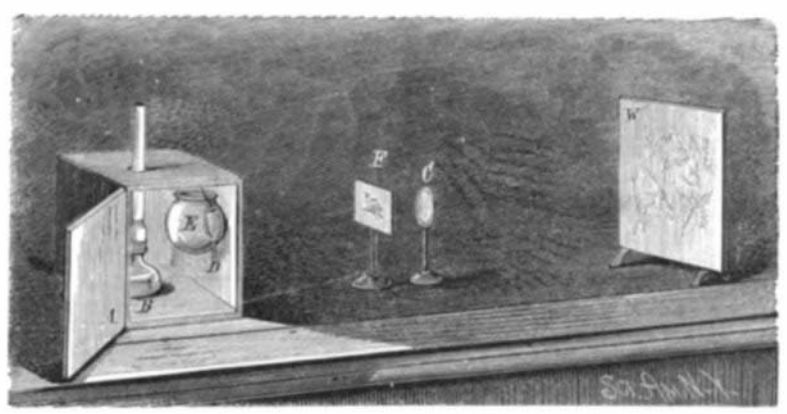
SIMPLE MAGIC LANTERN.

All that is required for this apparatus is an ordinary wooden packing box, A, a kerosene hand lamp, B, with an Argand burner, a small fish globe, and a burning glass or common double or plano-convex lens, C. In one end of the box, A, cut a round hole, D, large enough to admit a portion of the globe, E, suspended within the box, A, with the lamp, B, close to it. The globe is filled with water from which the air has been expelled by boiling.

Now moisten the surface of a piece of common window glass with a strong solution of sulphate of soda, or even common table salt, dissolved in water, and place it vertically in a little stand or clip, as shown at F, so that the light from the lamp, B, will be focused on it by the globe, which in this case answers as the condenser. The image of the glass will then be projected on the wall or screen of white cloth, W, providing the lens, C, is so placed in the path of the rays of light as to focus on the wall or screen. In a few minutes the salt solution on the surface of the glass, F, will begin to crystallize, and as each group of crystals takes beautiful forms, its image will be projected on the wall or screen, W, and as it is watched it will grow, as if by magic, into a beautiful forest of fern-like trees, and will continue to grow as long as there is any solution on the glass to crystallize. Then, by adding a few drops of any of the aniline colors to the water in the globe, the image on the screen will be illumined by shades of colored light.



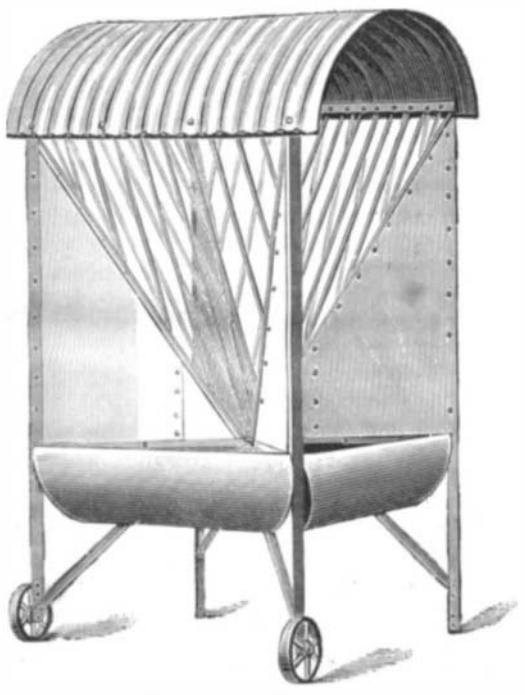
SIMPLE MAGIC LANTERN.

Powerful Pumping Machinery.

The San Francisco *Bulletin* announces the completion at the Risdon Iron Works of the largest pumping engine ever built. It is to be used in draining the Chollar, Norcross, and Savage shafts of the famous Comstock mines at Virginia City, Nevada. The engine occupies a space 65 feet by 20 feet, and weighs between 200 and 300 tons, which the underground machinery will increase to about 1,000 tons in all. The engine accumulates water at 1,000 pounds pressure to the square inch, in a reservoir at the surface 60 feet high, from which it will be conducted by a pipe 2,400 feet to the bottom of the shaft, there to operate a pump which will raise the seepage water 800 feet to the Sutro Tunnel, into which it will be discharged. The water which does the work returns to the surface by another pipe. The system can be extended to 3,000 feet in depth, or take water from mines half a mile away, simply by extending the pipes. The new system is intended to dispense with the heavy and cumbersome pump rods heretofore used. The engine is compound, with the Davey differential valve motion.

