center of the micrometer cross lines over the respective parts of it; an accurate drawing of the object will thus be traced upon the paper. For those, however, who may desire to make for themselves, it is only necessary to say that the length of the minor sides of the parallelogram within the eyepiece is ½ inch; of the major sides 5¾ inches, the instrument when extended to the full length measuring 12¼ inches

Fool's Gold and How we may Know It.

The following story is going the rounds of the papers, and would be decidedly rich if it were only true:

A verdant looking Vermonter appeared at the office of a chemist with a large bundle in a yellow bandanna, and opening it exclaimed: "There, doctor, look at that." "Well," said the doctor, "I see it." "What do you call that, doctor?" "I call it iron pyrites." "What, isn't that gold?" "No," said the doctor, and putting some over the fire, it evaporated up the chimney. "Well," said the poor fellow with a woebegone look, "there's a widder woman up in our town has a whole hill of that, and I've been and married her!"

That the poor fellow had married the widow for the sake of the hill of pyrites is very probably true, but that the pyrites evaporated up the chimney is simply impossible, and such a statement is to be regretted because the inexperienced may be led to believe that, if a bright, yellow metallic looking mineral does not evaporate when strongly heated, it must be gold. There are several minerals which are sometimes mistaken for gold, but the two which are most apt to give rise to deception in this matter are pyrites and mica, and hence they are sometimes called fool's gold. The method of distinguishing between them and gold is very simple, and requires no complicated apparatus. Gold is malleable, that is, it can be beaten out into thin leaves under the hammer, while the others crumble to powder. Moreover, gold is easily cut with a knife, while if we attempt to cut pyrites it breaks up, and mica separates into thin flakes. It is when mica is in fine powder, however, that it most resembles gold, and in such cases, its weight betrays its character. Gold is nearly twice as heavy as lead, and, even by poising it in the hand, we can tell that lead is much heavier than mica.

Estimation of Sulphur in Organic Compounds.

Chemists have always experienced more or less difficulty in ascertaining, with exactitude, the amount of sulphur contained in organic compounds, the usual methods and agents employed for that purpose being slow and uncertain in results. W. S. Mixter, of the Yale Scientific School, has devised an effective apparatus by which he burns the sulphurous substances in oxygen and condenses the sulphur in the form of sulphuric acid. This method presents an easy method of effecting the separation and permits the estimation of the sulphur with much exactness.

The following results, obtained by the author, in the order they are given, shows the applicability of the method, while some of the details mentioned may help to explain the use of the apparatus.

	Weight taken.	Per cent found.
1. Iron pyrites (mixed with carbon)	0·0658	51·20
2. " "	0·0597	51·26
3. Sulphur	0·2070	99·76
4. "	0·2807	99 92
5. "	0 4951	99·93
6. "	0·5882	100·02
7. Carbon disulphide	0·7725	84·12
8. " "	0 4598	84 16
9. Bituminous coal	0·6640	2·97
10. " "	0·7860	2 99
11. Wool	0·4640	3 44
12. "	0·4675	3·46
13. Tobacco	2 0720	0·37
14. "	2 1370	0·36

Manufacture of Envelopes.

One of the most interesting mechanical novelties to be seen at the International Exhibition in London, is the envelope machine of Fenner and Co. of that city. All the manual labor, that is required in attending to the machine, is limited to the supply from time to time of a pile of envelope blanks, and the occasional removal and banding of the finished envelopes. Thus the entire and various processes, of feeding, gumming, stamping, folding, delivery, and collection, are performed automatically by a series of mechanical operations devised with the utmost ingenuity and carried out in perfection; the machine withal being excessively compact and well arranged.

The pile of envelope blanks being placed in position on a plate at one end of the machine, which may be done either at rest or in motion, the feeding process is effected by the simple aid of intermittent suction. An elastic tube has a trumpet-shaped brass mouthpiece which descends on the uppermost blank, and at the moment of contact the air is exhausted by a stroke of the air pump, when the mouthpiece rises with the blank attached, the suction being maintained just sufficiently long to enable the arm and grippers, rapidly projected from the other side of the machine, to seize the blank, when the attachment to the mouthpiece ceases and the arm shoots back, drawing the blank into position over the folding box and there rapidly releasing it. At this moment, the stamping is effected by the action of a hammer and die, and the gum is applied in due place on the edges of the side flaps, whereupon a plunger head, of the rectangular form and size of the envelope, descends, carrying the blank down into the folding box; the flaps, thus raised into a vertical position, are then enclosed and folded down in proper sequence by slides working in the thickness of the folding box; and finally the bottom of the box rises and completes the operation by pressing the whole against the slides, so that the edges are made sharp and the adhesion is effected and secured. The slides are then withdrawn, and the bottom of the folding box drops, allowing the envelope to drop in a vertical position into the delivery trough underneath, running across the machine, wherein, by a simple contrivance and combination of guides, holders, and pressers, the envelopes as they drop from the folding box are successively, uniformly, and regularly arranged, and worked along the trough ready for removal and banding by the attendant.

