the other portion of the pipe and provided wtih an opening for admitting the water.

Mr Joseph Baker, of Lebanon, O., has invented an implement for cutting the wire bands with which sheaves of grain are bound. It consists of a blade with a hook at one end, and at the other a stock and bent lever connecting with one end of a rod on top of the blade, the other end of which has a right angular forked projection fitting over the blade, to which it is connected by pivots working in V-shaped slots in the fork. On one side of the fork is a cutting bit, and on the other a clamping edge opposite a lug attached to the end of the blade. The wire being caught by the open hook, the forked projection is thrown forward, severing the wire, one end of which is caught between the clamping edge and the lug, and thus drawn from the sheaf.

Correspondence.

Protection from Lightning.—A Note from Professor Macomber.

To the Editor of the Scientific American:

Your criticism of my use of the word "practical" in the SCIENTIFIC AMERICAN of November 1, is, to a certain extent, proper. In the amount of space accorded me for reply to a correspondent it was impossible to consider the matter fully. Fearing, however, that your criticism may lead readers to deem me an advocate of the "Chambers" lightning rod, I desire to call your attention to the fact that I have denounced that rod in language which cannot be mistaken, and the company has actually commenced a suit against me for $50,000 damages in the United States Court of this State.

J. K. MACOMBER.

Phys. Laboratory, Iowa Agricultural College,
Ames, Iowa, October 27, 1879.

Iron as a Fertilizer for Pear Trees.

To the Editor of the Scientific American:

It is conjectured that New Haven County, State of Connecticut, has a larger supply of choice pear trees than any other county in the United States. In the city of New Haven alone, their number increases to thousands. As the city is renowned for its noble elms and unsurpassed shade, likewise is it noted for its neat cottages and fine residences, about which are yards and gardens abounding with ornamental and fruitful vines and trees. Every owner of a lot seems to have devoted a portion to the culture of fruit. Of the large variety represented, the pear tree and grapevine are the most prominent. One gentleman has over two hundred varieties of pears growing on two separate plots of ground, embracing hardly more than 300 feet square. This number may appear to the owner of a single variety like a marvelous amount, but when placed in connection with the multitudinous number in existence, it dwindles through the comparison. It is stated that the celebrated pomologist of Europe, Dr. Van Mons, has fruited over eighty thousand varieties, which is only a small portion of the whole number produced by different individuals. This may seem incredible to those who are not acquainted with the culture of this fruit; and to those familiar with the peculiarities and capricious nature of the pear, it becomes a matter of no little surprise.

The climate as well as soil of New Haven appears to be peculiarly adapted to the culture of pears; but when the soil is examined closely it is found to be composed mainly of sand with a small proportion of iron, which is a needed requisite for stimulating the growth of the tree and fruit. When we take this fact into consideration, we are led to expressions of surprise at the success met with in this particular branch of pomology. There are bounds, however, to the successful culture of pears, as varieties have failed, in nearly all instances, of proving profitable. Of this number the most prominent is the Flemish Beauty and White D'Oyene. The latter, however, is now hardly known in this section, although it flourishes well, it is said, in the West; while the former, on account of the poor success attending the ripening of its fruit, is looked upon with disfavor. None were able to give any cause for this failure, and it was therefore with no very great hopes of ascertaining the cause and finding a remedy that I early in the season commenced making this variety something of a study.

In pursuing the study I have considered the manner of cultivation and nature of the fertilizers used, also position of the trees, and have selected three or four upon which to remark. The first to be mentioned is a standard, some fifteen feet in height and between twenty-five and thirty years of age, growing near a farmhouse a short distance from the city. The tree is sheltered upon the west, north, and south, but not upon the east. The ground is turfed and receives no fertilizer. This tree blossomed and set full, but the pears commenced early to crack, and none ripened. The second tree is a dwarf, notwithstanding the nature of the Flemish Beauty is a standard, growing in the western portion of the city. It is some twenty years old and not over ten feet high. It stands within eight feet of a high close board fence, and about it on the other sides stand trees of different varieties that produce excellent fruit. The ground about the tree is cultivated and fertilized from a compost heap. The tree blossomed full last spring, and the indications were promising for a superior crop until the pear had reached the size of an average Sickle, when they commenced cracking. At that time there was a sufficient quantity on the tree, had they matured, to make about two bushels of pears; but in place of gathering that amount but one ripe Flemish Beauty was plucked from the tree. All of the others had cracked, a very few had prematurely ripened and dropped off, in all furnishing not a dozen good ripe pears.

