blade and comb may be increased or diminished at will. The guard plate, having its edge curled over in the manner shown, is simply slid endwise upon the comb, so that it may be readily removed when desired. In use, the hair is caught upon the comb, and the shears operated in the ordinary manner, the comb serving to present the hair in proper and even shape to the blades, and also, when rested upon the head, to govern the length at which the hair is cut, rendering the same uniform and smooth.

The second illustration shows an improved razor strop, the invention of Mr. John Maxson, of Scott, N. Y. Fig. 1 is a front view of the strop, closed, the case being again shown in section. Fig. 3 is an edge view of the same arranged as a convex hone. The object is to furnish a strop which may be used as a haul strop, a straight hone, a flexible convex hone, and a spring strop.

A represents the stock of the strop, which is faced with leather. To the forward end is attached the end of a loose strop, B, of the same length and breadth as the face of the hone, A, to the free end of which is attached a ring, O, to hook upon a hook, D, attached to the forward side of the handle, and also to hook upon the hooks, *e'*, formed upon the lever, E The lever, E, is pivoted to a stud or bracket, F, attached to the handle, so as to leave room for the hooks, *e'*, when the lever, E, is turned back against the handle, and to allow the lever to turn so that the tension of the strap, B, will lock it in place, the ring, C, being made large enough to pass over the rear end of the lever, E, and over the bracket, F, Fig. 3. When the strap is to be put into the case, ●, the strap, B, is turned forward upon the face of the hone, A, and the ring, C, is hooked upon the hook, D, which prevents the face of the hone from being rubbed by the case, ●. This is also the adjustment when the strap is to be used as a haul strop. By detaching the ring, C, from the hook, D, and throwing the strap, B, back, the instrument is a straight hone. By swinging the lever, E, forward, passing it through the ring, C, passing the said ring into the hooks, *e'*, and drawing the lever, E, back, the stock, A, is bent to form a flexible convex hone, to enter the hollow of the blade and keep the edge thin; and at the same time the strap, B, being brought under tension, becomes a spring strop for setting the edge.

Correspondence.

A Second Channel for the Erie Canal.

To the Editor of the Scientific American:

I have a suggestion to make for increasing the capacity of the Erie Canal; and although it involves a large outlay, I believe the State would be justified in adopting it, at least for a part of the distance, say from Buffalo to Rochester. I propose to separate the downward bound from the upward bound boats, thereby having a distinct and separate channel for each; to effect this, I would have the work commence at the west end, at Buffalo, and dig another canal, alongside of the present one, from Buffalo to Rochester. Let the new canal be of the same width as, and 3 feet deeper than, the present one, and make it so that it will have a descent of 7 inches to the mile; this will establish a current of water of about 3 miles per hour; and then a boat will go, where speed is not a matter of importance, at about 3 miles per hour without requiring any steam power, and without any swell or washing of the banks.

This theory of a double channel canal will apply to other canals, or parts of canals, where water is plentiful and the down grade sufficient; and the speed and size may be increased or diminished so as to conform to the topography of the country and the requirements of commerce, the engineers being guided by experience. I have suggested this size for the Erie Canal, because one channel is already constructed; and if the authorities will dig the other of the same width and 3 feet deeper, it will, I think, be of the proper proportion. It should, however, accommodate such a brig as those which sail the Lakes; and the brig could draw 8 feet of water in the down grade channel and 6 feet in the upward. Some changes, however, would be necessary in the upward channel; the bridges would have to be removed, and drawbridges erected in their stead. As the different channels would seldom be on a level with each other, it would be necessary to construct partition locks at all important towns along the way, so as to lock from one channel to the other.

I think this improvement might be constructed from Buffalo to Rochester for $35,000,000, and the State could accomplish it in 5 years. Then, by saving the tolls for 20 years, the State might construct a similar distance further east at a similar cost, always keeping the tolls at such figures that the canal would not become a burden in a financial way.