These manifold operations are successively and successfully wrought with such speed, and almost simultaneity, that the finished envelopes are turned out complete at the rate of 50 per minute or 3,000 per hour.

A New Quicksilver Ore.

Professor J. D. Whitney has discovered a new ore of mercury in California, which, according to an analysis made by G E Moore, consists of sulphide of mercury 98 92 per cent, sulphide of iron 0·83 and quartz 0·25; its color is black, streak black, specific gravity 7·70, and no trace of crystallization. It appears to be identical with the amorphous modifications of sulphide of mercury. It is proposed to call it *meta-cinnabar*. The associated minerals are usually copper and iron pyrites, and a few crystals of cinnabar. The occurrence of the cinnabar has hitherto escaped notice, as it has been mistaken for black cinnabar, from which it differs, however, in the absence of crystalline form, in its black streak and lighter specific gravity. It promises to become an important ore in the quicksilver mines of California and some of the other Western States.

Correspondence.

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

Force of Falling Bodies.

To the Editor of the Scientific American:

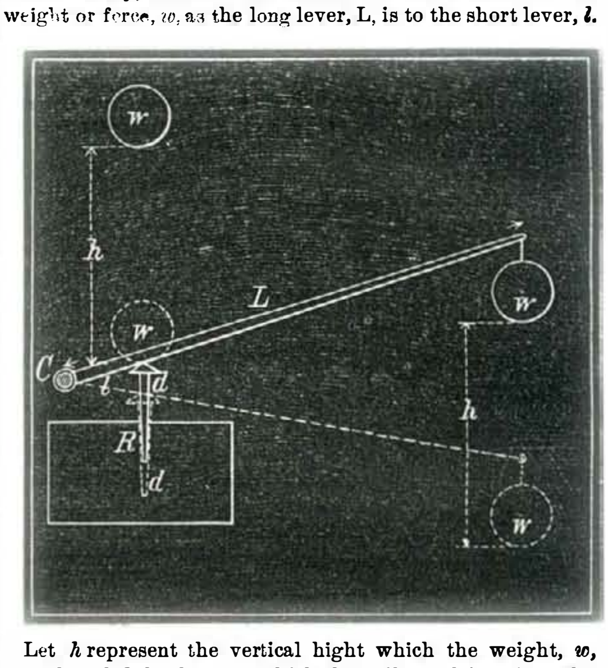
The question "With what force does a falling body strike?" has been frequently repeated in the SCIENTIFIC AMERICAN for the last 25 years, and has generally been answered by the batch of dynamical terms used in colleges and styled "scientific." The answers have invariably made the problem more obscure. Each one generally says that "the problem is very simple," and he pretends to understand the subject perfectly. I am one of those pretenders, and propose to answer the question in my own way, reference being made to the accompanying figure.

Let us assume the case of driving a nail into a piece of wood by the aid of a lever whose fulcrum is at *C*. The applied force is represented by the weight, *w*, acting on the lever, L. Let R denote the force of resistance in the wood, expressed by the same unit of weight as that of *w*, say pounds.

The weight, *w*, acts on the long lever, *L*, and the resistance, *R*, on the short lever, *l*. Then

$$R : w = L : l, \text{ and } R = \frac{wL}{l}.$$

That is to say, the force of resistance in the wood is to the weight or force, *w*, as the long lever, L, is to the short lever, *l*.



Let *h* represent the vertical hight which the weight, *w*, moved, and *d* the distance which the nail was driven into the wood. Then

$$R \cdot w = h : d, \text{ and } R = \frac{wh}{d}.$$

That is to say: the force of resistance in the wood is to the force or weight, *w*, as the hight, *h*, is to the distance *d*.

Now let the same weight, *w*, fall from an equal hight, *h*, directly upon the head of the nail, and the latter will be driven into the wood the same distance as by the aid of the lever. Therefore: the force with which the falling body acted upon the nail is to the weight of the falling body as the hight of fall is to the distance the nail is driven into the wood. The force of the falling body is equal to its weight multiplied by its hight of fall, and the product divided by the distance which the nail is driven into the wood.

JOHN W. NYSTROM.

Philadelphia, Pa.

Fast Small Side Wheel Steamers.

To the Editor of the Scientific American:

I have read J. A. G.'s communication entitled "Small Fast Steam Propellers Again," in your issue of August 10, 1872, with much interest, for the reason that J. A. G.'s first communication was shown to a gentleman of our city, who wished just such a boat to solicit his various customers living on the many navigable waters of the West. After giving the subject some attention, he arrived at the conclusion that a propeller would not answer his purpose, as he desired an extraordinarily fast and light steamer; hence he contracted with the well known hull builder, Mr. D. S. Barmore, of Jeffersonville, Ind., for a hull of the following dimensions: Length 70 feet, beam 15 feet, depth of hold, 3 feet; of an easy model, but with displacing lines very full just above light water line, so that, in going very fast, she would not bury.

