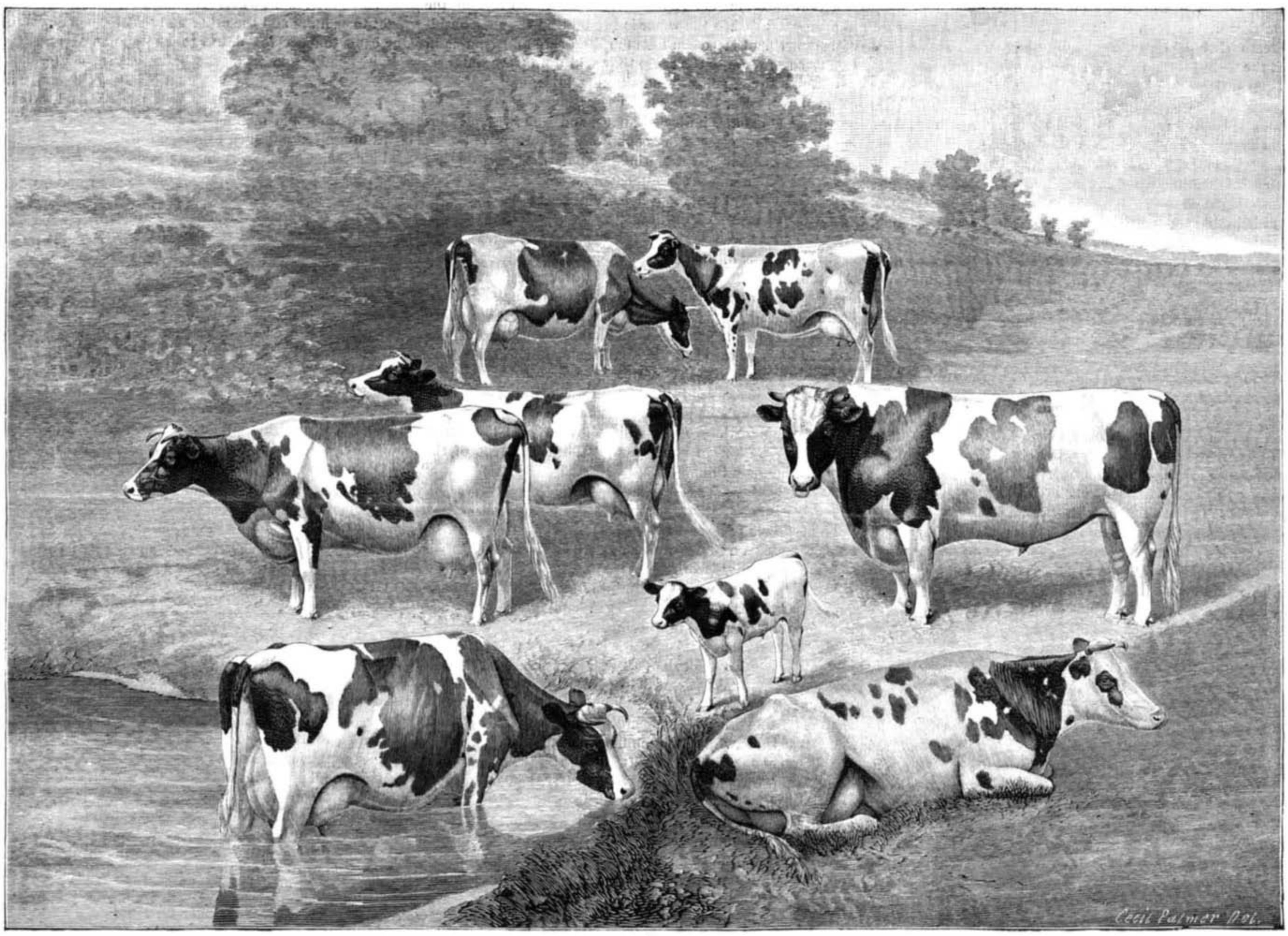
SOME SPECIMENS OF FINE CATTLE.

The accompanying representation of a select herd of cattle is from the pencil of Mr. Cecil Palmer, who has obtained considerable distinction in making pictures of this class; our engraving, for which we are indebted to the courtesy of the *Rural New-Yorker*, being a reduced copy of an original 28 by 36 in in size. The cattle represented all belong to the same family, the Aaggie, a breed imported from Holland, and now in possession of Messrs. Smiths & Powell, of Syracuse, N. Y.

