¼" 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.

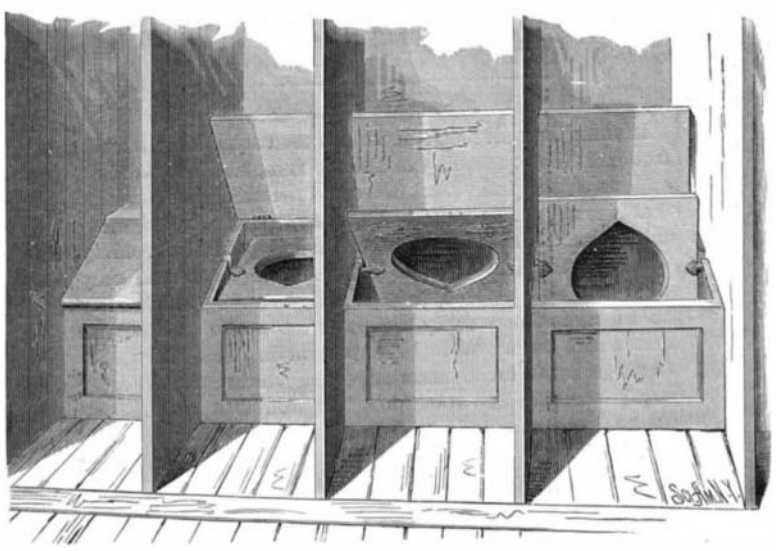
HOW TO WORK THE NEW COPYING PROCESS.

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, table covers, 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.

Mr. Otis E. Davidson, of Clarksville, Tenn., has recently patented an improved paper bag machine, which is capable of rapidly and economically making satchel-bottomed bags having a single lengthwise seam or lap. The invention consists in novel mechanism for feeding and pasting, and also creasing the continuous web of paper, and for cutting off blanks therefrom, and folding, pasting, and pressing the latter, and discharging them from the machine as completed bags. A complete detailed description of the construction and operation of this machine would require engravings.

An improved centrifugal honey extractor has been patented by Mr. George W. Williams, of San Diego, Cal. The invention consists in the combination of a revolving extractor fitted with swinging comb holders and a cylindrical vessel. The shaft carries radial arms and hinged foraminous comb holders.

Messrs. Louis Rakow and Charles H. Kunke, of Gilbert's, Ill., have patented an improved machine for holding the hubs and spokes of wheels whilethe spokes are being driven. The invention consists in a combination of devices which cannot be clearly described without engravings.

Mr. Samuel P. McClean, of Range, O., has patented an improved metallic burial safe, which is intended to effectually prevent what is known as "body-snatching." The invention consists in a strong metallic case having a cover provided with locking devices of such a character that when once locked they are permanently locked, and can never be opened except by cutting through the heavy iron of the case. Devices are also provided which prevent the digging of the earth down to the case; and the case is secured so that it cannot be removed bodily for the purpose of gaining entrance to it through the bottom.

Mr. Richard Elliot, of Plainfield, N. J., has patented an earth auger provided with guards in the spiral groove, made fan-shaped to allow the earth to work up past them when the auger is working into the ground, and prevent its relapse as the auger is pulled out.

Mr. Henry P. Schneck, of Huntingburg, Ind., has patented an improved hay carrier which consists of a frame having wheels and sliding on an elevated rod or track, and provided with a bottom sliding plate moved by the contraction of a spring, and also having a sliding bar and clutch, the whole being arranged so that it may be moved and operated in opposite directions.

An improved truck for loading locomotive tenders has been patented by Mr. Mark A. Dees, of Scranton, Miss. The object of this invention is to construct apparatus for loading wood or coal upon locomotive tenders in the required quantity at once in place of tossing the fuel by hand, as usually practiced, thereby saving time, and, in the case of wood, packing it more closelyon the tender. The invention consists in a truck adapted for being moved on a track by means of a rack and pinion, whereby one end may be projected over the tender, and fitted at its end with a tilting platform for receiving the fuel and discharging it.

Mr. Carroll J. Atkins, of Louisiana, Mo., has invented an improved elevator for putting ice from water into a house. The horizontal part of the elevator is to set into the water deep enough to allow the ice to be floated into it, while the inclined part extends up to the house to the height, or above it, at which the ice is to be packed. The ice is drawn up the incline by means of a windlass and chains or ropes.

THE CARE OF TOOLS.

We believe—although we are not certain that it is capable of demonstration—that more tools are ruined by want of care than broken or worn out by proper use. It is surprising how ready even the thoughtful workman is to leave to neglect the tool which has just subserved his purpose. Carelessness in the use of tools is a source of enormous annual expense to manufacturers and others, an expense which, if aggregated, would probably surprise even the most observant. On the farm the plow is left in the furrow, the hoe between the rows of corn, the shovel in the pit, the scythe on the tree, and the ax in the log—left to rust and to the liability of accidents. The wood-worker, called away suddenly from the job he is doing, leaves his plane on the board he has been smoothing, to be knocked off by the first passer-by, or allows the auger bit or the saw to remain in the half-pierced timber, to be broken by the first swinging board in the hands of the apprentice. The blacksmith leaves his tongs at the vise when he needs them at the anvil, and the machinist drops tap, drill, reamer, or hammer, where last used.