The third tree is one belonging to Henry Hale (Henry Hale & Co, carriage builders), and growing near Mr Hale's house, situated in the lower or eastern portion of the city. The tree is a standard of a very thrifty growth, about twenty five years old, and as many feet in height It is protected on the south by his dwelling, the north by standards of different variety and the carriage factory; east and west by adjoining gardens. The ground is turfed save a circle about four feet in diameter around the tree. Within this space the earth is kept loose and free from weeds or other vegetation. For a fertilizer Mr Hale has for many years used one of a peculiar nature, it being composed of the sweepings of the smith shop and the shavings, dust, and dirt from the room in which the woodwork is made, all being burned in one heap, and the residue used as a fertilizer, it being well mixed with the earth about the trees The sweepings of the smith shop is comprised of many particles of iron varying in size from an iron filing to that of a half ounce in weight. The trees treated in this manner, and the Flemish Beauty in particular, are remarkable for their healthy appearance This tree produces pears of great and unusual size, which mature well, and, as Mr. Hale states, have never been known to crack. His knowledge of cracked pears was acquired by his attention being called to samples shown him by his neighbors, who were unsuccessful in raising Flemish Beauties. This season the tree bore the extraordinary crop of between six and seven bushels, the largest weighing from ten to twelve ounces, a fair average being nine ounces.

At the county fair held in this city there was a collection of two hundred and seventy-five plates, of which number Mr. Charles Dickerman, of this city, represented sixty-four varieties. The largest pears exhibited were a half dozen Napoleons; next came the Dutchess. The Flemish Beauty was represented by only three or four plates, of which Mr. Hale took the first premium; the nearest approaching his in size being very much smaller.

The conclusion I have reached regarding the cause of failure in crops of Flemish Beauty is to attribute it to the lack of iron in the soil. This is based upon the success met with by Mr. Hale in the culture of his trees, representing quite a variety, all of which excel in size and quantity of fruit. It cannot be ascribed to the virtue of the ashes, as the residue from each burning remains as an accumulation to the pile, gradually increasing its size for several months before a sufficient quantity to warrant its removal has been heaped together. The ashes are meantime leached by rains, and their strength is exhausted. The particles of iron do not so readily waste their strength, but when corroding enter into the ashes, enriching them with its changed form and becoming a suitable ingredient for nourishing the roots and trees. This conclusion is strengthened by considering, in connection with this tree, one growing upon the opposite side of the street from Mr. Hale's ground. It has the advantage of the same soil and similar location, but not the same fertilizer. The fruit of this last tree cracked badly. Is not therefore the suggestion of fertilizing with iron worthy of a trial? It would cost nothing but the trouble to procure some iron filings or drillings and occasionally mix them with the soil about the roots of the tree. Filings or drillings corrode the most readily, and would prove the speediest manner of producing the desired effect. One year's trial may produce no decided improvement; several may prove no better; yet we consider it worthy of a trial.

There is another indication in the fruit of the Flemish Beauty of an unhealthy state of the tree, consisting in the pears becoming covered with small black spots; and a lack of vitality by the leaves turning and falling early. Neither the spots nor blotches are found upon Mr. Hale's fruit, nor do the leaves prematurely fall from the tree. The fruit on this tree is possessed with a dark green skin, marked with streaks or blotches of rust, and in ripening the green changes to yellow, the rust is more strongly defined, and the scarlet tint, so much admired by pomologists, deepens.

GEORGE A. HUBBARD.

New Haven, Conn., October, 1879.

The Blake Transmitter.

To the Editor of the Scientific American:

It is somewhat remarkable that the friends and admirers of Mr. Edison take such great pains to prove to the world that he is the inventor of every electrical instrument and contrivance which turns out to be of value.