At the right stands Neptune, the head of the family, and lying down in the foreground is Aaggie Kathleen; she has given this season, the first after her importation, 9,525 pounds of milk in seven months and five days to Nov. 1. Aaggie Beauty, standing in the water, has a milk record of 80 pounds 6 ounces in a day. As a three-year-old in Holland she gave 68½ pounds in a day; as a four year-old she gave, the first year after importation, 13,573 pounds, and made in one week 10 pounds of butter. Just above this one is Aaggie, having a milk record of 18,004 pounds 15 ounces in a year, and next behind her is Aaggie Beauty 2d, a daughter of Aaggie Beauty, who has given this season, as a three year-old, 7,793 pounds in seven months and six days to Nov. 1. At the left in the background is Aaggie Rosa, who as a five-year-old in Holland gave 91 pounds in a day, and last season gave 16,156 pounds in the year. The one in the right of the background is Aaggie May, the dam of the calf shown, and she has given this season, as a three-year-old, 57 pounds 13 ounces in one day, and 8,705 pounds in six months and sixteen days to Nov. 1.



SOME SPECIMENS OF FINE CATTLE.

Ardea Cœrulea.

Reader, I see before me a small lake or pond, lying in a vast tract of pine forest, unbroken, save here and there by the clearing of the settler who has cast his lot in this sunny clime of Florida; a pond that is decked here and there with beautiful water lilies, beneath which lies the alligator, ever ready to catch him who dares intrude on his domains; a pond wherein dwells the deadly moccasin, and whose shores are covered with a rank growth of wild oats and trees from which hangs the long Spanish moss—a landscape pleasing to the eye, but seen only by him who seeks Nature in all her glory. It is such a place as this that the little blue heron inhabits, and to which I shall take you for a glimpse of him as he is when freest from the fear of danger, and when pursuing his natural vocations. The little blue heron (*Ardea Cœrulea*), sometimes called the little white heron, is a constant resident of Florida, frequenting the small ponds, lakes, bayous, and lagoons, where its food is to be found, and where I have seen them assembled six or eight in number. The young are pure white in color (hence the name little white heron), from which they change to the dark blue color as they grow older, which, if I am not mistaken, they acquire in their third year.

Should there be a number of ponds near by, they seem to give preference to some certain one, at which they may almost always be found, unless previously frightened away, when they betake themselves to the next, where if they are not followed they remain for a time, and in the course of an hour or so wend their way back to the aforesaid pond. Now let me describe to you some of the habits of these birds, as I have observed them when lying in concealment on the shores of one of these ponds. Young and old feed together in perfect harmony, and a beautiful sight it is to see the snowy white plumage of the young birds intermingled with the dark blue of the old.

How proudly and yet how stealthily they step through the tall grass in search of their food! Suddenly one pauses, darts his beak at an insect, and again pursues his way. Yet in their chosen haunt they are constantly on the lookout for danger; pausing, they raise their long necks, and peer about them closely for some cause of alarm; assured that all is safe, they again betake themselves in search of whatever they may fancy as an article of diet.

Presently, one in his wanderings comes to a log lying partly on land, partly in water; mounting this, he proceeds to dress his plumage and to sun himself. With head drawn down between the shoulders, he stands motionless for an hour at a time, and it might seem as though he were asleep, but not so; let him hear but the snapping of a dry twig in the woods, and instantly every nerve is on the alert. Stretching out his neck, he gazes intently in the direction of the noise, and should he perceive sufficient cause for alarm, he immediately springs into the air together with the rest of his companions, who are not far off, when unless fired at they generally alight on the opposite shore, and seek refuge in the tall grass, or else alight in a tree. Should the one, however, who first heard the noise perceive no cause for alarm, he sometimes signals to his companions in some way, when they all arise, and fly a few times over the spot, and then alight again.

Let us now suppose that they have alighted in a tree where we can see them plainly. There they sit pluming themselves, but yet keeping a sharp lookout to see if they are followed. If everything remains quiet after a lapse of ten or fifteen minutes, they begin to fly down one at a time. Close at hand lies the upturned root of a fallen tree; on this they alight first, then from there they fly to the ground. The last one to leave his perch usually tarries a few moments as if to take a last look, then he also flies down and joins the rest, when they soon work their way to some favored spot.

When perched on a tree they carry their body in an oblique position, at an angle of about 45°; but when walking on the ground or when wading in the water in search of food, it is horizontal, or perhaps the breast is carried a trifle below the tail. The way in which they carry their necks when flying is different from their near relative, *Ardea Herodias* (great blue heron), being the shape of a broad, shallow U, with the head a little higher than the shoulders, whereas in *A. Herodias*, it is folded similar to a reef. Should they be suddenly approached, they fly away with a hoarse, harsh, croaking noise.