This hull is propelled by two side wheels placed amidships, with outer ends of shaft inclined aft ten degrees on a parallel line with keel. The wheels are 12 feet in diameter and with 6 feet buckets, the bucket blades or paddles being corrugated, and a right angled face riveted on to make them have an additional hold on the water, as the angle plate will prevent a splash of water to the center of the wheel. Each wheel is driven by a separate engine, each 10 inches × 36 inches. Balanced oscillating slide valves are used. The boiler is my own patent, and as I have "boiler on the brain," I do not want a very large gratuitous advertisement, but would modestly say: It is a wrought iron sectional safety boiler, the firebox enclosed with tubes filled with water, the same as used on my portable and traction engines; in some respects, it resembles a Root boiler.

The machinery of the steamer is now being made by Messrs F. Warren & Co., Louisville, Ky, and the boat will be ready on September 1st. The owner has had from various builders and mechanics an estimate of the speed that she will develop; and these estimates have been from 4 to 20 miles per hour. We wish you would give us an opinion of the result that should be obtained when using 120 lb. steam, with engines wide open; you have a fair chance to be a prophet, as many expert mechanics and prominent men have been invited to accompany her on her trial trip, which will be made during the Louisville exposition. Should she perform well, a second trial may be made to Cincinnati.

Her builders contract to make but 9 miles against the current of the Ohio river, and she will trim up upon 16 inches with water in the boilers. MIRCLEAN N. LYNN.

New Albany, Ind.

Steam Engineering in the Mahoning and Shenango Valleys.

To the Editor of the Scientific American:

The valleys of Mahoning and Shenango are situated about 15 miles apart, the former being in the county of the same name in the State of Ohio, and the latter in Lawrence county, Pennsylvania. Both valleys are largely occupied by iron works and coal mines, there being 40 blast furnaces and rolling mills in operation, and coal mines large in number and extent. In the iron works, engines from 10 to 500 horse power are in use, all on the high pressure principle, the poppet valve system being in great repute. This form is much used on steam boats on the Ohio and Mississippi rivers. The boilers generally approved in these districts are cylindrical in shape, of the double return flue design; the diameters range from 30 to 42 inches, and the lengths from 22 to over 40 feet. The thickness of the plates generally used is three sixteenths or one quarter of an inch, the heads of the boilers being five eighths thick. The boilers are generally set up from two to six in a battery, enclosed in a reverberatory furnace; and they are worked at a pressure ranging from 60 to 110 pounds on the inch.

These works, however, are generally in anything but a thriving condition, and the cause is the scarcity of educated engineers, posted in the theory as well as the practice of their profession. But who is to blame for the incompetence of the botches and inexperts? Both the employers and the engineers themselves. The former employ incapable men because of the somewhat higher wages which a properly instructed mechanic rightly demands, although the ultimate expense of this cheaper labor is three times that of doing the work well and efficiently at first. I propose to give an illustration or two of the losses and waste caused by incompetent men, employed under a mistaken notion of economy.

The most obvious loss is in running the engines and machinery. The former soon become out of order; the pistons get to be loose and leaky, the valves are improperly set, so that there is no lead on the exhaust side of the poppet valve engine. The latter fault causes a waste of power which an experienced engineer only can rightly appreciate. Further losses are occasioned by loose pins, journals and bearings, and by the engines being out of line; the slide valves are sometimes very badly fitted at first, and then get more out of shape for want of an occasional facing. External corrosion on boilers is caused by leaky joints, and steam is conveyed long distances in pipes not covered with any non-conducting material. There are many other faults, which are probably in the recollections of such of your readers as have been in an ill-managed engine and boiler house.

I have already stated that the incompetence of the engineers is the cause of this state of things, and I know no other reason for the employment of such men but the before-mentioned one of economy. But as a general thing, our employers do not have much to say to us. I cannot account for this, unless it is owing to an idea that we might not continue to recognize their authority, or that we might ask for higher remuneration if our positions were improved and our knowledge appreciated. But I admit that many of us are such as to justify the indifference of their employers, which, however, leads to the degrading of the man of ability and knowledge to the level of the botch and the inexpert.

It frequently happens that we have to replace an old engine by a new one, and the owner will go to a machine shop and order an engine in some such words as these: "I want you to build us an engine complete, twenty inch cylinder and four feet stroke, with a balanced slide valve;" or perhaps, "an engine with a thirty inch cylinder and a six feet stroke with poppet valves." For some shops, an order given in this way might suffice, but generally the shops here in the West cannot properly fill an order on such instructions as these; and the result is a badly built misproportioned engine, of which, however, the owner is seldom competent to detect the faults. I maintain that when an engine is wanted, it should be designed by a competent builder, and drawings should be given to the maker when it is ordered. As good an engine as I ever saw was built on this system in a second class shop in Pittsburgh; and I am sure that every engineer who has charge of engines and machinery should be a draftsman. But this, probably, would not suit some employers whose only notion of an engine is something with a balanced slide valve, as big as a barn door. Another point in which employers do not recognize the value of a capable engineer is in the economical use of steam.

