

order to lessen the blackening action of the osmic acid, as much pure water as the test tube will hold is added. In certain waters rich in organisms the microscopical examination may be made in a few hours. If the water is comparatively pure, twenty-four or forty-eight hours must be allowed to pass. The liquid, with the exception of the last one or two centimeters, may then be decanted. The detection of the organisms in the residue is facilitated by the employment of coloring agents, such as Ranvier's picocarmine, methyl violet, logwood, etc. It is always well to introduce the coloring agent mixed with glycerine; the organisms are thus better tinted, and can, if desired, be better preserved.

#### The Conversion of Starch into Sugar.

In the new era which is before the brewing trade of this country there will be many problems to solve, and many opportunities to practically apply the teachings of science. The principal change which takes place in the brewer's mash tun is the conversion of an insoluble substance, starch, into soluble substances, dextrine, maltose, and dextrose; the exact nature and proportion of these resulting saccharine bodies are not yet absolutely determined, and they vary considerably with changes of temperature, time, and quantities. The brewer's art consists largely in the production of a wort of suitable composition, by which we mean, one containing all the essential constituents for a healthy fermentation, and also a due proportion of such substances as will resist the disintegrating properties of yeast, and remain to fulfill their proper functions in the finished beer.

Hitherto the only converting agent at the disposal of the brewer has been the diastase of the malt, and in the future, in all probability, this will also be the principal converting agent, even if raw grain be used in conjunction with malt. But with a free mash tun, we shall be at liberty to avail ourselves of other methods of conversion if there be such, and if they can be practically applied. It is now well known that dilute sulphuric acid exerts a solvent action on starch very similar to diastase: but while malt extract converts starch into dextrine, maltose, and dextrose in varying proportions, with probably other intermediate products, boiling dilute sulphuric acid converts starch almost immediately into the ultimate product—dextrose, accompanied by only small quantities of dextrine.

This property of sulphuric acid is largely made use of by the glucose manufacturers, and in this way the enormous quantities of this substance, both home made and imported, are prepared; the process consists in boiling maize or other grain containing a large proportion of starch, with dilute sulphuric acid, sometimes under pressure, although this is not absolutely necessary, except for hastening the change, and after neutralizing the acid with carbonate of lime the saccharine liquid is concentrated to a sirup, which solidifies on cooling. A large amount of fuel is employed in evaporating the sirup, and as the solid glucose has to be dissolved again by the brewer, this represents a considerable loss. With perfect freedom in the choice and manipulation of his materials, it is more than probable that the brewer will learn to use sulphuric acid as a converting agent; but besides the conversion of starch into dextrose, sulphuric acid will be useful in inverting cane sugar.

The plant required for carrying on this conversion of starch into sugar by means of sulphuric acid is very simple, for pressure is only required when a complete conversion into dextrose or glucose is desired; but the brewer prefers to have a mixture of dextrine and intermediate products with his dextrose, and he would, therefore, probably obtain the most satisfactory result by conducting the operation at the ordinary pressure.

Distillers who now use large quantities of raw grain in their mashing process have already in some instances availed themselves of this property of sulphuric acid, and lead-lined mash tuns for the purpose are not unknown; brewers may in the future find it worth their while to do the same, and in answer to the objection by so doing they will be converting their breweries into chemical manufactories, we say the process of mashing is essentially a chemical operation, and that as the products obtained by the judicious use of sulphuric acid and malt extract are really identical, there can be no valid reason for not using the first-named agent, if it possesses any advantages over the latter.—*Brewer's Guardian.*

#### Learning Versus Common Sense.

Democritus long ago drew an emphatic distinction between learning and wisdom. Learning consists of knowledge acquired mainly from books, and often its possessor is developed by its acquisition only in his perceptive and retentive faculties. Though his memory may be a vast storehouse of useful facts and brilliant second-hand ideas, yet, owing to a judgment originally weak and only partially trained to discriminate, he may be the most inconsequent and uncertain of reasoners. Wisdom, on the contrary, is the outgrowth of native sagacity, sound judgment, wary discretion—in a word of good common sense, and yet of common sense acting under the enlightenment of more or less knowledge. Thus wisdom makes a man a true seer. He not only sees and grasps the best means to accomplish an

end, but he instantly sees and selects the highest and best ends as the objects of his aim and life. Regarding learning and knowledge as the same thing, we may conclude with Cowper that

Knowledge and wisdom, far from being one,  
Have oftentimes no connection.