Occasionally they stroll for some distance into the woods, for the beetles, insects, etc., to be found there. I have seen them forty to fifty rods from the water. When there they sometimes rise and fly a few yards, and then alight again; in such cases they do not fly higher than four or five feet from the ground. I have never seen these birds in the rushes; they seem to prefer the grass from two to three feet high on the shores. Their manner of alighting is different from that of other herons. When about to alight, they throw themselves back into the air perpendicularly, with wings and tail widely expanded, and neck partially drawn in (representing as near as possible the screens that are made from them by taxidermists), then glide toward the spot selected, pause an instant, wheel, and alight. Sometimes these birds become so far accustomed to civilization that they will approach quite close to a building from which much noise proceeds. To illustrate: I saw one alight on the shore of a pond, in plain sight of and within a stone's throw of a large saw mill (which at the time was running at full speed), and remain there until frightened away by the mill hands. I have never heard this bird utter any note, except the note described when suddenly surprised, and then only when surprised.

Description: Length, 22⅝ in.; extent, 38 in.; iris light yellow in both stages of plumage. Bill dark blue at base, black at tip. Lores yellowish blue, tarsus pea green, toes pea green, claws blackish drab. In white plumage, mostly white, but generally showing some traces of blue, especially on the wing tips. In the full or blue plumage, slaty blue, or dark grayish blue, becoming purplish red or maroon colored on the neck and head. Bill on loral space, blue, shading to black toward the end. Legs and feet black.

E. M. HASBROUCK.

THE oldest person in the State of Wisconsin, John Jondro, aged 121 years, died on Saturday morning, Nov. 29, 1884, at Arkansaw. Mr. Jondro was born in the parish of Phillip, near Montreal, in 1763. He was in the employ of the Northwestern Fur Company forty years, and during the last forty years he has lived in this neighborhood. In his younger years he served some time in the Federal army, and often related interesting tales of army life. His age is taken from the statement of the parish prelate of Phillip.

Artificial Sea Water for Aquaria.

The following, by Prof. R. E. Hoffmann, of Berlin, is translated in the *Bulletin of the United States Fish Commission:*

In former years hardly any salt water aquaria were found in inland countries, because the expense and trouble of furnishing a constant supply of salt water were too great. Even the Berlin Aquarium, with its abundant funds, was so far from the nearest sea coast as to make the supply of natural sea water uncertain, and it suffered from this condition of affairs. The people of Berlin wittily called this chronic condition of their aquarium its "sea sickness." Although every new institution has to pass through a period of so-called "children's diseases," this peculiar "sickness" of the Berlin Aquarium proved very obstinate, and even threatened the life of the young and tender child whose birth had been hailed with so much joy. The Vienna Aquarium had to pass through similar experiences, and the stockholders were obliged to pay dearly for the experiment. As matters stood at the Berlin Aquarium, the use of artificial sea water seemed very desirable; but many a well planned experiment based on scientific principles proved a failure; for, although the component parts of sea water are well known, and any chemist can easily prepare it from a receipt, it seemed at first impossible, in a chemical way, to breathe the "breath of God" into our scientific sea water, and to impart to it the secret of true vitality. At last, however, long after the institution had been opened, Dr. Hermes succeeded in solving the problem in a scientific manner, and proved in the most incontrovertible way that the maintenance of inland salt water aquaria was no longer dependent on the nearness of the sea coast. Dr. Hermes succeeded in satisfying every demand, as regards sea water, within one week.

The very bold assertion of the director of the zoophyte aquaria in the zoological garden in Regent's Park, London, that artificial sea water, even if a chemical analysis cannot discover the least difference between it and natural sea water, is never beneficial to animals and plants, has been disproved by the success of the Berlin Aquarium. Since we have succeeded in manufacturing artificial sea water which possesses all the qualities necessary for the life of animals and plants, and which, by the use of suitable apparatus, can be kept fresh for years, nothing prevents inland towns from having sea water aquaria, which, in many respects, are peculiarly interesting.

As sea water aquaria have a great future in Germany, and will rapidly increase in number if proper directions for their maintenance are given, I will describe the manufacture of the water in such a manner that any one can easily prepare it himself. To 50 liters (about 13¼ gallons) of pure hard well water take 1,325 grammes (46½ ounces) of common salt, 100 grammes (about 3½ ounces) of sulphate of magnesium, 150 grammes (about 5¼ ounces) of chlorate of magnesium (chlormagnesium), and 60 grammes (about 2 ounces) of sulphate of potassium, all of which can be obtained at any drug-store, but generally not entirely pure; and foreign admixtures and impurities may easily cause the death of all the animals. Each of these chemicals is dissolved in water by itself; accordingly they may all be poured together and allowed to stand quietly for several hours, so that little stones and other impurities may settle to the bottom. All particles of dirt floating on the surface should be carefully removed by dipping. The mixture is then poured into another vessel, and diluted with fresh water until the hydrometer indicates the proper degree of saltness. The quantities given above will produce about 50 liters (about 13¼ gallons) of sea water.