As ironmasters and workers of iron, many capitalists in this district deserve great credit. Many of them have secured valuable patents for improved processes. But so long as the ability of some engineers is not recognized by them, and the workmen themselves are hardly recognized as mechanics, what use is it for any youth to study for a period of ten or twelve years? The consequence is that the men, who should be readers of scientific books and should have the means to purchase them, are generally wanting in instruction and be come idle, and in some cases, intemperate and immoral.

Gentlemen employers, have you ever once given it a thought that your wealth and property are in the hands of these careless ignorant men? If you paid more attention to these subjects, you would find out what you lose in cost of running and deterioration of machinery; and you would learn to value the services of a competent engineer as you ought. ENGINEER.

Youngstown, Ohio.

To Detect Sulphuric Acid in Vinegar.

To the Editor of the Scientific American:

The method to detect the sulphuric acid cheat in vinegar, given by the *American Journal of Pharmacy* and republished in your paper on page 120, is the most glaring piece of stupidity which I have had the misfortune to encounter for a long time, and the editors of the *American Journal of Pharmacy* should know better than to publish such nonsense. You are perfectly right in wishing that some of your readers might suggest an easier method for this purpose.

The addition of the alcohol is not made in order to take up "the free sulphuric acid to the exclusion of the sulphates," as the druggist's circular states, but to destroy the acetic acid by changing it into acetic ether; the mixture of acetic acid, alcohol, and sulphuric acid, and afterwards evaporating or distilling the same, is exactly the regular method for making the volatile acetic ether, which will be the vapor or the product of the distillation; in this way the acetic acid is disposed of with the alcohol, and the free sulphuric acid and the sulphates are left; pure vinegar must neither contain the one nor the other, and if adulterated with sulphuric acid, it will mostly contain traces of sulphates also. The addition of a solution of chloride of barium will, in any vinegar, without previous unnecessary preparation, at once demonstrate their existence by a white heavy precipitate, which is sulphate of barytes or heavy spar; while pure vinegar will not show this precipitate, simply because acetate of baryta is soluble in water, and not insoluble, as the sulphate. The advice of preparatory treatment, therefore, with alcohol, heating, etc., is absolutely unnecessary, and simply a specimen of as gross an ignorance as is the attempt at explanation.

The sole purpose of my dilating upon this matter is for the amount of chemical instruction it conveys.

Now the simple test of detecting sulphuric acid in vinegar is this: Make a solution of chloride of barium, pour a little in the suspected vinegar; if it remains clear, there is no adulteration with sulphuric acid; if a white cloud shows itself, there is adulteration.

Even the quantity of the adulteration may be determined in this way; when gradually so much chloride of barium has been added to, say, one pint of vinegar till no more precipitate is formed, and this precipitate is then collected by filtration and dried, every three parts of the precipitate will indicate very nearly one part of sulphuric acid adulteration.

P. H. VANDER WEYDE, M.D.

New York city.

Strikes.

To the Editor of the Scientific American:

Perhaps, after the recent disastrous failure, the laboring men will listen to a few words from a brother laborer. I will start with the proposition that all strikes, whatever their termination, are injurious to the working man. Take, for example, the so called success of the shoemakers and coal miners during the late war. The former, according to their letter writers, obtained an average rise of five per cent, and we will concede as much to the latter. The strike lasted some six weeks, more or less, at an average expense of about one hundred dollars per man; how long did it take them to make up this loss? The price of coal nearly doubled in a few months, and foot gear took some very long strides up ward; and who reaped the profits? Why, speculators and holders of stocks, of course.

Now, brother workmen, as you do not seem to see it, I will tell you where the laugh comes in. It is when the Crispin pays a double price for his winter's coal, and the miner pays the same increased rate for his boots and shoes; and although the currency had something to do with the rise of the two commodities in question, I venture to say that the strike, so far as it affected the rise, put forty-five cents into the pockets of speculators where it put five into those of miners or shoemakers. J. E. S.

Portland, Me.

The New Type Writer.

To the Editor of the Scientific American:

As the original projector and one of the inventors and patentees of the type writer, which you have so well illustrated on the first page of your issue of August 10th, I must take exception to and protest against any inference, therein conveyed, that Mr. C. L. Sholes, of Milwaukee, Wis., is the sole inventor thereof. CARLOS GLIDDEN.

Milwaukee, Wis.

THE COHOES RAILROAD BRIDGE.—The new railroad bridge spanning the Mohawk river at Cohoes N. Y., is to be 704 feet long and 18 feet wide, and is to consist of four spans of 140 feet each and one of 135 feet. Two spans are already finished, the ordinary combination truss (wood and iron) being employed. The progress of this work has been seriously retarded by the throwing down of one of the piers by the powerful current in the river. A force of workmen is now engaged in repairing the damage. The structure is being built under the supervision of the State engineers.

