

EXPERIMENT ILLUSTRATING DISCHARGE OF ELECTRICITY FROM CLOUDS.

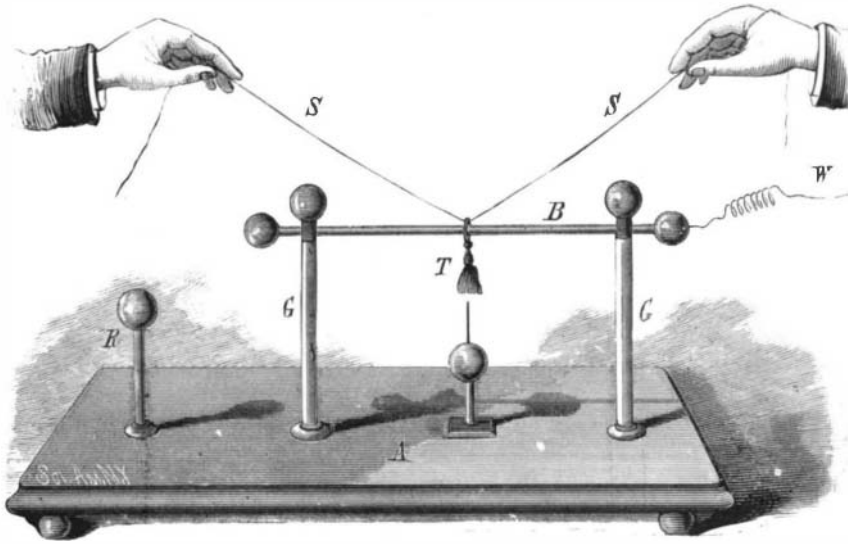
Mr. Loudon gives the following pretty experiment in the *Colliery Guardian*. It illustrates some of the phenomena of thunderstorms:

In the engraving, A is the base of the instrument, made of wood and brass. G G are glass legs supporting an arm of brass, B. The cloud is here represented by the moving tassel, T, pulled backwards and forwards by the strings of silk, S S. O is a ball provided with a point or lightning conductor. This ball is not insulated, that is, not supported by a glass leg. W is a wire leading to an electrical machine. On working the machine electricity is spread over the arm, B. The tassel consequently diverges, owing to each filament being charged with like electricity. On drawing the tassel (cloud) over the lightning conductor, O, an opposite kind is given off at the point and neutralizes the cloud and the leaves or fibers collapse. If we were to wholly detach the tassel and work the machine till we raised a large envelope of electricity around the arm, B, a vivid flash of light (lightning) would pass to uninsulated conductor, R. If the ball, O, was not provided with a point, on moving the electrified tassel along the arm, B, it would not collapse on passing the ball, except that a faint spark was given off. If this spark took place, you have what often happens in nature.

Persons ought never to stand near a tree nor a house, nor even a building provided with lightning conductors, for shelter. My reasons are these: Wood is a poor conductor, masonry worse, and if buildings provided with these conductors are not what they ought to be, they only invite destruction.

The rollers between which the work passes are actuated by reversible worm and cam motions, and the machine has, in addition to these roller feeds, what is known as a top feed motion, suitable for a lighter class of work.

The stitch, as in the ordinary sewing machine, can be adjusted from one eighth inch upward, and the pressure of the rollers on the work passing through the machine can be regulated at the will of the operator. The machine, which



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is driven by steam, has been made for a manufacturing firm in Liverpool.

More Oil Tanks Struck by Lightning.

On the 19th of August the Bradford oil regions, Pa., were visited by a severe thunderstorm which did much damage. Two oil tanks, each holding 25,000 gallons of oil, were struck at Dallas city, six miles from Bradford. Seven

Improved Iron Chains.
A public test of chains, made on the plan of Capt. Chas. A. Chamberlain, by the American Chain Company, of Philadelphia, lately resulted in a signal victory for the improved pattern. Mr. Charles Cramp, Mr. McCloud, Chief of the Testing Bureau of the Pennsylvania Railroad Company, Mr. Holman, Secretary of the Franklin Institute, Mr. Saragant, of the Pennsylvania Railroad Company, Abram Barker, President of the Wharton Railroad Switch Company, and other prominent gentlemen were present.