The paradox is, therefore, not unfrequently met of learned physicians who are destitute of skill as practitioners, of learned orators who are wretched statesmen, of learned linguists who are little better than fools, and finally of learned theologians who are the worst possible interpreters of the oracles of God.—*Christian at Work.*

#### THE WILLIAMSPORT PANEL PLANER.

The panel planer shown in the annexed engraving is manufactured by Messrs. Rowley & Hermance, of Williamsport, Pa., and possesses several features which render it very efficient. It is designed for planing door panel and cigar box stuff, and is especially adapted for general use in manufacturing furniture, doors, and boxes, and may be used to advantage in any wood-working shop.

The frame is cast in a single piece, giving it great rigidity, and its form being pyramidal gives it a very wide base, which insures stability. The machine is provided with two pressure bars, one on each side of the head; the front one being

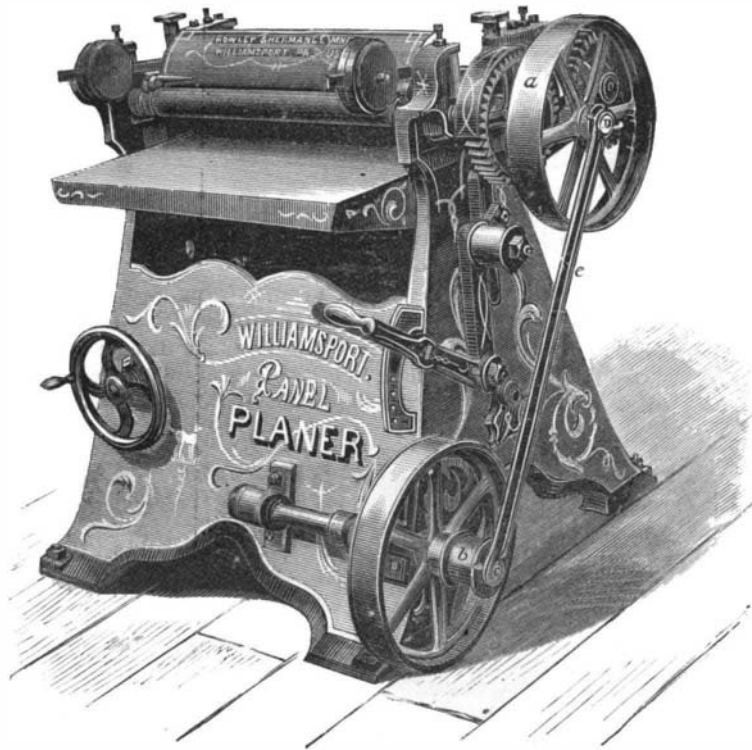


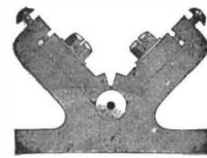
Fig. 1.—THE WILLIAMSPORT PANEL PLANER.

hinged and weighted adjusts itself automatically to different thicknesses of stuff. Both of these bars are placed very near the head to prevent the work from clipping or tearing out.

The cutter head is of forged steel, and being of small diameter may be run at a high rate of speed with perfect safety. This is very important, especially in working brash and cross-grained lumber. This machine is provided with two devices for preventing the marring of the surface of the lumber as it is delivered from the machine, one being a steel scraper attached to the delivering roll for preventing it from gumming and marking the lumber; the other is a shaving guard, which is so arranged as to prevent the shavings from getting under the smooth rolls and imprinting the work. This is a very essential feature in a smoothing planer. The feed is very powerful, the machine having two geared feed rolls. The planer is capable of planing long or short stuff with equal facility. Stuff as short as four inches, and from one-sixteenth to six inches thick, may be planed without clipping the ends. The machine is made in two sizes, adapted to lumber eighteen or twenty-four inches in width. The smaller machine weighs about 1,200 pounds, the larger one 1,400 pounds, and the speed of the head is from 4,000 to 5,000 revolutions per minute. It will be noticed that the planer is very heavy; it is strong, well built, and calculated to withstand constant use.

The journals of the head are provided with Ellis' journal box, the patents for which have been acquired by this firm at considerable expense and trouble. This box, which is shown in detail in Fig. 2, is entirely different from the ordinary cap box, and will keep the shaft central and tight until the box is worn out, and heating and trembling of the shaft, and the trouble of taking out liners, scraping, and readjusting, are avoided.

The construction of the box will be readily understood by referring to the engraving. It is made in three parts, the caps being held in place by bolts and adjusting screws, and they are tightened by loosening the bolts and setting down the adjusting screws at the ends of the caps, an operation requiring less than a quarter of the time required to adjust a box of the old style.