I claim for this theory that, in the eastward or downward direction, it would double the speed of the boats and quadruple the capacity of the present canal; and that it would be much more convenient for boatmen, for it would enable them to transport freight for one half the price which they now do, and pay the same tolls. I have based my estimates on a knowledge of the topography of the country gained by 20 year's experience; and would be pleased to have the opinions of some of the local engineers.

Sioux Rapids, Iowa. W. T. CROZIER.

A Cheap Refrigerator Wanted.

To the Editor of the Scientific American:

As ice water is a necessity, I suggest that some one of our manufacturers of paper pails should put into the market an ice cooler, made of paper with a jar of glazed pottery inside, with sawdust between the two vessels. Such a utensil would be within the reach of all as to price: and paper being a good non-conductor of heat, it would be far superior to the metal of which most coolers are now made. I made one last summer from a large paper box, in the manner above described. In the next office to mine, with similar temperature, there was a cooler made with an outside of tin, zinc-lined, and filled in with charcoal. Each morning a similar quantity of ice was put into each. The result was that, at about 4 P. M. every day, the ice in the metal and charcoal cooler had disappeared; and in the paper and sawdust one, there was ice left on the following morning.

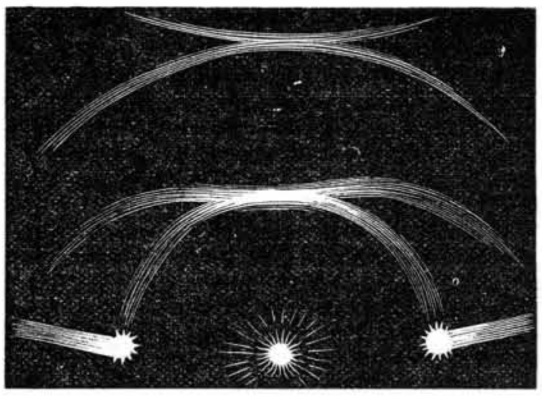
If any manufacturer of paper pails avails himself of this suggestion, I shall be paid for making it, and will have an opportunity of replacing the homemade one I now have with one more ornamental.

Cottonwood Springs, Neb. C. H. ROBERTS.

A Solar Phenomenon.

To the Editor of the Scientific American:

I inclose a diagram of a solar phenomenon which appeared on January 31, at 10:30 A. M. The day was warm and springlike. At night the air turned cold, and a light snow fell. The intersecting circles over the sun formed an Indian bow,



and showed the prismatic colors very brightly. The halos extending from the sun dogs were long and straight, their outer ends being higher above the horizon, as represented in the engraving. C. O. HOWARD.

Waukon, Iowa.

Bored or Driven Wells.

To the Editor of the Scientific American:

Some time since I noticed in your journal the question: "Are not bored wells a failure, on account of the small cistern they have for holding water?" The following are a few facts on the system as used in California.

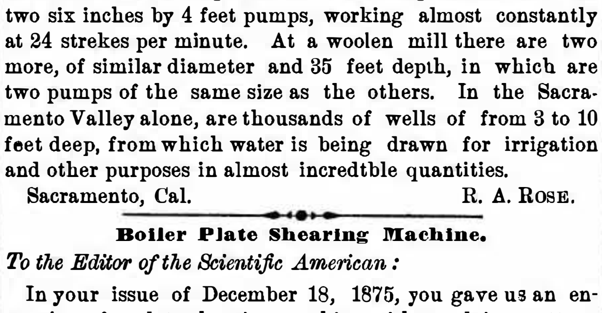
We have been in the business of well boring here for 18 years, and in that time have never seen a well properly bored, which failed to give an inexhaustible supply of water. We have on our place a well of 6 inches diameter and 35 feet depth, from which the largest hand fire engine in the city, running at its utmost speed, had a plentiful supply. At some shops in this city, there are two wells of 13 inches diameter and 75 feet depth, situated 6 feet apart, in which are two six inches by 4 feet pumps, working almost constantly at 24 strokes per minute. At a woolen mill there are two more, of similar diameter and 35 feet depth, in which are two pumps of the same size as the others. In the Sacramento Valley alone, are thousands of wells of from 3 to 10 feet deep, from which water is being drawn for irrigation and other purposes in almost incredible quantities.