Not satisfied with the signal defeat which Mr. Edison sustained in the great microphone controversy in Europe, where the leading scientists, without exception, supported the claim of Professor Hughes, that the microphonic action is totally different from the principle which Mr. Edison has always claimed as the basis of his carbon telephone, viz., "the property possessed by some substances of moderate conductivity of having this power modified by pressure," although even this cannot be regarded as his exclusive property, as it was discovered as early as 1856 by the Count Du Moncel, and described by him in his "Exposé des Applications de l'Electricité," and also used by M. Clerac in 1865—not satisfied with this, I repeat, an attempt is now made to induce the public to believe that Mr. Edison is also the inventor of the only really successful microphonic transmitter ever produced. I allude to that invented by Mr. Francis Blake, of Newton Lower Falls, Mass., and described in your issue under the date of November 1.

Wherein the similarity between the Blake and the Edison transmitters lies, it is difficult for one acquainted with both to say, save in the fact that both are used in combination with an induction coil, the secondary circuit of which is a part of the main line.

I have examined Mr. Prescott's account of Mr. Edison's inertia telephone, and find it totally different, both in action and principle, from any microphone.

It appears, however, from the article in question that Mr. Edison's latest transmitter, described also in the SCIENTIFIC AMERICAN a few weeks since, is also like the "old invention," in principle. If so, it is a query why the Western Union Company did not bring out this superior instrument instead of the carbon telephone, when the latter was beaten everywhere by the Blake transmitter. The fact really is that the Western Union tried to imitate the Blake transmitter at different times since its introduction, a year since, and could never make the imitations work, simply because the Blake transmitter has a few technical points on which its success depends, and which are only known to the electricians of the National Bell Telephone Company.

Mr. Prescott states in his book, and it is found to be true in practice, that although many substances may be used as a conducting medium for varying resistances in the Edison transmitter, lampblack is the best; per contra, lampblack is not used in the Blake transmitter at all, the substance used being invariably very hard gas carbon, besides which Mr. Edison himself states in his patent 203,016, that unmixed carbon is not adapted for use in his transmitter.

The article we have alluded to as in your last issue, in its second paragraph states that there is "nothing delicate or fine about the construction" of the Blake transmitter. In the third paragraph we find the words, "this casting supports two delicate springs, etc." One of the main features in this transmitter is the delicacy of the adjustment obtained by means of the casting, which is perpendicularly across the inside of the diaphragm, and the screw in its lower end. In conclusion, I desire to say that no caviling spirit dictates these remarks, but simply a desire for justice to the Blake transmitter, its inventor, and perfecters.

Boston, October 29, 1879. T. D. LOCKWOOD.

A String of Questions.

To the Editor of the Scientific American:

Please allow me a small space in your scientific journal (which assists to educate scientists as well as the mass of your readers) to propound a few questions for philosophical thinkers to elucidate and explain.

Is there such a thing as a vacuum in a molecule of matter?

If not, is there such a thing as a vacuum anywhere outside of a molecule of matter?

If not, where is the capacity of matter for elasticity?

If there are no vacuums, or no room for movement of molecules, how do they manage to change places?

If there are vacuums (which I claim) are they not necessarily perfect vacuums, either inside or outside of molecules?

Are molecules invariably spherical in form?

If so, what occupies the interstices?

Are molecules all of the same size?

If so, how do you account for the angularity of crystallizations?

If not of the same size and density, how do you account for the even flow of electricity along a good conductor?

If they are irregular in size, shape, and density (which I claim), can the phenomena exhibited in their movements be explained on any other ground than that there are perfect vacuums either inside or outside their organism.

Is heat or caloric a principle or a result?

If not a tangibility, can its phenomena of action be explained on any other ground than a result of activity of molecules by friction?

Is not the result of friction electricity?

Are not heat and electricity identical?

If not, explain the different results of the excitation of either as molecules of electricity or molecules of matter in the abstract?

If a cake of Northern lake ice will thaw or melt a portion of polar ice, by the activity of molecules adjusting the temperature, is the result heat or electrical activity?

If the force of heat or electrical activity can be measured, why does combustion produce such unequal results by same quantity in each different substance?

H. S. B.

A Small Steamboat.

To the Editor of the Scientific American:

I have been interested in several descriptions you have given of small steam yachts, and as I have lately built one which is (with one exception perhaps) the smallest recorded, I thought you might like to know of it, as there is now a general interest in the subject of small cheap steam pleasure boats. You will notice the results I get with a very small engine by having a light boat and high pressure.