This composition I have ascertained comes very near to that of natural sea water, for, besides the component parts given above, it also contains small quantities of soda, iron, and potash. I obtain the chemicals for preparing my sea water, which contains all the seven ingredients in their true proportions, from a friend of mine who is a chemist, and am prepared to supply others. Most of the sea water found in the market contains only the four first mentioned salts, and is likewise suitable for filling the basin. One should be careful, however, not to put animals in such freshly manufactured sea water, as this would almost beyond a doubt kill them. It is well known that sea water is 0·027 gramme heavier than fresh water; its weight is therefore 1·027. Everything lacking in this weight must be carefully added from time to time by pouring in fresh water as the water evaporates, while this is not the case with the salts. The solid ingredients of sea water constitute about 3½ per cent of its weight, or one-half ounce to a pound of water. A hydrometer is indispensable for ascertaining the degree of saltness.

Newly manufactured sea water should be placed in the open air in some cool place, and allowed to stand for some time. If one has any live salt water algæ adhering to stones they should be added, because they impregnate the water with oxygen. After some weeks the algæ will spread all round them clouds of diminutive seeds, which adhere to the walls, and quickly grow under the influence of light. By supplying oxygen they make the water, after it has been filtered several times, still more fitted to receive animals. Of sea plants, the green ulvæ and the confervæ are particularly suitable for recently manufactured salt water.

In the beginning only a few hardy animals should be placed in the water, which will flourish and thrive in it; and after an attempt may be made with more tender animals, which, if placed in the water in the beginning, would probably have died. If no algæ can be obtained, the water should be allowed to stand longer. Any one who can afford to wait until a green cover of algæ spreads over the panes, will do well to defer placing the animals in the water till that time, and a little patience is very commendable during the entire process. Like wine, salt water, if properly treated, improves with age, as special apparatus continually supply it with oxygen by night, and keep it agitated. The water in the Hamburg Aquarium has not been changed for fifteen years, and is still perfectly clear, transparent, and odorless, in short, of the very best quality; and all that has to be done is to make up for accidental losses or evaporation. The water of the salt water aquarium is changed or filtered only when it begins to get turbid, or if some change is to be made in the arrangement of the aquarium. It will always be advisable, however, to keep at least a double supply of sea water on hand, and place it in the cellar in well corked bottles, as any sudden emergency will then be fully met.

I have never been able to obtain natural sea water which was as clear as the artificial, through which one can see everything distinctly, even in the most remote corner of a large aquarium, which it would be very difficult to do in natural sea water. I have brought up sea water in a dipper which, when poured into a glass, was as clear as crystal and had a brilliant blue color; but this is possible only on the high seas, and when the water is brought up from a considerable depth. Fishermen take too little care and trouble in this respect: close to the shore they will dip up the water resembling a thick, yellow, and stinking juice, and ship it to other places. For this reason I use artificial sea water prepared in the manner indicated above, and even without adding any plants I succeed in keeping my animals alive.

It is self-evident that the principal point in constructing salt water aquaria is the treatment of the water, which, after all, is the element which decides the well-being and sickness, life and death, of the animals. Care should be taken to keep the water well supplied with oxygen, which is easily done by means of the aerating apparatus; and to see to it that the normal proportion between the salts and sea water is always maintained, and as soon as anything appears to be wanting in this respect, it should be supplied. As soon as the water begins to get turbid it should be filtered, and during an abnormal state of the weather it should be cooled. Only when these conditions are fulfilled will it be possible to keep up a successful salt water aquarium; only thus shall we be enabled to have in our rooms an exact representation of the bottom of the sea, with all its mysteries and wonders. I, therefore, repeat in conclusion, "The treatment of the water is the main thing."

A Florida Woman Who Runs a Sawmill.

The following letter, written to the *Northwestern Lumberman*, contains a number of homely truths that apply to all sorts of mechanical work:

Your letter of a late date requesting me to give my experience as a lumber manufacturer is at hand. I will state at the start that I am not in the business through choice; but having loaned money to parties with which to purchase a saw mill, I was compelled by their failure to make even the first payment to take the machinery from them. I then put my son-in-law, Ernest Wever, who promised great things, in charge. I told him I knew nothing of sawmilling, but I knew that the sawdust was too fine and the scratches on the boards too close together. I left him to run the mill, but in a short time I found he could do no better than other men, and I took him out of there so quick it made his head swim. I moved the mill a distance of 20 miles, fording the Hillsborough River, and placed it near my own house, at an actual expense of $9; and in a few days I had everything in good order. I have my own teams and carts, and take timber from my own lands.