Sacramento, Cal. R. A. ROSE.

Boiler Plate Shearing Machine.

To the Editor of the Scientific American:

In your issue of December 18, 1875, you gave us an engraving of a plate-shearing machine with revolving cutters, made at Manchester, England. I now send you a sketch of one I had made last summer at these works; and it is now running daily, cutting straight or circular work, in iron up to one quarter of an inch thick, and giving good satisfaction. The main shafts are made of steel, and the lower one has a set screw below the box to raise or lower the cutter for



different thicknesses of iron. The two small gear wheels are made of wrought iron, and the other four of cast iron. We run the cutters at about seven turns per minute.

JAMES ORCHARD.

Schenectady Locomotive Works, N. Y.

Destructive Boiler Explosion.

To the Editor of the Scientific American:

On January 25, 1876, an upright boiler exploded at Barnet, Vt. It was in the cellar of a shoe peg factory, and the concussion shattered the building in a fearful manner, the boiler (8 feet long by $3\frac{1}{2}$ feet diameter, with seventy-five $1\frac{1}{2}$ inch flues) going up through two stories and out through the end of the building into the road, 90 foot in all. The power of the explosion was so great as to throw a dryer in the second story out of its place and drive it, through a double boarded floor, up against the rafters, breaking in its course a cast iron shaft 5 inches diameter, and also breaking four sticks of timber 8x9 inches, and taking two floors clean out; and much other damage was done.

At the time of the explosion there were 16 persons in the building, 8 of them being women, within twenty feet of where the boiler went up; but, happily, no one was killed or hurt. The boiler was run, by a boy of no experience, in a blundering way. Steam was made only for heating and drying.

The explosion was caused, I think, in this way: Around the foot of the boiler there was a space of two inches between the outside plate and the firebox, which was two feet high. The boiler had not been blown off for two weeks or more, and the water that supplied it came from a very muddy brook, and must have filled the bottom full of fine dirt; and this dirt, caking on the fire sheets, caused the firebox to get red hot and bulge out, and then the water above, coming in contact with the red hot iron, caused the explosion.

If any one who has boilers or machinery desires the safety of himself, his work people, and his property, he should invest $3.20 in the SCIENTIFIC AMERICAN, and he would do away with much blundering and many disasters.

Barnet, Vt. GEO. H. KIDNEY.

[For the Scientific American.]

A NEW MEDICAMENT.

Boldo is the name given in Chili to a small aromatic tree indigenous to that country. It was first described by Molina, in 1782, under the name of *peumus boldus.* Jussien, in his "Naturel System of Botany," places the boldo in the family of the *monimiaceæ*, under the name of *boldea fragrans.* M. Baillon, in the "Histoire des Plantes," now in publication in numbers in Paris, restores Molina's designation, *peumus boldus.* The sub-order to which the tree belongs consists of only eight genera, chiefly natives of South America.

The boldo, always green, grows alone and is not found in forests. Its leaves are in pairs, opposite and unfurnished with stipula. In drying, the leaves become of a reddish brown. The flowers are disposed in upright clusters (cymes), the stem of one cluster being the end of the branch, the others being axillary, or springing from the junction of the leaves. The flowers are of a yellowish tint on a white ground, and are in marked contrast with the brilliant green of the foliage. The bark of the tree, thin, and wrinkled longitudinally, gives out a very pronounced aromatic perfume. The flowers are diœcious, that is to say, unisexed, with the two sexes growing on different trees. The flower has a calyx proper or perianth; and in the male flower the receptacle has numerous stamens. The female flower has from three to five free carpels, each with one cavity, the ovary containing a single ovule or seed germ. The fruit is about the size of the berry of the hawthorn, with a very hard stone.