The first test was with an ordinary chain, $\frac{5}{8}$ of an inch in diameter, manufactured of iron from the Trenton Iron and Steel Company's works. The chain stood a strain of nearly ten tons, when it snapped at the end. The American Company's chain of the same size and weight stood a strain of $16\frac{1}{2}$ tons before it was broken across the weld. Another test was made with the company's five-eighths chain to see the effect produced by the Admiralty proof test of seven tons strain. The result was that the chain showed but slight evidence of the great pressure. It was then run up to the breaking strain, which is 40 per cent greater, and still no further effect was produced. At another test the chain broke on the side with a strain of $15\frac{3}{4}$ tons. A five-eighths ordinary chain was again produced, and was snapped at the end with a strain of $9\frac{3}{4}$ tons. A one inch ordinary chain was then tested, and stood the severe strain of 29 tons before it showed any signs of separation. The chain of the American Company, however, stood a far greater test, a pressure of 42 tons— $16\frac{1}{2}$ tons more than the Admiralty—being used before a break occurred on the side. The concluding test was the weight of 15 fathoms of one inch ordinary and the same length of the American Company's chain. The former weighed 958 lb., and the new manufacture 990.

The secret of the strength of the new chain lies in the strengthening of the end of the link by taking an equal

proportion of thickness from the two straight sides. This, it is claimed, so divides the strength of the link that one portion is no stronger than another, with this difference, that the link does not wear or break easily at the most important part—the end. On the other hand, the ordinary chain is constructed with equal thickness throughout, and it necessarily follows that as the two sides are more powerful than the end, the latter must give way first. The new chain has been tested by the United States Government for the last year in connection with signal buoys, and when taken up recently it was found, says the *Public Ledger*, in such good condition as to warrant the continuation of it in the same service for another year.

Tests for Purity of Water.

In copying our reply to a correspondent in a recent issue of the *SCIENTIFIC AMERICAN* for a simple test for indicating the purity of water, the *Plumber and Sanitary Engineer* adds: "Tannin precipitates albuminoids from drinking water, but it also affects other matters which may be present in wholesome waters. The smell and color of a water constitute the most satisfactory of the ready tests of quality. To detect organic matter by the odor, the water should be warmed to blood heat in a large bottle half filled and corked. It should then be shaken, and if organic matter is present it may be detected in the air with which the water has been thus washed. The color is best seen by looking down at a white reflector through a column of the water contained in a long glass cylinder. A column of pure water should be at hand for comparison. Organic impurity gives shades varying from yellow to brown."

The *London Lancet* also has an article on the "Microscopic Examination of Water," in which the writer claims that the microscope, as at present used, reveals only the coarser forms of animal life, and those only with uncertainty, and that the discovery of the microscopic organisms has hitherto been very much a matter of chance. Patience and skill are even of slight help. Fortunately, however, certain chemical reagents kill these organisms without changing their appearance; osmic

acid is of especial value for this purpose. In the examination of water M. Certes employs a one and a half per cent solution of osmic acid. One cubic centimeter of this solution will suffice for thirty or forty cubic centimeters of water, all animal and vegetable organisms being by it rapidly killed and fixed. In a few minutes, in

SUBMARINE OBSERVATORY AND ELECTRIC LIGHT.

The accompanying engraving, taken from the *Leipziger Illustrirte Zeitung*, illustrates Bazin's submarine observatory and electric light, which has been found to be of the greatest service in examining wrecks, submarine foundations, etc. It was used for the first time in examining the wreck of the Confederate steamer Alabama, which was sunk off the French coast at Cherbourg. The electric light is contained in a heavy cylinder, about $4\frac{1}{2}$ feet high and about 4 feet in diameter, and provided with a heavy plate glass bottom. The lower part of the cylinder contains alum water to counteract the pressure of the sea water, which increases very rapidly as the apparatus is lowered. The upper part of the cylinder contains a powerful electric lamp, the light rays of which pass through the alum water and the plate glass bottom, and lights up the bottom of the sea for a space about 100 feet in diameter.

