

REDIER'S NEW REGISTERING THERMOMETER.

M. Redier has devised a new registering thermometer which operates through the dilatation in a straight line of two metals, zinc and steel. If a multiplying mechanism be mounted on a steel bar, 39 inches long, and connected with a zinc bar of the same length, the difference of the two expansions per 212° Fah. will be about .08 inch. This difference is used in the present apparatus to register changes in temperature. Fig. 1 represents the thermometer proper. It consists of an exterior steel tube, A, which carries a toothed wheel, D, on which multiplying mechanism is mounted. Within the tube, A, is a zinc tube, Z, which fits closely. These two tubes are connected, and at that point there is a pivot. At the upper portion of tube, Z, is a plate, L, on which is fixed a small carriage, Y, which carries a pointer adjustable by the milled head, B. This pointer acts on a pallet, X, which is movable, and which transmits any movement of elongation of the bar, Z, to the needle, A. On the extremity of the latter is a small hook, C. The foregoing part of the apparatus is mounted on a plate in face of a double clockwork movement, and so disposed that it turns from right to left, the exterior steel tube, A, serving as a pivot.

The clock train has two springs, M and N. M terminates in a chronometer escapement, and N in a very delicate flier, which turns with great rapidity. These two movements are interconnected by the differential train, R R, S. The satellite, S, entrains the axis, A, which on one side carries the pulley, P, on which is wound a cord which moves the pencil, and on the other a pinion, E, which engages with the wheel, D, Fig. 1, of the thermometer. These two gears are so constructed that the velocity of motor M being 1, that of motor N will be 2.

We may now trace the operation under a constant temperature. The hook, C, of the needle, A, stops the small fly-wheel. The escapement, E, of the motor, M, which works constantly, turns the large wheel, D, from right to left. The needle, A, follows the movement and disengages the flier, V, and spring, N. The latter now being freed, and its velocity being 2, while that of the escapement is 1, tends to turn the wheel, D, from right to left until the needle, A, again catches by its hook, when the same operation is repeated. As the pulley, P, makes the same movement as the wheel, the pencil will trace on paper, if the temperature remains constant, a right line, apparently continuous, but in reality formed of a series of very small zigzags. This movement of constant oscillation is of great importance as regards the sensitiveness of the instrument, as it suppresses the effect of friction at starting, and renders the instrument always ready to show instantly the least change of position of the needle, A. If the temperature augments, the flier, V, remains hooked for a longer or shorter period, proportional to the change of temperature, and as the increase, while turning the wheel, D, from left to right to unhook the flier, also causes the turning of the pulley, P, the latter will rotate over an angle proportionate to that which the change of temperature causes the needle, A, to pass over. The inverse effect is produced when the temperature falls. The pencil, K, Fig. 3, moves on a cylinder, C, on which the paper, H, is rolled. The chronometer, R, regulates the movement of this cylinder at a velocity of 0.16 inch per hour.

A City Sliding Down Hill.

The Virginia (Nev.) *Enterprise* says: "Our town is very quietly moving to the eastward down the face of the mountain. This is owing to the settling of the ground over the Bonanza mines. As all the town is going together it is not much noticed on the surface, where no cracks are seen. The water and gas companies are better acquainted with the movements taking place in the ground forming the site of the town than most others, as the instability of the earth tells upon their pipes.

"On B and C streets, north of Union, the ground is moving both north and east. A water main, running north and south, uncovered yesterday at the cor-

ner of B street and Sutton avenue, was found to be telescoped to the distance of over a foot, and besides had in it a great kink, which made it necessary to take out a piece nearly two feet in length. About the Consolidated Virginia pan mill the pipes are crowding in from both east and west; at least, owing to the settling of the ground in that neighborhood, there appear to be two movements. Although there are as yet no cracks in the central part of the town, there is a large one to the westward. It begins at Cedar Ravine,

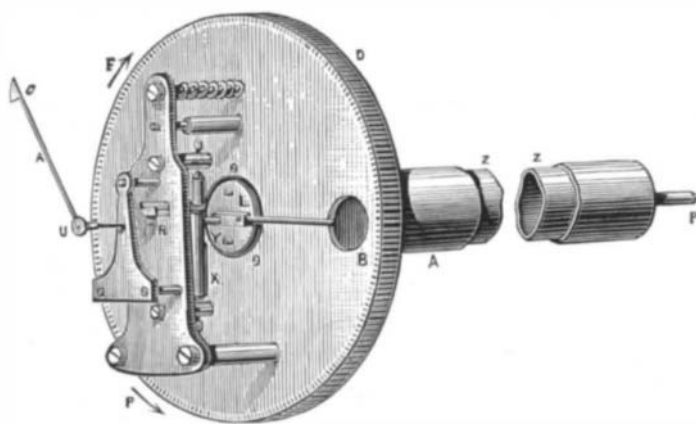


Fig. 1.—REGISTERING THERMOMETER.

runs south to near the large water tank of the Ophir, on the hill west of town, then turns east for a considerable distance, when it takes its course southward west of Stewart street, and finally joins the old crevice below the Gould & Curry croppings. Toward the north this crevice is about eight inches in width, and the ground on the east side of it is about three feet lower than on the west side. Captain Overtown, of the Water Company, whose opportunities for observing these movements are unsurpassed, says that as the ground settles over the bonanzas on the slope of the mountain, where it is not much disturbed, it gradually moves down. He says the International Hotel has moved east about five inches since it was built. If such is the case, all the buildings in that part of the town, with the ground on which they stand, must have moved the same distance, as no cracks are to be seen in the earth. As we are now traveling, however, it will be a long time before we reach the Loaf Sugar."