An interest above its botanical history and classification was given to the boldo in 1869. Specimens of the plant were sent to France, attention having been called to its curative properties, as not unfrequently happens, by accident. A flock of a sheep were tainted and dying with a disease of the liver. The hedge about the enclosure in which they were confined was one day prepared with fresh branches from the boldo. The sheep devoured the leaves with avidity. The repairs of the fence were kept up with the same material, and the flock of sheep recovered and became sound. On such vague reports, no serious data could be founded as to the value of the remedy, or the mode and circumstances under which it can be applied. Careful and systematic experiments were undertaken by MM. Dujardin, Beaumetz, and Claude Verne. Other practitioners in the hospitals of Paris have pursued like inquiries.

Messrs. Beaumetz and Verne submitted to chemical analysis the specimens of the plant sent to them. Treated in succession by ether, alcohol, and distilled water, the results were: An essential oil, a bitter principle named boldina, citric acid, lime, sugar, gum, tannin, and some thick and dark aromatic matter, due probably to the oxidation of the essence.

In South America, this plant is often used in infusions, the properties of which are (analogous to those of tea and coffee) tonic and diaphoretic, and promote digestion. It appears also to be a popular remedy in syphilis and diseases of the liver. All parts of the tree are utilized. The green leaves are used to flavor sauces; and dried and reduced to powder, the leaves serve the purpose of snuff. The wood, which burns slowly, makes a charcoal high in favor with the smiths, and the bark is used for tanning skins. The fruit is eaten, the stones of the berries are strung for necklaces and bracelets, and from the kernels a fixed oil is extracted.

Many pharmaceutical preparations have been experimentally tried by M. Verne. These are two extracts (one alcoholic, the other aqueous), an essential oil, a tincture (little differing from that prepared in Chili), a wine which possesses in a high degree the aromatic properties of the plant, and a sirup, which would seem to be, on account of its agreeable taste, easy of administration. The essential oil has so strong an odor and so sharp a taste that it is found necessary to inclose it in pills or capsules. Each contains eleven centigrammes (a little more than two grains) of the oil. Preparations in the form of a tincture or elixir make a pleasant change for the invalid in his habitual disgust for medicines. Experiments upon Guinea pigs and dogs have been made in the laboratory of M. Vulpian; and the results have been drowsiness and a lowering of the temperature, without serious effects upon the organism

M. Beaumetz has prescribed preparations of the boldo as a diffusible tonic in chlorosis, anemia, and debility of various organs, and as a restorative to patients convalescent from typhoid fever. The results obtained have been very marked. In such cases, the appetite has been stimulated and the digestion improved; and in instances where quinine could not be endured, the boldo has satisfactorily answered. But the new remedy must be administered with caution, since, in over doses, it provokes vomiting. While the experiments, made so far, are not absolutely conclusive, the boldo may be received as a bitter aromatic tonic and a remedy, which, hitherto unknown to medicine, may claim, if its results continue favorable, an honorable place in the pharmacopœia. *

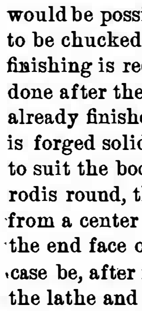
PRACTICAL MECHANISM.

BY JOSHUA ROSE.

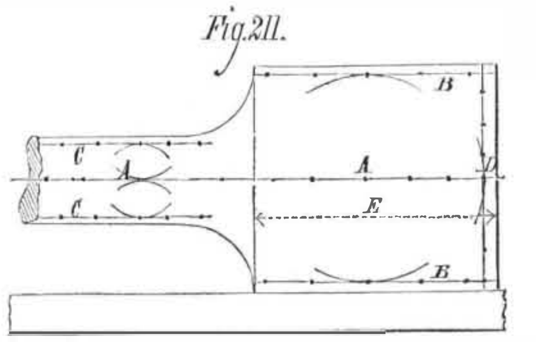
NUMBER XLII.

LINING OUT CONNECTING RODS.