The totall ength of boat is 15¼ feet; beam, 4¼ feet; depth 22 inches; built of $\frac{7}{16}$ inch cedar, lap joint on ¾x1¼ oak ribs, and sheathed inside. Total weight with flagpoles, awning, etc., about 400 pounds (without boiler, etc.).

The boiler is made of a piece of lap-welded boiler flue, and is 12 inches diameter and 34 inches high (upright), with 40

¾" seamless brass tubes, and is provided with steam and water gauges, whistle, etc. Engine is upright, with reverse link motion, having a cylinder 2 *inch bore by* 3 *inch stroke;* runs at about 200 per minute, under a pressure of 100 pounds in boiler. Propeller is 16 inches, 3 blades on a 1 in. shaft, coupled to engine with universal joint. The pump takes water from outside or the bilge box, and will throw into boiler or over side of boat. Total weight of boiler, engine and shaft, wheel, etc., 400 pounds. About three scuttles of coal are used in 10 hours' steaming. On still water I get a speed of 5 to 6 miles an hour, or with the tide about 8. The total cost of the boat was less than $230, including machinery, etc.

Yours very truly, FRED. F. SMITH.

Bridgeton, N. J., October.

Curious Facts Concerning the Cochineal Insect in the Canary Islands.

To the Editor of the Scientific American:

It is well known that these islands are the great producing market for the insect dye cochineal, giving perhaps seven-eighths of the earth's product. Therefore it naturally falls under one's notice both in its cultivation and its preparation for market. The birth is brought about by placing the madres (mothers) in a kind of hot house, and spreading them out thinly on shallow wooden boxes. The insect, as it thus appears, may be likened to a grain of wheat just taken from a pool of dirty water, as it is about that size and shape, but of a dark lead color. It has neither head, legs, nor arms, and shows no signs of life. Yet after being in the warm room a short time they begin to give forth their young.

These, to the inexperienced eye, seem to be little white specks, as devoid of life as the mother. On close examination, however, they are found to be endowed with life and activity, and have their head and arms or legs as well formed and distinct as other insects.

The mother continues to give birth for some days. Some insects are said to give as many as 800 young ones, but they invariably die when they have brought forth their progeny.

The young ones are taken to the cactus plant (which is at once their home and their sustenance) on cotton cloths, to which they adhere when the cloths are spread over the shallow boxes. These cloths are sometimes covered in a few moments, so rapidly does the parent give birth, and some one has to be with them constantly for removing the full cloths and replacing fresh ones. The cloths seem to be covered with a white powder, but the cochineal grower knows that they are the basis of his yearly earnings, and has them sent out at once to the cactus, to which the cloths are fastened by a small thorn which grows on the same plant.

Once attached to the plant the insect forsakes the cloth, and adheres to (or burrows slightly in) the plant. It soon becomes stationary, begins to grow, and assumes the characteristics of its parent, that is, loses all signs of animation, drops all its members, and becomes a part and parcel, as one may say, of the plant.

It seems to "shuffle off its mortal coil," and appears as inert and inanimate as the cactus. Notwithstanding this apparent lifelessness, they are as sensible to heat and cold as other insects. Every year the proprietor suffers more or less loss from the extreme heat sometimes felt here. This heat comes from the great Sahara Desert, and causes death to the insects by asphyxia. Early in July there were a few days of this weather, which, it is said, destroyed at least one third of the crop. I can readily believe this, as the insects had just been "planted," or put upon the cactus; and the younger they are the more sensitive they seem to these changes of the weather. They are, however, liable to loss this way as long as 30 or 40 days after being placed on the plant, and when near to maturity.

The heat kills or stops growth, the insect dies, and drops from the cactus on receiving the slightest touch of wind or other weather. The most remarkable point concerning this specimen of the animal world is, that the foregoing *only refers to the females,* as the male is a creature entirely distinct in its form and habits and mode of life.

The males are very scarce in comparison with the number of females, some assert in the proportion of one to one hundred thousand. The male has wings and flies from plant to plant, with a body like an ant. These visits from plant to plant give for their result the operation I described at the beginning of this article, that is, the hatching of the young insect.

Now the scientific questions that arise in my mind are:

1. What kind of life is this of the female, after being placed on the plant? Is it a semi-animal, semi-vegetable life?

2. Is there any other example in nature where the proportion of the female in numbers is so much greater than the male, and where their form, habits, and life are so distinct?