A Shower of Aerolites.

On the 9th of June, 1866, a remarkable fall of aerolites took place in the County Unghvär, in Hungary, which was witnessed by a large number of persons. A violent detonation was first heard, like the discharge of a cannon, making the glass rattle; this was followed by several more feeble sounds, accompanied by a noise like that of a heavy wagon rolling along the pavements. Attention having been attracted by the noise, a small cloud was seen in the distant heavens, which moved rapidly, having about ten times the apparent magnitude of the sun, and which emitted rays of smoke. Persons at a considerable distance off saw a red, incandescent, pear-shaped body, surrounded by a blue light, and which approached the earth at an angle of thirty to thirty-five degrees with great velocity, leaving behind it a train of vapor. One of the observers affirmed that this red body continually emitted incandescent particles, and separated into two parts in its course, and that the two globes of fire fell separately upon the earth. The phenomenon is said to have lasted four or five minutes, while the smoke emitted by the bolide remained visible for ten minutes afterwards. Some persons even professed that they perceived a decided smell of burning sulphur; and one of those who picked up a fragment a little time after its fall said that it was not free from the odor for three days after. The number of stones that fell on this occasion was quite considerable, two of them being much larger than others, one weighing nearly 600 pounds and the other about 80 pounds. At least a thousand fragments were picked up, being scattered over a surface of about 6,600 feet in length by 2,500 feet in width. The largest mass penetrated the earth to a depth of 11 feet, and the smaller to that of about two feet.

Nicholson or Alkali Blue on Wool.

This dye differs from all other aniline colors in the fact that it is not, like magenta, aniline violet, etc., the soluble salt of a base insoluble in water, but a base soluble in water of itself, yet capable of forming, in union with acids, colored and insoluble salts. The base is in itself colorless, or very pale. To obtain a dye, the base already fixed on the fiber must be united with an acid. This is effected by passing the dyed wool through an acid bath. Thus for 10 lbs. of wool, a very dilute solution is prepared by boiling 1 to 1½ ounce of the dye in pure water; a color bath is next prepared at a hand heat, in which 1½ to 2 ounces of borax must be dissolved. An equivalent quantity of the carbonate of potash or soda may be used instead. The borax serves to neutralize any trace of acid existing in the water or the wool to be dyed (possibly also to prevent the working on of certain impurities which may be present in the dye). The solution of Nicholson blue, previously well filtered, is next added. The goods, previously saturated with water, are next entered and kept constantly in motion, while the temperature of the bath is very gradually raised to the boiling point. They are then taken out, worked well in water at a hand heat, and passed into the acid bath, which, for 10 lbs. of wool, should contain 10 ounces of sulphuric acid. Here they are worked till the color is fully developed. The Nicholson, or alkali, blue is the most permanent of all the aniline colors hitherto obtained.

Dispersion of Electricity in Gases.

The gradual loss of electricity by charged conductors, supported by solid insulators and surrounded by air, is due, according to Coulomb, to two causes: first, the imperfect insulating power of the supports, and second, the action of the atmosphere, inasmuch as the small particles that are in contact with the conductor are electrified and driven away, giving place to fresh unelectrified particles, which are influenced in their turn similarly.

Coulomb found that charges which did not exceed a certain limit of electric density were perfectly insulated by the better insulators; this limit varied according to the insulating power of the substance used. For lower densities, the loss of electricity took place only by the atmosphere; and he found that the time in which the charge was reduced to an aliquot part of its amount has a constant value.

The dispersion is found to be nearly the same in dry carbonic acid and atmospheric air; in hydrogen, only about half as great as in these gases.

Moist air does not give a much greater dispersion than dry air.

The dispersion of positive and that of negative electricity take place at the same rate.

PNEUMATIC COAL MINING MACHINERY.—Pneumatic coal mining machines are now employed with much success in several of the British coal mines. The machines are provided with cutting wheels 3 feet 6 inches in diameter, which cut their way into the coal seams with great facility. A face of 120 yards in length has been cut in one night. The cutters are operated by air, which is compressed by means of suitable pumps located upon the surface of the ground, and conducted in iron pipes down the shaft, along the roadway, and by rubber hose pipes into the machines.

BY a recent amendment to the general railway law in Massachusetts, all railways connected with Boston are required to run a six o'clock morning and evening train, and issue tickets therefore at a rate not exceeding three dollars per mile per year, for distances not exceeding fifteen miles. The object of the law is to provide cheap transportation for working people. The rate of fare just established appears to be less than the actual cost. The Legislature ought to have gone a step further and ordered the companies to run a free train. As it is, the amount allowed is hardly worth collecting, so some of the companies think.

Steam on the Canals.---The Reward of One Hundred Thousand Dollars Offered by the State of New York.---Modification of the Preliminary Tests Required.