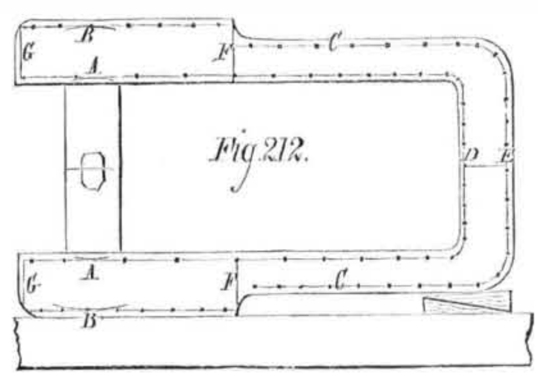
Connecting rods, so large in size as to be cumbrous to handle, are generally made by forging the ends to which the strap is attached by themselves, and afterwards welding them to the body of the rod: the advantage being that the machine work done to the rod ends can, in that case, be done in small machines and at a higher rate of cutting speed than would be possible if, the rod being solid, its whole body had to be chucked in order to operate on the ends only. If any finishing is required to the body of the rod, it is in such case done after the rod ends are welded to it and made true to the already finished block end of the rod. If, however, the rod is forged solid, the whole of the marking-off should be gaged to suit the body of the rod. For instance: If the stem of the rodis round, the marking-off of the ends should be performed from a center marked off true with the round stem and on the end face of the rod. The first operation should in this case be, after marking off the said center, to put the rod in the lathe and face off the block end faces, thus giving us a face, at each end of the rod, true with the stem of the rod, and therefore useful not only to receive the marking off lines but also as a face whereby to true the other faces on the block or stub end. If the ends are forged separately from the body of the rod, it is better to face off one of the side faces, and to mark off on that side face. To mark off a rod end that is forged solid with the stem of the rod, we proceed as shown in Fig. 210, A representing the center, true with the body of the rod; B B shows the diameter of the rod end struck with the compasses from the center, A, and C C, the thickness of the rod struck in like manner. If there should not be sufficient metal on the block end to permit the marking-off to be performed from the center, A, when true with the body of the rod, that center must be moved sufficiently to allow the rod end to be cleaned up; this is, however, to be avoided if possible, for the following reasons: If the body of the rod runs much out of true, the turning of it in the lathe will be a slow process, because such rods are liable, from their length, to spring in consequence of the pressure of the cut. Hence it is not practicable to take heavy cuts along it; and if in consequence of the body of the rod running much out of true, it cannot be cleaned up at one cut, the tool will scrape, during the first cut, against the scale, necessitating that the cutting speed of the tool be much less than it otherwise need be.



After the segment of circles, B B and C C, in Fig. 210, are struck, which may be done before setting the rod on the marking-off table, the rod should be set on the marking-off table with one of the broad faces downwards, and with the scribing block needle point placed level with the mark, C, on the upper face; and the rod should be tried along that face to ascertain if there is sufficient metal to clean it up all across. The scribing block should then be carried to the other end of the rod, and tried with the upper mark, C; and that being found correct, the scriber point should be set to the lower mark, C, at each end of the rod; and thus the two lines across the rod end, representing the thickness thereof, may be drawn by the scribing block at each end of the rod. The lines representing the breadth of the block end of the rod may then be drawn by simply placing a square on the surface table, with the edge of the square placed in each case level with the extreme diameter of the segments of circles, B B, Fig. 210. No other lines in this case will be required, because the rod ends, having been turned in the lathe, give the machinist two true faces whereby to set the rod at each chucking. If the rod ends are not welded to the rod, the better plan is to have one of the broad surfaces on each rod end surfaced up in a planing machine, and to then perform the marking out on the surfaced faces. The marking out should be made about true with the stem of the rod, as shown in Fig. 211. The surfaced face is to be set, by a square, to a right angle to the marking-off table face; and the center line, A A, of the stem is found from the body of the stem, and carried from end to end of the forging as a guide to set the work by, the lines, B B or C C, being too short to serve the purpose. These latter lines are struck equidistant from A A. The line, D, should be struck with a square resting on the marking table, and any surplus metal should be taken off the end face rather than out of the corner where the butt joins the stem; because it is easier to take the metal off the end than out of the shoulder. The round corners need not be marked, it being preferable to make a gage to shape them to. The edges thus marked being shaped off, the thickness of the butt end may be marked off by a scribing block, the planed surface of the butt end lying flat on the marking table. The strap should first have one face surfaced, and then a center face should be placed between the jaws, being made just sufficiently tight to be held, and not so tightly as to sensibly spring the jaws open; otherwise, while the thickness of the jaws would be marked off correctly, the width