Order is the "first law" in the shop as in heaven, and care, no less than cleanliness, is "next to godliness." Next to the advantage of having a place for every thing is the wisdom of keeping every thing in workable condition. In the machine shop the use of impure oils in drilling, tapping, etc., is an expensive economy. Oil containing mineral or earthy matter is only a grindstone in solution. It cuts and abrades the edges of the tool, while in use, precisely as does the grindstone or buff wheel. Gummy oils are scarcely less injurious. They add to the friction of the tap or drill, and demand increased strength to resist torsion. A "gummed-up" tap or file is almost useless until thoroughly cleaned. The application of warm soapsuds, benzine, or turpentine, will not always remove this gum. In such a case they can be readily cleaned by covering them with oil, turpentine, or any inflammable substance, and exposing them for a moment to a flame until the liquid takes fire; then card or wipe them and they will be found to be in excellent order. Finishing files not unfrequently become clogged, and when the card is useless to remove the "gurry," this process will be found efficient.

Sometimes, also, in filing wrought iron the tough particles of the iron are torn off by the teeth of the file and lodge, producing scratches on the work, and thus impairing the efficiency of the tool. A simple device, which we used for years, that easily and quickly dislodges these clinging particles, is a piece of soft iron wire flattened under the hammer at one end to a chisel point, or disintegrated like a broom and used thus: The point of the file resting on the bench, the handle held by the left hand; then strike across the face of the file, in the direction of the "first cut" teeth, with the flattened end. It certainly and thoroughly dislodges the snags, and the file is ready for work. The wire instrument may have a ring turned at the handle end, or be affixed to a wooden handle. No. 8 wire is large enough.

Turning tools, after being tempered and ground, are frequently left wet from the stone until wanted for use. In this state the keen edge is acted upon by rust, and a regrinding becomes necessary. If not put at once to the oil stone they should be wiped with oily waste. These little matters are more important than they seem at first sight. A saw or chisel which has been used in unseasoned wood, should be carefully wiped and oiled, otherwise it contracts rust, and wears away fast. A new file should not be put upon the scale of cast iron or of unannealed steel, and a file kept for brass or bronze should not be used on a harder metal. Back saws for cutting iron and other metals are often ruined in inexperienced hands. If drawn forward and back too rapidly they heat and lose their temper, when they become almost useless.

A hundred other instances might be adduced to show the depreciation of tools by neglect and the necessity of paying attention to these "little things." The real economist, however, needs but a hint, while the constitutionally careless are slow to see their errors.

The Microscope in the Witness Box.

As the New York *Tribune* says, the scientific aspects of the evidence against the Rev. Mr. Hayden, of Madison, Conn., for the murder of Mary Stannard, are truly remarkable; indeed the microscopic exhibition of arsenic and the comparison of arsenical crystals show that the law has a powerful auxiliary in chemistry. After the arrest of Mr. Hayden, and the disinterment of the remains of the dead girl for examination, it was claimed that all of the arsenic which Hayden had bought was still in a box in the barn. There a box was found containing a full ounce. It was shown that the arsenic found in Mary Stannard's stomach could not have been taken from this box. At this point recourse by the prosecution was had to Prof. Dana, who visited England, studied the manufacture of arsenic, and then, by the use of his microscope on the crystals, demonstrated that the arsenic from the girl's stomach was an entirely different lot from that hidden in the barn, and that it was identical with the arsenic sold by Tyler, at the time when Hayden is known to have bought his ounce. The conclusion sought to be established is that a part of the arsenic bought by Hayden was used to poison the girl, and that the rest was flung way, and that the barn arsenic was bought elsewhere afterward merely as a blind. The crystals of the stomach arsenic are three or four times as large as those of the barn arsenic, but none of them are large enough to be visible without the microscope. Hereafter criminals will do well to recognize in science one of the agents of possible detection.

Profitable Reading.

In these days all men and women read something, but the trouble is that by reading in a single vein, which so strongly appeals to their individual tastes and personal idiosyncrasies that it is not study at all, they lose their power to study anything else. The rule for successful and profitable reading would, in the light of these facts, seem to be to read only what one does not like to read. That reading which costs no effort, and necessarily dissipates the power of study, is that which we know to be important in itself, and in its bearings upon broad knowledge and culture should most engage our time and attention. The trouble is, not that we do not read enough, but we read so much of that which simply pleases us as to destroy our power to read that which will edify and enlarge us.—*Dr. J. G. Holland.*

Probable Uses of the Telegraph.