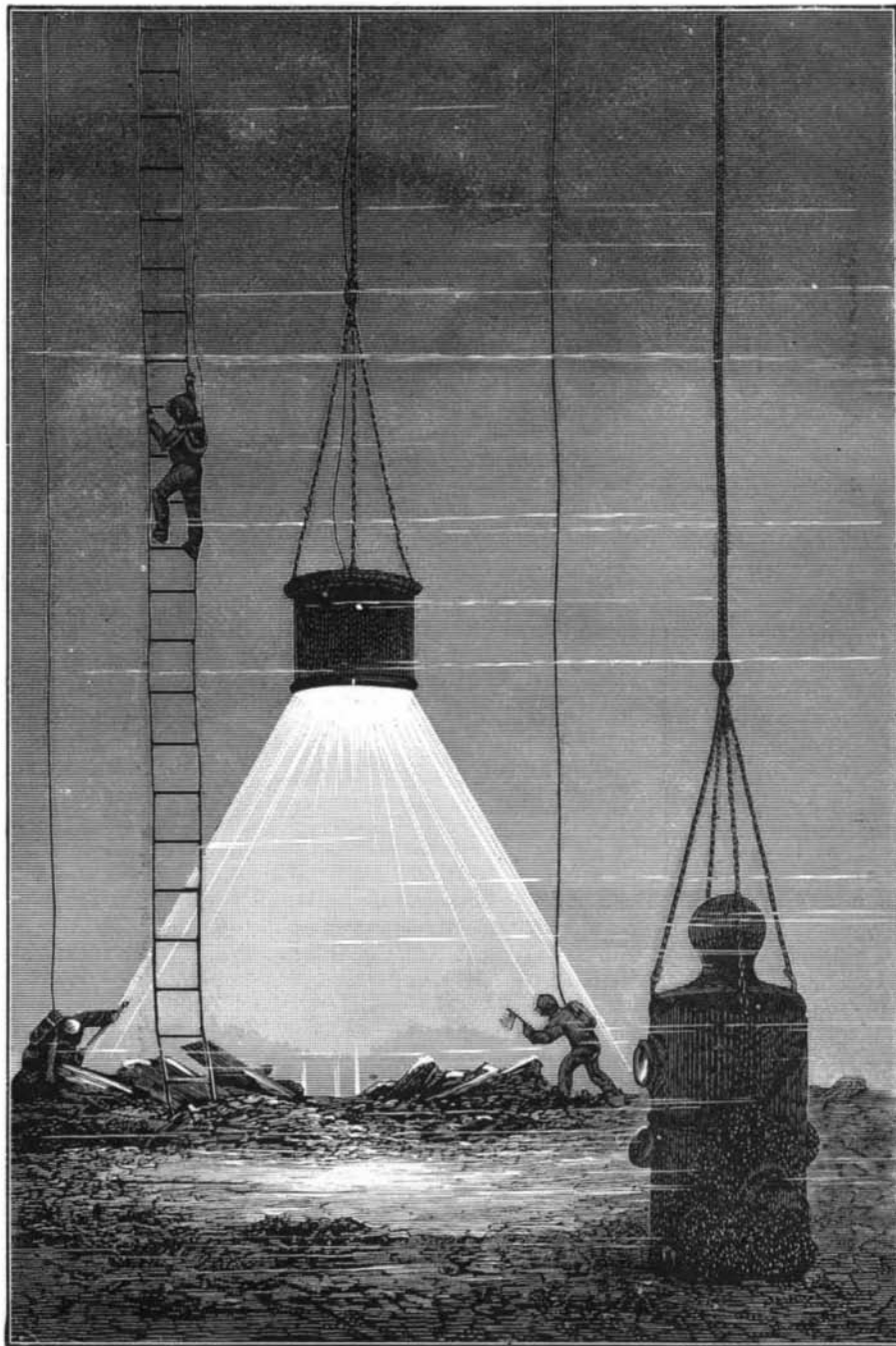
Bazin's observatory, shown in the right hand corner of the engraving, is about 9 feet high and 2 feet in diameter. It is provided with two bull's-eye windows through which the person in the observatory can watch the divers that are at work on the wreck. As the water is an excellent conductor of sound the superintendent can converse with the divers very conveniently.