At a meeting of the commission appointed by chapter 868 of the laws of 1871, held at the office of the State Engineer and Surveyor, at Albany, N. Y., on the 6th and 7th days of August, 1872, the following members were present: Van R. Richmond, chairman, George Geddes, Erastus S. Prosser, George W. Chapman, John D. Fay, Willis S. Nelson, Wm W. Wright.

Various persons were heard by the commissioners in regard to the preliminary tests heretofore required, and certain modifications were made, as will appear by the following preamble and resolution, that were passed and ordered to be published:

WHEREAS, It is the opinion of the commission that the intent of the law, in regard to the speed required of competing boats, is that the same shall be determined by the rate of movement through the levels of the canal, not including lockages or the navigation of the Hudson river, and that the objects of the preliminary tests required will be secured by not requiring over 100 tuns of cargo to be carried west; therefore, it is

Resolved, That the first and second resolutions, adopted by this board July 10, 1871, relating to preliminary tests, which were as follows:

Resolved, That for the purpose of carrying out the intent of the law, this commission will require, among the tests to be made, that the several competitors shall make not less than three round trips, from New York to Buffalo or Oswego; each boat to be loaded with not less than 200 tuns of cargo each way; the trips to be commenced as soon as any party is ready, and all completed in the least practicable time. For the purpose of determining the time consumed by each and all the trips, the clearance must show the day of the month and the time of day that the boat passes each collector's office; certified copies thereof to be furnished to the commission. In order to obtain information in regard to the practical working of the several devices in competition, as soon as practicable, the engineer of the commission, Mr. David M. Greene, of Troy, will inspect the same from time to time, as in his judgment may be necessary, and report the facts obtained to this commission.

Resolved, That competitors are hereby notified that for the purpose of carrying out the intent of the law, though it is desirable that the three consecutive round trips from Buffalo or Oswego to New York be made at the earliest time practicable, the whole of the year 1872 will be allowed to such persons as may desire so much time, and the awards will not be made until the close of navigation in that year," —be and the same are hereby modified by the passage of the following resolution:

Resolved, That boats making the three round trips from Buffalo or Oswego to the Hudson river and return, as heretofore required by this commission for the purpose of determining the rate of speed of said boats, will not be required to continue the trips to New York city, nor to carry more than one hundred tuns of cargo going west, and that deductions from the time consumed in navigating the canals will be made for passing the locks, equal to twenty hours for each round trip from Buffalo, and proportional allowance will be made if the trial is from Oswego. In case of delays growing out of obstructions to navigation, that are caused by breaks in the canals or injuries to the structures or sunken boats, or such as detain boats drawn by horses, the time lost will also be allowed for in computing speed.

The commission adjourned to meet at the office of the canal commissioners, in the city of Syracuse, Tuesday, October 1st, 1872, at 3 o'clock, P. M.

Recent Patent Decisions.

United States Circuit Court—Southern District of Louisiana.

A suit at law upon letters patent for an improvement in metallic ties for cotton bales, granted to Frederic Cook, March 2, 1858. Mary Frances McComb and James Jennings McComb, plaintiffs; and George Brodie, defendant.

THE LAW OF INFRINGEMENT—THE LAW OF DAMAGES.

WOODS, Circuit Judge.

There may be a claim for two inventions in the same patent if they both relate to the same machine or structure; and an action can be sustained for the infringement of either one of these separate inventions when claimed as separate and distinct in their character.

Where plaintiff's patent covered three different features of invention, but suit was brought on one claim only, the jury were instructed to consider the case precisely as if the patent covered that claim alone.

The third claim of Cook's patent of March, 1858, for cotton bale tie, construed to be for the right to use an open slot cut in a buckle, which without the cut would be a closed buckle, so as to allow the end of the tie or hoop to be slipped sidewise underneath the bar through which the slot is cut.

If a party uses the open slot for passing the end of a cotton tie sidewise under the slotted bar, it makes no difference whether such end is in the form of a loop or not, if the result attained is that the end of the tie has been "slipped sidewise through the slot underneath the bar, so as to effect the fastening with greater rapidity than by passing the tie through endwise."

A man cannot have two patents for the same process because for different purposes.

When the means, devices, and organization are patented, the patentee is entitled to the exclusive use of this mechanical organization, device, or means, for all the uses and purposes to which it can be applied, without regard to the purposes to which he supposed, originally, it was most applicable.

To constitute infringement the contrivances must be substantially identical, and that is substantial identity which comprehends the application of the principle of the invention.

If a party adopts a different mode of carrying the same principle into effect, and the principle admits of different forms, there is an identity of principle though not of mode; and it makes no difference what additions to or modifications of a patentee's invention a defendant may have made; if he has taken what belongs to the patentee, he has infringed, although with his improvement the original machine or device may be much more useful.

All m[illegible], however changed in form, but which act on the same principle and effect the same end, are within the patent; otherwise a patent might be avoided by any one who possessed of ordinary mechanical skill.

The rule of damages at law is not what the defendant has made, or what he might have made, but it is the loss sustained by the plaintiff by reason of the infringement.