Although accustomed to manage my own affairs, commencing by the time I was grown, I found difficulties enough in making lumber, and I have often said that a sawmill and Satan belong in the same family, and some people say that since I became the owner of one they are sure of it; but while they talk I am at work. This is the trouble with half the country sawmills: There is too much talking and not enough work. Why, Mr. Editor, the most of men talk over a log long enough to saw it into inch boards. Then when they get started they discover that the fireman has not steam enough; then they must all sit down and talk again. By the time steam is up and one or two boards sawed, a belt must be repaired, which might just as well have been attended to before working hours in the morning or at noon. Then one man sews the belt while all engage in talk again. When the belt is ready, the sawyer gets it into his mind that the machinery needs oiling; then he hunts up the oil can, for he never has a place for anything, and goes around squirting oil into every hole but the right one, while the other hands go on with their talking. The next day they are out of logs, and the mill hands do nothing except to allow "their time to go on." The day following some of the men are reported sick, and more time is lost. At the end of the month there is little lumber and no money, and they all wonder why sawmilling does not pay.

I knew well enough that machinery is made to run, and when running it should be at work, and all I had to do was to keep the saw cutting for ten hours a day and six days in the week. In order to do this the mill must be kept in good order, not by repairing broken parts, but by keeping it from getting broken. And I soon saw that the parts of machinery out of sight were neglected the most. I would suppose any man would know that it is the inside of things that needs attention—the inside of the boiler, the inside of the cylinder, the inside of the pump or inspirator is of far more importance than the outside. Nothing makes me more angry than to see a man rubbing up the outside of his boiler when I know the mud is six inches deep inside, baking, burning, and blistering the iron; yet I have seen but few saw mills except my own. But I saw how that was managed before I took possession of it, and I am told that others are managed no better.

Many a man in the sawmill business would do well if he could get skilled labor, but this State is cursed with a tribe of sawmill tramps who claim to know everything, and when tried can do nothing. They are always on foot and out of money, yet if we are to believe them they have been the superintendents of the largest mills in America. Every one of them has been Governor Drew's principal sawyer for at least ten years, receiving not less than $6 a day. They all know more of machinery than the men who make it, and are ready, not to commence sawing, but to commence cutting, changing, splicing, and rebuilding, with a promise that if I will give them $3.50 per day and board they will double the capacity of my mill and be ready for work in about three weeks. I have never been deceived by one of them, but they leave their mark wherever employed. One-half of them ought to be hung and the other half sent to the penitentiary. One came to me a few days ago who was an exception, for, notwithstanding he was "the best sawyer in Florida," he was willing to work for $10 a month and board, or $12 if he boarded "hisself"—hungry looking wretch! I wouldn't have boarded him even a day for $2, and I knew he couldn't board himself at any such price. Said I, "Do you see that road out there?" He very meekly said he did. "Then," said I, "you go out there, and when you get to it you take either end you like; the one that will put you out of my sight the quickest will suit me the best." He went. If he had not, I would have put the dogs after him in three minutes.

I employ none but the best hands—not paying too much or too little, for one fault is about as bad as the other.

I can't say just what my lumber costs me, but I know that when sold I have taken in more money than I have paid out. I am 53 years old, or about that, was born in Florida, and was raised at a time when bookkeeping was not thought of.

I now have my second husband, and I am the mother of nine children, seven of whom are now living. Several of the elder are doing business for themselves, yet they always come to "mother" for advice, and when they don't take it they wish they had. I have always managed my own business, and I expect to while I live. I awake in the morning and plan the day's work while the men are asleep, and at the breakfast table I give every one his orders, including my husband, who never objects to my doing the thinking for the family.

My first advice to men who contemplate going into the sawmill business is—don't do it, for not one in twenty of you has the ability to succeed. If, however, you are determined to try it, be careful that you get the best machinery, strong and heavy enough to stand the bad treatment of awkward hands. Buy the most durable belts, no matter what they cost, for half the failures in our backwoods mills are caused by constant breaking of belts. And when a complete outfit is secured, locate where you can get timber and sell lumber. Keep your machines in good order, taking special care of all parts out of sight. Pay your hands in cash, and not in promises, for they work for the money, and not for any love they have for you or your business. When you can't pay, shut down, stack your lumber, and discharge all hands. Your mill will neither eat, drink, nor wear anything while standing still. But when you do run, work everything to its full capacity. HARRIET SMITH.

Tuckertown, Fla., November 17, 1884.

A Bird Catching Tree.