The following curious item, headed as above, was published in the SCIENTIFIC AMERICAN, October 26, 1867, when telegraphy may be said to have been in its early infancy:

Why should not every house have its telegraph wire? When gas was first applied to purposes of illumination it was used only in the public buildings and streets, and even now on the continent of Europe it has been introduced but sparingly into private dwellings. Why may not the telegraph wire be extended and diffused—if we may say so—as the gas pipe has been? Suppose a network of such wires laid from a central point in the city to the library or sitting room of every dwelling, and an arrangement made for collecting news similar to that controlled by the associated press. Through the wires, then, this news might be instantly communicated to each family, without the work of time rendered necessary to put it into type, print it, and distribute it by means of carriers. A fire, a murder, a riot, the result of an election, would be simultaneously known in every part of the city. Of course, this would do away with newspapers, but what of that? All things have their day, and why should such ephemeral things as newspapers be an exception to the rule?

THE EJECTOR.

[*Continued from first page.*]

them after a thorough test, and after a severe competition with those of English make. Ocean and coasting steamers provided with one or more of these ejectors in each watertight compartment would have a means of keeping clear of water until the necessary repairs could be made.

It is not sufficient to say that a steamer is provided with pumps, as it is a notable fact that pumps are almost always in a state of disarrangement, whereas there is nothing in the ejector that can get out of order or be misplaced.

The upper right hand view shows the application of the ejector to the fitting of railway water tanks, and the view below it shows its application to work in breweries and chemical works.

The ejectors are made in different ways for different purposes, and persons contemplating adopting these useful instruments should address Messrs. Nathan & Dreyfus, 108 Liberty street, New York city, for further information.

Water and Fire Proof Paper.

A water and fire proof paper lately patented is made by putting a mixture of ordinary pulp and asbestos reduced to pulp in the proportion of about two-thirds of the former to one-third of the latter into a strong solution of common salt and alum. This mixture is put through the engine and then run off through a Fourdrinier. The paper thus made is run through a bath of gum shellac dissolved in alcohol or other suitable volatile solvent of that gum, and subsequently through ordinary calender rolls, after which the paper is ready to be cut into such sized sheets as may be required for use. The effect of the strong solution of salt and alum upon the paper is to greatly strengthen it and to increase its fire-resisting qualities. The shellac bath to which it is treated is said to cause the paper to become thoroughly permeated with the gum, so the paper becomes water-proof to such an extent that long boiling in water does not disintegrate it, and the presence of the gum in and upon the surface of the paper seems to present no obstacle to the proper and usual absorption of ink, either printing or writing. Thus, by the combination of the asbestos, salt, and alum in the paper, it is rendered so far fire-proof that a direct exposure to an intense fire does not burn up the substance of the paper to an extent that interferes with safely handling it, and when exposed to great heat in books, or between metallic plates, a number of sheets together, it is much less injured by the fire.

The addition of the gum shellac to the paper makes it, for all practical purposes, water-proof, so that if account-books, valuable documents, bank bills, and other monetary papers for which this paper is used be subjected to the action of fire and water, either one or both, in a burning building, they will not be injured to such an extent as to destroy their value.

A Large Electro-Magnet.

Mr. Charles Reitz, of Indianapolis, Ind., sends us a description of a large electro-magnet made by him for Professor Zahm, of the University of Notre Dame. The length of the cores is 30 inches, diameter 4 inches. Heads, of rubber, ½ inch thick, 9 inches in diameter. The yoke is 3¾ inches thick, 6½ inches wide, and 18 inches long, with 3 inch slots to admit of moving the cores. The bolts which connect the cores with the yoke are 1¼ inches in diameter. The cores are wound with eight layers of No. 6 cotton covered copper wire, the wire being wound double, and the alternate layers being provided with terminals, which are connected with a plug switch on the baseboard, so that the electric current may be sent through the coils in various ways. The magnet is provided with two sets of pole extensions for diamagnetic experiments, one set being conical, the other flat. The armature is 15 inches long, 3 inches thick, and 4 inches wide.

Different effects may be produced in this magnet by connecting the coils with the battery in different ways. The changes that may be made in this way are almost without number. It is estimated that the magnet, with proper battery power, will lift three tons. The weight of the magnet and its attachments is 800 pounds.

The Maryland Ship Canal.

The route chosen for the proposed ship canal between Chesapeake and Delaware bays begins at Queenstown, Maryland, and runs across the peninsula to Lewes, Delaware, discharging into Delaware Bay, five miles above the Delaware breakwater; distance, 51 miles. It is proposed that the canal shall be 200 feet wide and 25 feet deep, with tide locks only. The entire line will have to be dug; estimated cost, $31,000,000. The saving in distance between Baltimore and any Northern port will be 225 miles.

Value of Knowledge.

It is affirmed that "a little knowledge is a dangerous thing." The saying may be true, but it is not necessarily true. I cannot help thinking that it is a great advantage to you to gain as much knowledge as you can, of as many subjects as you can, and not to be deterred by any fear that your knowledge, being superficial, may lead you into error. Of course, the danger is that a person, who knows only a little of a subject, may fancy himself well qualified to give an opinion on points that are really out of his depth; but as long as a person feels and knows that his knowledge of a subject extends only so far, and does not venture beyond