If plaintiff was ready to supply the market with his patented goods, and his business was hindered or interfered with by the competition of defendant, plaintiff's damage will be the amount of profit which he has lost by reason of such interference.

If a plaintiff neglects to prove that his patented article was stamped, or that he gave to the infringer the notice required by section 38 of the patent act of 1870, a jury cannot award him more than nominal damages.

W. M. Randolph, C. Roselius, J. A. Campbell, and S. S. Fisher, for plaintiffs; Semmes and Mott, for defendant.

United States Circuit Court, District of Massachusetts.

WOODWARD *vs.* MORRISON *et al.*

This was a suit in equity, brought against Louis P. Morrison and George G. Noah by Joseph Woodward, for an alleged infringement of letters patent granted the complainant, February 20, 1866, for an improved prepared paste for book binders.

INFRINGEMENT UPON ARTICLES OF MANUFACTURE—INFRINGEMENT OF CHEMICAL PROCESSES—CHEMICAL EQUIVALENTS—CONSTRUCTION OF PATENTS.

SHEPLEY, Circuit Judge.

The invention patented to Joseph Woodward, February 20, 1866, for an improved paste, consisted in the discovery that the use of a very minute quantity of corrosive sublimate would arrest the tendency to fermentation in the paste, without imparting to it any poisonous properties; also, that an improved result was effected by the addition of chloride of sodium, or an equivalent salt, soluble in the aqueous solution of corrosive sublimate.

A paste in which corrosive sublimate is used in proper quantity to prevent decomposition without making the compound poisonous and unsafe to handle, held not to be anticipated by a paste in which the same ingredient is purposely used in such quantity as to make the compound poisonous and destructive of animal life.

Semble, that where the patented invention is an entirely new article of manufacture it might be sufficient to find that the defendant makes substantially the same thing, whether by the same or a different process.

Patents are infringed by the substitution of chemical equivalents as well as of mechanical equivalents.

The use of chemical equivalents may infringe a patent even if in some respects they are improvements on the original process patented.

To constitute an infringement of a chemical process, it is not necessary that the substituted ingredient be the equivalent in every respect and for every purpose of that in place of which it is used; it must only be an equivalent in the particular process, contributing to produce the same composition of matter by substantially the same chemical action.

Where the patentee of an improved paste used the chloride of sodium mainly for increasing the solubility of the antiseptic agent employed and assisting in its diffusion through the mass of the paste: *Held*, that the use of the chloride of zinc, which in the particular process produced practically the same result, was an infringement.

Every specification is to be read as if by persons acquainted with the general facts of the mechanical or chemical science involved in the invention; and the specification of the parts is a specification to ordinary skillful mechanics or chemists of the well known mechanical or chemical equivalents.

If there are equivalents, mechanical or chemical, existing, but previously unknown to ordinarily skillful mechanics or chemists, these are not included in the specification of a patent unless specially stated therein. They are new discoveries in themselves, and may be used by all without infringing the patent.

The ingredients and the proportions thereof in their respective formulas of manufacture, as stated in the respective patents, are as follows:

Complainants.	*Defendants.*
Flour, 2 pounds.	Flour, 100 pounds.
Common salt, (chloride of sodium, Na. Cl.,) 1 ounce.	Chloride of zinc, 5 pounds.
Alum, ¼ ounce.	Alum, 5 pounds.
Corrosive sublimate, (bichloride of mercury, Hg. Cl.,) 6 grains.	Bichloride of mercury, 1 ounce.
	Oil of cloves, ½ ounce.

JAMES B. ROBB, for complainant.

H. G. PARKER and B. C. MOULTON, for defendants.

ELECTRIC ILLUMINATION OF LIGHTHOUSES.—The following is a list of the electric lights in England and France with the dates at which they were erected: Dungeness, January, 1862; Cape La Heve, France, South Light, December, 1863, North Light, November, 1866; Cape Grisnez, France February, 1869; Souter Point, England, January, 1871; South Foreland, England two lights, January, 1872. It is interesting to see, says *Nature*, that England took the lead in this matter of the adaptation of electric illumination to lighthouse purposes, and it must also be remembered that although the first electric light was only erected in 1862, yet in 1859 experiments were made, under the supervision of the late Professor Faraday, which were very successful.

[We believe that in the United States there is no light-house in which the electric light is employed.—EDS.]

A SPROUTING SNAKE.—Professor Cope states that he had for sometime a specimen of *Cyclophis æstivus*, received from Fort Macon, N. C. The slender form of this snake and its beautiful green and yellow colors, show that it is of arboreal or bush-loving habits. It never exhibited such in confinement, however; and instead of climbing over the caladia, ferns, etc, it lived mostly under ground. It had a curious habit of projecting its head and two or three inches of its body above the ground, and holding them for hours rigidly in a fixed attitude. In this position it resembled very closely a sprout or shoot of some green succulent plant, and might readily be mistaken for such by small animals.