IMPROVED CATTLE FEEDER.

The engraving shows an improved cattle feeder invented by Mr. Wm. Griffiths, of Shrewsbury, England. It consists



GRIFFITHS' CATTLE FEEDER.

of four triangular troughs with racks above, fitted to a square frame having T-section iron uprights supporting a curved corrugated roof, troughed at the eaves for carrying the rain water to the corners. The racks run up from the center of the troughs to each upper angle, forming a triangle. It is fed from either end of the roof, and will hold as much fodder as a man can carry. The whole structure is of iron and mounted on wheels, two of which can be locked at pleasure should it be desired to make it a fixture.

TO DEADEN THE NOISE OF HAMMERING IN SHOPS, it has been suggested to place rubber cushions under the legs of the work-benches. We have found wool, felt, or any very thick loosely made woolen texture a much better material for this purpose than rubber. Pieces suitable for these pads can ordinarily be selected from tailors' clippings, and may be had for little or nothing.

An Interesting Railway Relic.

One of the most interesting relics we have seen in some time is a page from a Boston paper of 1825, containing a picture of the "Hetton Railroad," as designed by William Strickland, Esq., civil engineer. The stupendous line was to be seven miles five furlongs in length, and was to extend from the Hetton collieries, in England, to the town of Sunderland, on the River Wier. From the picture and the accompanying description, we find this railroad climbing hill and descending dale, and making no attempt to follow any grade. Several stationary engines are used to transport the coal wagons over these irregularities of the surface, and finally a locomotive, made of thick sheet iron, weighing five tons and possessing twelve horse power, takes them in tow and pulls them to Sunderland. These locomotives are able to pull ninety-ton trains.

Below the general view of the road is a cut representing a train. The engine is neither a graceful nor a complicated affair, and consists chiefly of boiler, smokestack, and piston. There is no cab for the engineer, who stands on a platform beside the boiler and takes the weather as it comes to him. The tender is equally primitive in its construction, and appears to be about the size of an ordinary box wagon. The coal carts look very much like the bobtail dumps of the present day.

The letter-press on this page contains a description of the Hetton Road; a general article on the value and utility of railroads; an extract from a letter from Hon. De Witt Clinton, comparing railroads with canals to the former's injury, and a series of answers to questions respecting railroads by Thomas Tredgold, an English civil engineer, who was advanced enough in his ideas to believe in railroads. The entire page shows that it appeared at a time when the question of railroads *vs.* canals was being agitated. The great expense of the former seemed to be the chief difficulty in the minds of the canal advocates, who could not realize the enormous profits which would go to pay those expenses and enrich railroad men to boot. Governor Clinton's arguments are rather amusing in the light of our present railroad facilities.

The relic is weather-stained and exceedingly old-fashioned in appearance. It is the property of Mr. F. H. Munsell, of the Central. And when we look at this picture and think of the great four-track line it seems as if the relic must be a thousand years old. One cannot believe so much had to be learned in the space of fifty-five years.—*Buffalo Courier.*

Apprentice System Reviving.

We are pleased to see that the Ames Manufacturing Company, of Chicopee, Mass., are doing something toward a return to the old apprentice system. The company have been very much troubled to get skilled help, and also by having men leave after they have learned enough to begin to be useful. They have now adopted a plan something like the former system, only the term of service is not more than three or four years instead of seven, and they are overwhelmed with applications. The men sign a contract to stay to the end of the term, and the company will teach them the different branches of the business, so that when they go out they will be masters of the trade instead of knowing how to run but one machine or to do one particular kind of work. The company keep 10 cents a day from their pay until it amounts to $100, which is given to them at the end of the apprenticeship.

The Yield of Wheat.

To test the bearing qualities of the leading varieties of wheat the Superintendent of the Ohio Agricultural College Farm sold seed wheat to farmers in various parts of Ohio and other States, requesting report of yield from each. The results are shown in the following comparison: Fultz, 24 reports average 25¾ bushels; Clawson, 10 reports average 23¾ bushels; Silver Chaff, 15 reports average 26¼ bushels; Velvet Chaff, 11 reports average 26 bushels; Gold Medal, 12 reports average 21⅔ bushels; Sandomicka, 7 reports average 24½ bushels.

Porcelain Manufacture in New Orleans.