Among the transactions of the New Zealand Institute Mr. R. H. Govett gives some startling facts as to the bird-killing powers of *Pisonia brunoniana* or *P. sinclairii.* A sticky gum is secreted by the carpels when they attain their full size, but is nearly as plentiful in their unripe as in their ripe condition. Possibly attracted by the flies which embalm themselves in these sticky seed vessels, birds alight on the branches, and on one occasion two silver-eyes (Zosteropos) and an English sparrow were found with their wings so glued that they were unable to flutter. Mr. Govett's sister, thinking to do a merciful act, collected all the fruit bearing branches that were within reach and threw them on a dust heap. Next day about a dozen silver-eyes were found glued to them, four or five of the pods to each bird. She writes: "Looking at the tree, one sees tufts of feathers and legs where the birds have died, and I don't think the birds could possibly get away without help. The black cat just lives under the tree, a good many of the birds falling to her share, but a good many pods get into her fur, and she has to come and get them dragged out."

In a note Mr. T. Kirk says that *Pisonia umbellifera*, Seeman = *P. sinclairii*, Hook. f., is found in several localities north of Whangerei, both on the east and west coasts, also on the Taranga Islands, Arid Island, Little Barrier Island, and on the East Cape, possibly in the last locality planted by the Maoris. The fruiting pericarp is remarkable for its viscidity, which is usually retained for a considerable period after the fruit is fully matured. It can be readily imagined that small birds tempted to feed on the seeds might easily become glued to a cluster of fruits.

On Steel Hardened by Pressure.

The new process invented by M. Clemandot for hardening steel was lately examined by M. Ad. Carnot, and made the subject of a report presented by him, as a chairman of a committee, to the French Societe d'Encouragement for National Industry. The method in question consists in heating the metal to the proper degree of softness, and submitting it while cooling to heavy pressure. The result is the formation of a hardened steel possessing properties similar to those developed by the operation of quenching.

The remarks and explanations contained in M. A. Carnot's paper are quite interesting and practical, but somewhat lengthy. We give below a condensation of the most important points.

The use of strong pressure in working steel, he says, was tried some years ago in England by Whitworth, but with a different object and under different circumstances. Then the idea was to prevent the flaws due to air bubbles forming during the solidification of cast steel. Similar trials were also made in France, but always in the same manner, that is, by operating on the steel while yet in the semi-liquid state. M. Clemandot, on the contrary, takes steel already worked, either cast, hammered, or rolled, which he only heats to cherry-red heat, and then submits, under a hydraulic press, to a pressure of from one thousand to three thousand kilogs. per square centimeter (about six and a half to twenty tons per square inch). The metal is allowed to cool in the press, and when withdrawn has acquired the new qualities, and needs no annealing or supplementary process whatever.

The metal thus produced sensibly differs from ordinary steel slowly cooled in the air without pressure. It is much finer grained, and considerably harder and tougher. To a certain extent it resembles steel hardened by quenching in water, yet the two are not identical.

On examining the process it will be seen that it consists of two physical effects, different although nearly simultaneous. One is continuous and powerful pressure; the other rapid cooling.

Strong pressure must cause, on one hand, a rise of temperature in the metal, and also a tightening of the steel molecules while they are yet soft enough to weld together. On the other hand, the cooling of the steel must be very rapid between the plates of the hydraulic press. It must be all the more so that a high pressure tends to render the contact very close between the objects and the heavy metallic plates of the press. Hence the final result of the operation is a double one: it combines to a certain extent the effects of hammering or rolling with those of hardening by quenching in water.

To better understand where the old processes and the new one differ and where they are similar, it is well to examine separately the various methods of working steel.

HAMMERING AND ROLLING.

When steel is heated to redness, and allowed to cool slowly, it is apt to acquire a granular structure, often at the same time allowing a part of the combined carbon to separate in the state of graphite. The operations of hammering and rolling the metal, while yet very hot, prevent to a certain extent the granular change, render the steel tougher and more homogeneous, and lessen the proportion of carbon which is lost in the shape of graphite. These operations, however, last but a short time, so that on being left to itself the metal soon crystallizes again, and in the end is not very different in texture from what it would have been if it had been left alone.

The effect of the hydraulic press must be quite dissimilar. The actual pressure, it is true, cannot equal that produced by the pounding of heavy hammers, but it is uninterrupted while the objects are cooling. Hence the molecules of the metal are possibly welded together permanently, thus forming a very tough and elastic steel.

TEMPERING.

The tempering of steel appears to have the effect of preventing the metal from crystallizing. Whether mercury, oil, pure water, or saline water be used for quenching, the principle is the same, and consists in a rapid cooling of the metal. The results are *chemical* and *physical*.

The *chemical* effects are still imperfectly known, yet it is generally admitted that steel contains, after quenching, a larger proportion of combined, or rather dissolved, carbon than before, while untempered steel contains more free carbon in a state resembling graphite. The chemical effects of tempering may therefore be said to closely unite the carbon and the iron, or to prevent the separation of the two substances already combined.