(Patented May 9, 1871, and September 23, 1879.)  
Fig. 2.—Ellis's Adjustable Journal Box.

The advantages of a box of this description will be apparent to practical men, and there can be no question but that, other things being equal, a machine having journal boxes of this kind is to be preferred to one having the ordinary boxes.

#### MISCELLANEOUS INVENTIONS.

Mr. Aden K. Munson, of Marysville, Kan., has patented a yoke to be used with a pair of horses in driving a plow, whereby the horse in the furrow may at all times control the tongue and guide the plow, while the horse on the land can pass around any obstruction and come in place again without changing the direction of the plow.

A machine for forming flanges on counter-stiffeners for boots and shoes has been patented by Mr. Hiram G. Farr, of Brandon, Vt. The invention consists in a novel arrangement of a concave mould and convex mould for pressing the material into the required shape.

An improved baling press has been patented by Mr. John H. Simonson, of East Norwich, N. Y. It consists in the combination with the followers, of a series of levers, bars, and ropes, so arranged that the followers may be drawn toward each other with constantly increasing power.

An improved limekiln has been patented by Mr. William Hughes, of Avondale, and Joseph L. Foulk, of Strasburg, Pa. This invention relates to that class of kilns known as "continuous" kilns, or those in which the limestone is supplied to the top of the stack, and as it settles during the calcining process the lime is drawn off at the bottom of the heating chamber, and a fresh supply of limestone is added to the top of the unconsumed mass in the heating chamber or stack; and it consists, first, in an improved construction of combustion chamber, in combination with a peculiar arrangement of furnaces to direct the flame equally across the entire area of the combustion chamber to prevent the formation of cores or unburned masses of limestone, in connection with a relative arrangement of draw chute or delivery channel which will secure an economy of space together with the greatest effective volume of flame or caloric from the furnaces.

Mr. Christopher G. Calo, of Albany, N. Y., has patented a simple device for instantaneously fastening and unfastening hames. It consists in a combination of devices which cannot be clearly described without an engraving.

Mr. Josephus H. Rosson, of Columbus, Ky., has patented an improved holder for hair, bristles, broom straw, and like material, for making brushes or brooms in a simple and convenient manner.

Mr. John D. Baxter, of Mechanicsville, N. Y., has patented a double-edged chisel provided on each side with a groove, which extends from between the points upward to the shank of the chisel, said grooves widening as they extend upward, the object being to render the chisel self-clearing.

An improved wagon spring, patented by Mr. William G. Hughes, of Churubusco, Ind., consists of a spiral spring set on the end of a wagon bolster and held in a vertical position in a framework of arched rods, while resting centrally on the top of the spring is a slotted yoke, from the ends of which depend two eyebolts or clips and links, that pass down to or through cross bars which extend laterally from beneath the wagon bed, and thereby support the wagon body.

An improved gate, so arranged that it can be conveniently opened and closed from a vehicle or by a pedestrian, has been patented by Mr. Edward Lanning, of Iowa City, Iowa. It consists in a balanced gate, pivoted near its center, and provided with two pulleys, to which ropes or wires pass, by means of which the latch and the gate are opened and closed. The gate has an improved head containing a weighted lever and pulleys for the purpose of keeping the latch in its proper place or for drawing it.

Mr. Charles L. Wolff, of Edgewater, N. Y., has patented an apparatus for supporting the middle part or center of the top or arch of cisterns and other structures while being built, so constructed that it can be readily taken out through the man-hole when the work has set, and which will allow the floor and sides of the cistern to be cemented before the middle part of the top is built.

Mr. Frederik Alsing, of Copenhagen, Denmark, has patented a compass provided with mechanism so constructed as to record all changes of direction in the ship's course and divide the diagram of the course into hour spaces.

An improved compensating pendulum, patented by Mr. Charles T. Mason, of Sumter, S. C., consists in a compound bar of metal bent in curved form, hung on the pendulum rod, and connected by links with the sliding bob in such manner that the expansion and contraction of the compound bar shifts the bob in the direction of the length of the pendulum. The bob is sustained by the compound bar, and the latter hung on the pendulum rods by a screw rod, which permits adjustment for regulating the clock.

An improved grain troller has been patented by Mr. William J. Wilson, of Stephenville, Texas. This invention consists in a novel construction of a revolving cylinder provided with cavities representing certain measures, and of a casing in which the cylinder works, whereby provision is