between them and their outside diameter would be too small when finished. The strap should then be placed on the marking table, and marked as shown in Fig. 212, the lines, A A, B B, and C C, being marked off to the required widths apart and equidistant from the center line, marked across the center-piece and across the crown of the strap, at D E. The center of the center piece having been obtained from the inside of the jaws, and carried across, at D E, after the strap is set upon the table with the inside faces of the jaws parallel with the face of the table, the width between the lines, A A, should be marked less than is the width of the block end on which they fit, for the following reasons: A connecting rod strap will, by reason of its shape, spring open between its jaws very easily indeed; and were the width between the jaws made the same as that of the block end of the rod, the strap would fit very loosely to its place. It is therefore necessary to make allowance for this in the width between the jaws of the strap, making them narrower than the block end of the rod. The amount of this allowance depends upon the size and stoutness of the strap, an ordinary proportion being about one sixteenth of an inch to a strap five inches wide between the jaws. This amount of allowance will enable the strap to spring over the rod end, and be a good fit, that is to say, not so tight but that it can be easily pulled off by the hand, and not so loose as to fall off of its own weight if unsupported. Then, again, any ordinary amount of metal removed in fitting the strap to the rod end will not seriously affect their fit together. Now it is obvious that, if the rod end faces on which the jaws of the strap fit are made parallel to each other, the strap, in being sprung on, would spring open so that its jaws would only touch the block at its entrance end, the end of the jaws standing open from the block end. To obviate this, the block end faces, B B, in Fig. 211, are made slightly taper, that is to say, about one thirty second of an inch or rather less in a length of six inches, the diameter of the end being the smaller. It is not necessary to mark so small an amount of taper in the marking, it being sufficient to run the center punch dots a little inside the line at the end of the block on each side. The lines, A A, in Fig. 212, representing the inside jaw faces, should also be a little taper, first to allow of fitting the strap



to the block end, and next to make the fitting of the brasses into the strap an easier operation. It is obvious that, if the inside jaw faces of the strap are parallel with each other, so soon as the brass is reduced to the size of the top of the strap, it will slide clear down to its bed; whereas, if those faces are made a little wider apart at the open end than at the crown end, the brasses, after entering at the open end, will have metal sufficient to be taken off them before being let down to the crown to permit of their being fitted nicely to the strap. For these reasons, the faces of the strap, A A, in Fig. 212, are made wider apart, in the proportion of nearly one sixteenth of an inch of taper to a strap having a jaw twelve inches long. The line, D, in Fig. 212, representing the amount of metal to be cut out of the crown of the strap, should only need that sufficient metal come off to allow that face to just true up: because it is an awkward face to operate on, and it is much easier to take any surplus metal off the outside crown of the strap, as represented by the line, E, in Fig. 212. The lines, F F and G G, are marked at the requisite distance from the crown, D, of the strap, with a square resting on the face of the marking table. The round corners and curves are marked off with the compasses, using the blocks of wood shown in our lesson on marking-off a double eye, previously given. The finishing, however, of such corners, both in the machine and in the vise, is usually done to a small sheet iron gage. Such corners can, it is true, be cut on a slotting machine table to a correct curve without the use of a gage; and there are many shaping machines with special attachments for the same purpose. Slotting machine work is, however, comparatively a very slow process; and in most cases it is found, in the end, more expeditious to shape out small corners with the cross and the up-and-down feed of the machine than to bother with such attachments.

Useful Recipes for the Shop, the Household, and the Farm.

To clean Britannia metal, use finely powdered whiting, 2 tablespoonfuls of sweet oil and a little yellow soap. Mix with spirits of wine to a cream. Rub on with a sponge, wipe off with a soft cloth, and polish with a chamois skin.