The *physical* effects are more complicated than is generally believed. At first the exterior strata contract on cooling, and strongly compress the internal portions, still soft and malleable, in such a way as to probably weld together the molecules of the metal. This first action may be compared to that produced by hammering the red hot steel.

But now a secondary action begins, which is quite different, and all the more noticeable that the piece is larger. At the moment of the sudden hardening of the surface the inside layers are yet hot and strongly dilated. Hence, when the latter, on cooling in their turn, tend to contract, the external strata having become hard and rigid cannot follow the motion, and this must create unequal tensions between the various sections of the steel.

There are no direct experiments proving the truth of this theory, but two facts indirectly show its correctness. One is the decrease observed in the specific gravity of steel when it is tempered. The other is the internal cracking so frequently noticed in large pieces of tempered steel, and which occurs sometimes at the moment of quenching, sometimes shortly afterward, and again after a longer delay, when the piece is struck or exposed to changes of temperature.

If it is considered that the internal inequality of tension above alluded to may become so considerable as to rise above the tenacity of the metal, the cause of these cracks becomes readily intelligible.

The remedies proposed for these fatal defects have all been either useless or impracticable. Among them the quenching in boiling water succeeds to a certain extent, but fails to afford the hardness obtained otherwise. The plan of cooling from the center instead of the exterior is excellent in theory, but almost impossible in practice.

HARDENING BY PRESSURE.

A mistaken idea must be, to begin with, brushed aside. It has been written by some that hardening by this process could only be obtained by pressure in a mould of the exact dimensions of the steel object.

Such is not the case. The pressure needs only be applied to two opposite surfaces of the object, previously heated to a cherry red heat. A square bar, for instance, straight or curved into horseshoe shape, has only to be laid flat on the plate of the hydraulic press. A cylinder or torus may have the pressure applied on two opposite edges, and so forth. As a rule, of course, it is advantageous to apply the pressure to the greatest surfaces. To work under the best conditions the steel object, previously heated as said above, should be compressed as speedily as possible. To this purpose the press is prepared so as to leave between the two plates space just sufficient to admit the object, and the pressure being applied at once, is carried as quickly as possible to the extent fixed beforehand. Care must be taken also that the metallic plates, which are in direct contact with the object, be clean and level, so as to be good heat conductors.

Thus the double result mentioned above, is obtained, namely, a tightening if not a welding of the steel molecules, owing to the powerful and uninterrupted action of the press, and at the same time, through contact with cold metallic masses, a rapid chilling similar to quenching in a liquid. And yet there is between the two processes this essential difference, that steel tempered by immersion increases in volume, thereby decreasing in specific gravity, while under the action of the hydraulic press steel retains its original volume, and escapes the state of internal distention already spoken of. Direct experiments have proved that *a priori* theories are confirmed by actual facts.

MAGNETIC EFFECTS OF COMPRESSION.

Between ordinary tempered steel and compressed steel there exists one more similarity, namely, the acquired power of forming magnets. A steel bar sufficiently rich in carbon becomes, after hardening by pressure, readily magnetized, just as if it had been hardened by immersion. Recently instituted trials have demonstrated that magnets made with compressed steel are slightly inferior in power to those composed of ordinary tempered steel, but the metal possesses the singular property of retaining its coercive force even after annealing and welding. Like ordinary steel it loses its magnetization on being heated to redness, but while common steel must be tempered again to make a magnet, compressed steel can be magnetized without further preparation.

The conclusions of the report are that M. Clemandot's invention deserves encouragement, as affording a new process for imparting to steel the hardness, homogeneousness, and capacity for magnetization hitherto obtained through tempering by immersion; certain disadvantages of this last process are at the same time obviated. It is the opening of a new way worthy of investigation.

Poisonous Cheese.

At the October meeting of the American Public Health Association at St. Louis, Professor V. C. Vaughan, M.D., of the State Board of Health of Michigan, read a paper on the "Study of Poisonous Cheese." It is well known that cases of severe illness follow the eating of some cheese, especially in North Germany and America, but in France no such cases are found. In Michigan, within the last six months, over three hundred cases of cheese poisoning have been reported. The symptoms produced are dryness of the throat, nausea, vomiting, diarrhœa, headache, and double vision—the same symptoms as gastro-intestinal poisoning. Cases of cheese poisoning are rarely fatal, six deaths in three hundred and forty-two cases occurring in Holland in 1874, a little over two per cent. Cheese that may be harmful to man may be eaten by lower animals without danger, and a cat once ate cheese that had poisoned thirty people, but the feline experienced no toxic effect. Coloring cheese with annatto may be looked upon, perhaps, as a justifiable adulteration. Samples of cheese that had poisoned many people indicated the presence of acids, litmus paper turning blue. The indications then were that the poison was caused by chemical acids and not by bacteria. Microscopic examination, however, revealed the presence of a spherical bacillus subtilis which did not affect a cat when injected beneath the skin. Only poisonous cheese violently reddens litmus paper, and this is a test easy of application. Every grocer should try the experiment when he cuts a new cheese. The following are the conclusions: 1. That toxic material in poisonous cheese is a compound soluble in acohol. 2. The production of this poisonous material is due to the rapid growth of the bacillus subtilis. 3. The difference between poisonous and non-poisonous new cheese is one of degree rather than of nature.