3. Is there any other insect that gives direct from the body (without eggs) such great numbers of young?

Santa Cruz de Teneriffe, Canary Islands, Oct., 1879. H. B. M.

ANY fibrous material can be stuck to metal, whether iron or other metal, by an amalgam composed of good glue dissolved in hot vinegar with one third of its volume of white pine pitch, also hot. This composition, it is said, will give a sure and certain result.

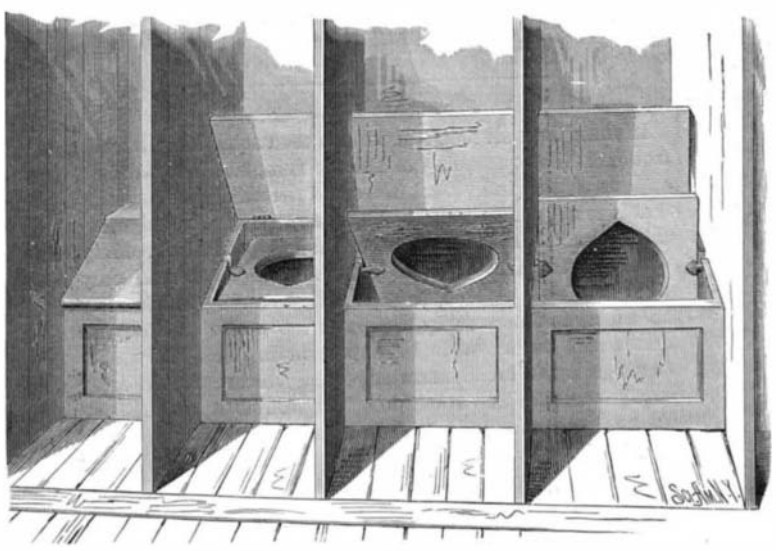
HOW TO WORK THE NEW COPYING PROCESS.

This process consists in transferring to a pad or tablet, composed essentially of a gelatinized solution of glue in glycerine, writings made on paper with a strong solution of one of the aniline dyes—violet or blue being generally preferred—and from this obtaining duplicate copies of the original by simply pressing sheets of paper on the transfer. The *modus operandi* of the copying is given briefly as follows:

Write with a steel pen on ordinary writing paper; allow to dry; press the writing gently upon the tablet, allow it to remain a minute, when the greater part of the ink will have been transferred to the gelatinous surface, and as soon as the paper has been removed the tablet is ready to take impressions from. Place ordinary writing paper upon the charged tablet, smoothing over with the hand, and immediately remove the sheet, which will be found to bear a correct copy of the original writing; repeat with other sheets until the transferred ink becomes exhausted. Immediately after, wash the tablet with water and a sponge, let it dry, and it is ready again for use.

NEW COPYING PAD.

With a tablet and ink prepared according to the following fifty good copies from one transfer have been obtained, and doubtless with care it would afford twice this number. The proportions for the pad or tablet are: Gelatine, 1 ounce; glycerine, 6¼ fluid ounces. Cooper's gelatine and pure concentrated glycerine answer very well. Soak the gelatine over night in cold water, and in the morning pour off the water and add the swelled gelatine to the glycerine heated to to about 200° Fah. over a salt-water bath. Continue the heating for several hours to expel as much of the water as possible, then pour the clear solution into a shallow pan or on a piece of cardboard placed on a level table and having its edge turned up about ⅛ inch all around to retain the mixture, and let it remain for six hours or more, protected from dust. Rub over the surface a sponge slightly moistened with water, and let it nearly dry before making the first transfer. The ink is prepared by dissolving 1 ounce of aniline violet or blue (2 R B to 3 B) in 7 fluid ounces of hot water, and, on cooling, adding 1 ounce of wine spirit with ¼ ounce of glycerine, a few drops of ether, and a drop of carbolic acid. Keep the ink in a well stoppered bottle.



PARK'S IMPROVED CABINET SEAT.

IMPROVED CABINET SEAT.

The accompanying engraving represents an improved privy seat recently patented by Mr. Edwin R. Parks, of Copper Falls Mine, Mich., and intended more particularly for school privies and those of passenger depots, railway cars, boats, hotels, and other public places.

The invention consists in a seat made alike on both sides, and pivoted at opposite edges, so that it may be turned over or reversed. The engraving shows the seat in several positions, so that its construction may be readily understood without further description.