The best way to clean the inside of old iron pots and pans is to fill them with water in which a few ounces of washing soda is dissolved, and set them on the fire. Let the water boil until the inside of the pot looks clean.

To remove freshly spilt ink from carpets, first take up as much as possible of the ink with a teaspoon. Then pour cold sweet milk upon the spot and take up as before, pouring on milk until at last it becomes only slightly tinged with black. Then wash with cold water, and absorb with a cloth without too much rubbing.

Scorches made by overheated flat irons can be removed from linen, by spreading over the cloth a paste made of the juice pressed from two onions, ½ oz. white soap, 2 ozs. fuller's earth, and ½ pint vinegar. Mix, boil well, and cool before using.

Brown and black are the only fast colors in book-binding cloth. Red, green, and blue are the next nearest to fast colors. In calf binding, yellow or tan is the only color that will not fade. It wears best. Blue calf wears and rubs white. Purple and wine colors fade very quickly if exposed to light. Claret is greatly superior to the last named, and is nearly fast.

The following recipe for whitewash is recommended by the Treasury Department to all lighthouse keepers. It answers for wood, brick, or stone. Slake about ½ bushel unslaked lime with boiling water, keeping it covered during the process. Strain it, and add a peck of salt, dissolved in warm water, 3 lbs. of ground rice put in boiling water and boiled to a thin paste, ½ lb. powdered Spanish whiting, and 1 lb. clear glue, dissolved in warm water; mix these well together, and let the mixture stand for several days. Keep the wash thus prepared in a kettle or portable furnace, and when used put it on as hot as possible, with either painters' or whitewash brushes.

The best time for felling timber is when the tree contains the least sap, and that is the case in midsummer and midwinter. In general, all soft woods, such as elm, lime, poplar, and willow, should be felled during winter. Oak, alder, beech, and pine are better cut in summer.

A Useful Invention for Weavers.

Chambers' Journal has a brief account of Barker's patent self-acting punching machine for repeating Jacquard cards. In the ordinary machine, a skilled workman must be employed during three weeks or a month to fit it up and get it in working order. The new machine, which can be packed in a small box, is always ready for working, and will prepare from 12,000 to 20,000 of the perforated cards in a day: while the old process will not produce more than 1,200. Another advantage consists in the rapidity with which changes of fashion may be followed. A manufacturer will bring out new designs for each season; and if any of them meet with success, he will frequently be able to take large orders, if he can execute them with dispatch. Aided by the new machine, he can get cards for a large number of looms in a day or two, instead of being weeks over them as in the old system, and can thus start his looms quickly and send his goods into market in time for the season.

American Quicksilver.

Mr. J. B. Randol, general manager, gives the production of the New Almaden mine for the year 1875, in flasks of 76½ lbs. each, as follows:

Months.	Flasks.	Months.	Flasks.
January	850	July	1,220
February	800	August	1,100
March	1,033	September	1,200
April	850	October	1,250
May	1,095	November	1,700
June	1,050	December	1,500
Total			13,648

The total product of the mine for 1874 was 9,084 flasks, making the increase this year 4,564 flasks, or nearly 50 per cent.

Eating Rats.

An English contemporary suggests that the health of sailors and the comfort of life on board ship would be promoted if the practice were introduced of eating the rats which swarm in most ships. There is really no reason why rats should not be eaten as well as rabbits and squirrels. They are clean feeders, and extremely particular as to keeping their bodies free from dirt. Rats which have existed in the hold of a grain-carrying ship might be a toothsome delicacy.

A Huge Clock.

The celebrated clock at Westminster (London, England), has 400 square feet of dial surface. The minute hands are 11 feet long. Although the hands are all counterpoised, the entire weight of hands, counterpoises, tubes, and wheels which has to be moved at every beat of the pendulum is not less than 1½ tuns. The going weight is 1½ cwt., and the clear fall is 170 feet. It takes five hours to wind this clock up by hand. Huge as the great machine is, it shows an error of less than 1 second on 83 per cent days in the year.