The Process by which Steel Pens are Made.

A representative of the New York *Sun* has been investigating the steel pen manufacturing business of this country, and reports as follows:

About a million gross of steel pens are worn out every year in the United States. What becomes of them? Twenty years ago most of the steel pens used in this country were imported. Now comparatively few are imported, and there are several factories in the country in which they are made in large quantities. One factory is in Connecticut, another is in Pennsylvania, and a large one is in Camden. The manufacturers say that the industry has been fostered by the protective tariff, and that if the tariff were to be taken off, the market would be flooded with cheap steel pens at lower prices than ours and of inferior quality. At present the importation of foreign pens is mainly confined to high priced articles.

It was at first doubted that steel pens could be made in this country, but it was soon learned that the requisite skilled labor could be obtained for high wages, and the success of the pioneers led one manufacturer after another into the business, until now the field is pretty well supplied. Most of the work on these little instruments is done with the aid of very nice machinery worked by women and girls. The steel used is imported, because it is believed that the quality is more uniform than American steel. This uniformity of quality is necessary because of the very delicate tempering required in the manufacture of the pens. That mysterious quality of steel which gives different grades of elasticity and brittleness to different colors of steel is a quality that requires expert manipulation on the part of the workman who does the tempering. He must know the nature of the material with which he works, and with that knowledge must exercise a celerity and skill that seizes upon the proper instant to fasten the steel at a heat which insures the requisite quality.

First the steel is rolled into big sheets. This is cut into strips about three inches wide. These strips are annealed, that is, they are heated to a red heat and permitted to cool very gradually, so that the brittleness is all removed and the steel is soft enough to be easily worked. Then the strips are again rolled to the required thickness, or, rather, thinness, for the average steel pen is not thicker than a sheet of thin letter paper. Next the blank pen is cut out of the flat strip. On this the name of the maker or of the brand is stamped. The last is a very important factor. There are numbers that have come to be a valuable property to manufacturers. Many clerks say they cannot work to advantage unless they have particular styles of pens. The result is that by passing the word from one writer to another a market is soon created for a favorite style. Each steel pen has therefore to be stamped with sufficient reading matter to identify it thoroughly. The stamping is done with very nicely cut sharp dies that cut deep and clean, so that the reading matter will not be obliterated by the finishing process. Next the pen is moulded in a form which combines gracefulness with strength. The rounding enables the pen to hold the requisite ink, and to distribute it more gradually than could be done with a flat blade.

The little hole which is cut at the end of the slit serves to regulate the elasticity, and also facilitates the running of the ink. Then comes the process of hardening and tempering. The steel is heated to a cherry-red, and then plunged suddenly into some cool substance. This at once changes the quality of the metal from that of a soft, lead-like substance to a brittle, springy one. Then the temper of the steel must be drawn, for without this process it would be too brittle. The drawing consists of heating the pen until it reaches a certain color. The quality of the temper varies according to the color to which the steel is permitted to run. It is the quick eye for color and the quick hand to fasten it that constitutes the skill of the temperer of steel. When the steel is heated for tempering, it is bright. The first color that appears is a straw color. This changes rapidly to a blue. The elasticity of the metal varies with the color, and is fastened at any point by instant plunging in cold water.

The processes of slitting, polishing, pointing, and finishing the pens are operations requiring dexterity, but by long practice the workmen and workwomen become very expert. There have been few changes of late years, and the process of manufacture is much the same that it was twenty years ago, and the prices are rather uniform, ranging from 75 cents to $4 a gross, according to the quality of the finish. The boxes sold almost universally contain a gross.

Fancies come and go in the styles of pens as in other fashions. One American maker alone turns out about 350 different patterns. Some are very odd, such as the stub pens, the draughtsman's pen, which makes two parallel lines at once; the mammoth pen, suited to use on rough paper; and the pen with the turned-up point, that writes a thick mark, yet runs smoothly over the paper. Then there are delicate pens for ladies, pens that make a fine hair line and yet can spring out to a heavy shading. Already the American steel pens have become famous abroad, and many are exported. Many pens are made of other metals besides steel. One kind is the German silver non-corrosive pen for red ink. Another is an imitation gold pen made of non-corrosive metal. There are pens of all colors and sizes for all trades and professions.