A happy coincidence of enterprise and discovery has just occurred in the South. While Mr. Surgi, of New Orleans, was arranging for the setting up of a porcelain factory in that city, expecting at first to import the kaolin to be used, the Assayer of the Mint received from Texas, for analysis, samples of clay which proved to be kaolin of the finest quality. The deposit had been known for some time, but nothing had been done with regard to its development. The announcement of the proposed porcelain factory called the attention of the owners of the deposit to its possible value, and the two interests have recently been brought together. The kaolin occurs near Bremond, Texas, where a bed of eighty acres or more lies close to the surface. The depth of the deposit is not given.

Water Cresses in Winter.

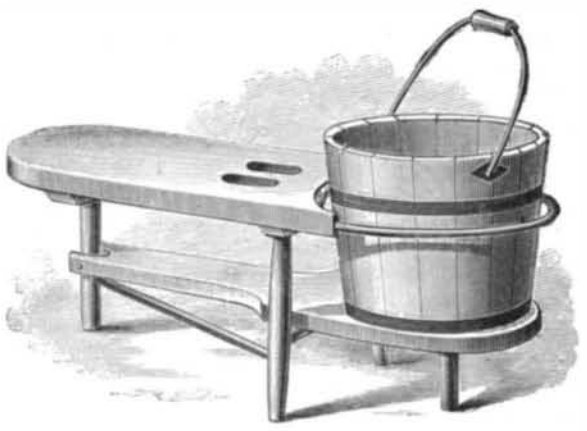
The *Gardener's Magazine* thinks that many of the writers in the horticultural papers do not know that frost kills water cresses. The delectable *Nasturtium officinale* is properly classed as a hardy plant, for it takes care of itself as a weed, and who, therefore, shall accuse it of tenderness? Where cresses are fast rooted and flourishing in a brook or any other water, it will be found that after a coat of stout ice has been formed the crop is gone entirely. That is to say, all the succulent leafy stems that might have been cut before the frost came have been destroyed by ordinary freezing, if only to the extent of about seven to ten degrees. It follows, therefore, that to preserve cresses for winter use anywhere out of doors shelter of some kind is necessary. There are many ways of doing this. It is not unusual for the market growers to let in a flood of fresh water when a sharp frost is expected. This covers the plants, and the ice is formed so far above them that they escape its effects. Another plan is to lay planks or tree loppings over the bed, and rough contrivances of this kind will carry a crop through a moderate frost, but a continued and severe frost will find its way through such penetrable stuff. Where it happens to be convenient, a frame is the best protection, and those who have to supply the table plentifully in winter would do well to arrange their plans with a view to the use of frames ultimately. That many who should know do not know that frost is destructive in its effects on cresses is not surprising, because hitherto the subject has but rarely obtained any special attention.

Glass Making in Ohio.

Five new glass works were started in Ohio last year, and several more will be added this year. The latest official statistics give 19 firms employed in glass manufacture, with 32 furnaces, having 292 pots and employing 2,032 men. In the production of window glass there are employed 7 furnaces, with 66 pots; flint glass, 19 furnaces with 199 pots; green glass, 4 furnaces with 27 pots. The glass works are in Bellaire, Columbus, Ravenna, Kent, Zanesville, Steubenville, Martin's Ferry, Bridgeport, La Grange, and Newark.

NEW MILKING STOOL.

The combined milking stool and pail holder shown in the engraving is the invention of Mr. G. W. Williams, of Eau Claire, Wis. The seat or stool carries a support for the pail, and is provided with a circular guard rail for retaining the pail in its position. There are two apertures in the seat



IMPROVED MILKING STOOL.

forming a handle by means of which it may be easily carried. The pail support is pivoted and is capable of moving up or down to accommodate itself to inequalities in the ground surface.

Hard Soap by a Cold Process.

Mr. R. F. Fairthorn, Ph.D., has contributed the following recipe to the *Druggists Circular:*

A good hard soap can be easily produced if four pounds of olive or sweet almond oil mixed with two pounds of soda lye, of the strength 36° Baume, are stirred until of the consistence of thick paste, when it should be poured into moulds, covered by several folds of muslin, and kept in a warm room for twenty hours. By this treatment the process of saponification, or union of the acids in the oils with the alkali, is complete. When these materials are first mixed the temperature of the mass rises, and in order to effect the entire union of ingredients so as to form the compound called soap, it is necessary that the heat thus generated should be maintained for some time, hence the necessity for covering the moulds and keeping them in a warm room.

He has found that it is desirable to use oil that is slightly rancid, or, if free from rancidity, to add about ten per cent of oil that has become so. Oil that is perfectly sweet requires two or three days to effect saponification.