A person can remain in this observatory for about three quarters of an hour, and if any parts should break or leak he can enter the upper helmet and remain in the same from eight to ten minutes, thus allowing ample time to raise the entire apparatus to the surface.

The Largest Sewing Machine.

The largest sewing machine in the world has lately been finished. It is of the Singer type. The machine weighs over four tons, and is in some respects of new design, uniting much simplicity of construction with great strength of parts. It is adapted for general manufacturing purposes of the heavier sort, although specially made for stitching cotton belting, an article which is just now taking the market as a cheap and serviceable institution for gearing and the ordinary leather belting. The material used is of great strength and toughness, and is sewed together in plies or layers, up to an inch in thickness. The belting in being sewed together is passed through heavy feed rollers some nine inches in diameter and over eight feet in length, getting stretched and pressed in the process. There are two needles at work with two shuttles, and the shuttles can be removed from the bottom without disturbing the overlying plies belting.

smaller tanks, located respectively at Parker City, Edinburgh, Steplersburg, Bullion, and Jefferson City, were also struck and burned. The loss in oil and tanks was about \$100,000. Mr. Morian, telegraph operator, received a severe shock, caused by lightning running into his office on the wires.



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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

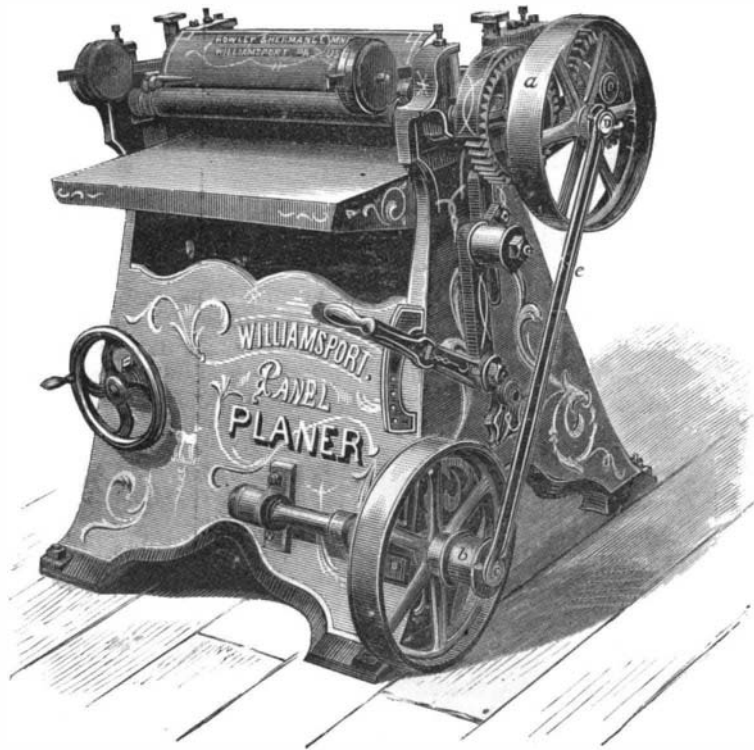


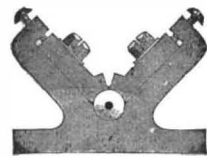
Fig. 1.—THE WILLIAMSPORT PANEL PLANER.

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