MISCELLANEOUS INVENTIONS.

Mr. Henry R. Robbins, of Baltimore, Md., has invented an improvement in fare boxes for street cars. It consists of an inclined conduit arranged between the back of the seat and the side of the car, and having depositing throats of different lengths extending upwardly from it between the windows, the conduit having a receiving box at its lower end, where it may be inspected by the driver.

Mr. William H. Russell, of Sedalia, Mo., has patented an improved vapor burner designed for burning gasoline and other light hydrocarbons for illuminating and heating purposes. The characteristic features of this invention are a double set of horizontal curved deflecting plates, a rotary cut-off located between the two sets of plates, and opening and closing communication with an internal tube, and a surmounting generator or globular chamber located above the plates in the flame space.

An improvement in dies for forming metallic horse collar frames has been patented by Mr. Ebenezer Fisher, of Kincardine, Ontario, Canada. This invention relates to an improvement in the dies for forming metal plates into the shape required to adapt them to form the sides of a horse collar; also to an improved metal collar or collar frame, the product of the dies.

In putting up pills which are prepared with an adhesive substance or composed of deliquescent material, it has been customary to place in the box with the same a dry harmless powder of some kind, which prevents the pills from sticking to each other or to the sides of the box. This powder frequently cakes in the bottom of the box, and always in removing a pill it is impossible to avoid taking up some of the powder with the pill. Mr. Norman V. Randolph, of Richmond, Va., has patented a device designed to avoid these objections. It consists in a box with a perforated diaphragm which divides the box into two compartments, into one of which the pills are inserted, and into the other the powder may be shaken and separated from the pills when they are to be handled or removed.

Mr. Theodore L. Wiswell, of Olathe, Kan., has patented an improved harness buckle, to which straps can be conveniently and securely attached without doubling or looping and sewing in the usual way. The buckle is composed of an apertured plate, a loop and tongue. The looped ends of the apertured plate are turned outward, so that the strap may be readily inserted in the buckle.

An improved faucet has been patented by Mr. John P. Mern, of New York City. The object of this invention is to provide for basins, tubs, sinks, etc., a faucet that cannot leak, even under great pressure, and that cannot accidentally be turned the wrong way and left running when its mouth is not over the basin or tub.

Mr. Charles P. Rood, of La Fargeville, N. Y., has invented a mattress adapted for use on shipboard, and constructed so that it may be used as a life-preserving raft when required for such purpose; and the invention consists in the combination, with a mattress of usual character, of watertight cells or compartments, that render the mattresses buoyant in water, and fit them for use as a raft singly or by connecting a number of them together.

A simple and effective refrigerator for cooling and preserving meats, etc., has been patented by Mr. Frederic Wolf, of Quincy, Ill. It consists essentially of a wooden refrigerating box, with a glazed cover and front, fixed between two higher ice boxes that open into it, so that the cold air from them shall descend into it.

Mr. Thomas Leach, of Taunton, Mass., has patented an improved stand for ice pitchers, which consists chiefly in a stand having an elevated support for the tilting pitcher, which stand is constructed with an opening in its surface, and a subjacent drawer adapted to catch the drip from the pitcher. The invention also consists in forming the handle for the drawer in such a shape as to make it either a support for the goblet or a receptacle into which the waste water from the goblet may be poured, and whence it passes into the drawer.

An improvement in napkins and analogous articles, patented by Mrs. Elizabeth W. M. Cameron, of Brooklyn, N. Y., consists in providing napkins, handkerchiefs, tablecovers, and similar articles with embroidered or printed fancy borders, which are made separately or of separate pieces, and attached to the edges of the body of the napkin or other article by a hemstitch.

Mr. Max Rübin, of New York city, has patented an improved fan of the kind that may be opened into circular form. It is so constructed that it may be closed into the space between the parts of the handle, and may be held securely in place both when opened and when closed.

An improvement in razors and knives has been patented by Mr. Nelson B. Slayton, of Rochester, N. Y. The object of this invention is to furnish razors which may be shut up and carried in the pocket without the necessity of putting them in cases.

A device for tightening wheel tires by raising or spreading the fellies so that washers may be inserted between the ends of the spokes and the felly or between the parts of the felly itself, has been patented by Mr. John A. Cooley, of Savanna, Ill.