AN acorn suspended by a piece of thread within half an inch of the surface of water in a hyacinth glass, will, in a few months, burst and throw a root down into the water, and shoot upwards its straight and tapering stem, with beautiful little green leaves. A young oak tree, growing in this way on the mantelshelf of a room, is a very elegant and interesting object.

MANUFACTURE OF PINS.

A recent visit to the works of the Empire Pin Company, situated in Cohoes, N Y., afforded us an opportunity to witness the entire process of pin making. The wire for this purpose is received in large coils, and the first proceeding is to render it straight and free from kinks and turns. Entering a long room filled with numberless little machines, which united to make an almost deafening clatter, our attention was directed to a coil of wire which had just been placed on a revolving spindle. The end was passed through an apparatus containing several small rollers, and then allowed to wind around a large wheel some two feet in diameter. From this wheel the coil is cut off in sufficient lengths. We now pass to the pin making apparatus proper, that is, the numerous small machines which spitefully seize the wire, drag it along under cutters, bite off small pieces, then supply each of the several bits with a head and sharp point, and finally throw them into a receptacle as nearly finished pins at the rate of hundreds per minute. We say "nearly finished," because, to all appearances, a handful of pins in their present condition appear to be all ready for use. But they are rough, they are still of yellow brass, and their points are far from smooth. We are now shown two revolving barrels into which, with a quantity of sawdust, the pins are thrown. Here they are rolled until perfectly smooth, when they are removed and treated to a boiling for four hours in a solution of cream of tartar and water, from which bath they emerge literally as "clean as a new pin," and, besides, thoroughly whitened.

Next they must be sorted. Pins of every size, some short, others long, must be separated, and each length placed in distinct boxes. To effect this, they are thrown on an inclined tray; down they slide, ranging themselves side by side. Now they pass over a piece of steel, in the edges of which indentations are cut of varying depths. Each pin keeps on its journey until it reaches a point at which one of the indentations makes a passage sufficiently wide for it to pass through lengthwise when it falls into its proper box.

The pins being now sorted, the next process is to place them in their papers. Being heaped upon a horizontal tray, they are sent, by a sweep of the attendant's hand, traveling down an inclined plane of steel, in which slots have been cut. Each slot is made of such a width as to allow the body of the pin to pass through but not the head. There are as many of these slots as there are to be pins in a row. The pins sliding down range themselves in an even line at the foot of the plane. Meanwhile a continuous roll of paper has been attached to the machine from underneath. This, as each row of pins is ready for insertion, is pressed and held into a die, which forms crosswise creases in it. The pins are then forced down through these creases, the paper leaves the die, and is rolled along; another row of pins falls into place, and the operation is repeated. The paper, when filled, is cut off into proper lengths, and sent to girls to supply missing pins. As each paper is completed, it is folded and then packed in bundles of a dozen each, marked, labeled, and sent to the market.

There is another auxiliary machine connected with this manufacture by which the pins which are crooked and which fall through the last described apparatus are separated from the straight pins which become mixed with them. This is done by causing the pins to fall upon a number of endless leather belts. The crooked ones remain steady, and are carried along the belts and dropped into a receptacle at the end of the machine. The straight pins, however, in falling upon the belts do not rest upon them, but, receiving by this means a vibratory motion, roll off between the belts and are caught in a box underneath. The great rapidity of this work can be judged from the fact that some 650 packages of pins, each package containing a dozen papers, are daily turned out at the works of the Empire Company.

CARBONIC ACID FROM THE LUNGS.—It is customary to show the presence of carbonic acid from the lungs by breathing into lime water, and as the experiment is usually performed, it is necessary to blow through the water for a considerable time. Dr. Krebs recommends the simple device of holding the nostrils when making the expiration; it is then possible, by drawing a long breath, to obtain a considerable precipitate in lime water in one expiration. The difficulty has been that nearly all of the carbonic acid escaped through the nostrils, and hence the erroneous impression that only a small quantity was given off from the lungs.

VALUE OF POULTRY MANURE.—From actual experiment it has been found that the droppings from four Brahmas for one night weighed in one case exactly 1 lb., and in another more than ¾ lb., an average of nearly 4 ounces each bird. By drying, this was reduced to not quite 1½ ounce. Other breeds make less; but, allowing only 1 ounce per bird daily of dry dung, fifty fowls will make, in their roosting house alone, 10 cwt. per annum of the best manure in the world. Hence ½ an acre of poultry will make more than enough manure for 1 acre of land, 7 cwt. of guano being the usual quantity applied per acre, and poultry manure being even richer than guano in ammonia and fertilizing salts. No other stock will give an equal return in this way; and these figures demand careful attention from the large farmer. The manure, before using, should be mixed with twice its bulk of earth, and then allowed to stand in a heap, covered with a few inches of earth till decomposed throughout, when it makes the very best manure which can be had.

The Union Mill Company, of Fall River, Mass., make print cloth, and they pay dividends of 140 per cent annually on the stock of the corporation.