Salt River, Arizona.

It was long supposed that the brackishness of Salt river, Arizona, was caused by the stream running over a bed of salt somewhere along its course. Its waters are pure and fresh from where it heads in the White mountains to within 50 miles of where it empties into the Gila. Fifty miles from its junction with the Gila there comes into it a stream of water that is intensely salt. This stream pours out of the side of a large mountain, and is from 20 to 30 feet deep. It is very rapid, and pours into the Salt river a great volume of water. Here could be easily manufactured sufficient salt to supply the markets of the world. All that would be necessary would be to dig ditches and lead the brine to basins in the nearest deserts. The heat of the sun would make the salt. Were there a railroad near the stream its waters would doubtless soon be turned and led to immense evaporating ponds. It is supposed that the interior of the mountain, out of which the stream flows, is largely composed of rock salt.

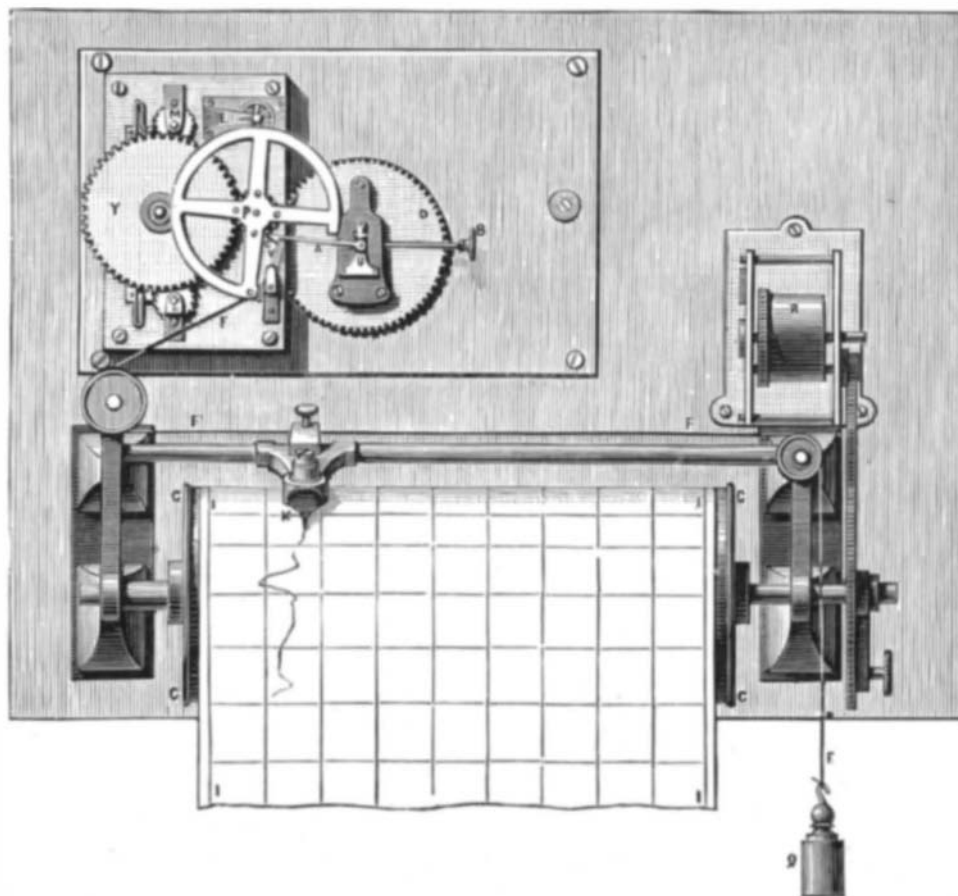


Fig. 3.—REDIER'S NEW REGISTERING THERMOMETER.

Comparative Prices and their Relation to Production.

BY ANDREW J. LAWSON.

In view of the partial settlement of the currency question by the remonetization of silver, coupled with the natural results of the business depression of the past five years, and the laws of supply and demand, perhaps some comparison of prices for the staple agricultural productions may serve as interesting market gossip this week. To begin at the beginning, let us see what the total productions of the leading farm products were five or six years ago, and last year, in order to understand at a glance their relation to the prices that prevailed at that time and now. The wheat product of 1872, both spring and winter, was about 250,000,000 bushels, or about 20,000,000 bushels more than that of 1871, and 37,000,000 bushels less than the crop of 1869, the largest ever produced in the country, excepting that of last year, which was 330,000,000 bushels. The average price of wheat in March, 1872, at Chicago, was \$1.15 per bushel; and of flour, for extra winter wheat, \$7.25 to \$9 per barrel. In 1876 the average value of wheat was \$1.24 per bushel. It is customary to estimate an average of five bushels of wheat for each barrel of flour. With improvements in milling, $4\frac{1}{2}$ bushels would be nearer the truth. Thus, in 1872-73, ground wheat recovered its supremacy from its loss in the previous five years. The best brands of flour are consumed at home, and the bulk of the flour for export consists of that made of the poorer kinds of wheat. However, of late years foreign millers have demanded our best wheat for their own mills. During the past week wheat has advanced slightly, and is quoted at an average of \$1.30 per bushel, considering the various grades. Flour, which was quoted in 1872 at \$6.60 to \$6.75, is now quoted at \$5.90 and \$6.50.

In March, 1872, No. 2 corn was quoted at 37 to 39 $\frac{1}{4}$ cents per bushel. The corn crop of the preceding year was reckoned at 1,092,719,000 bushels, valued at \$435,149,290, against \$310,180,000 for the wheat crop. The corn crop of the last statistical year was 1,283,827,500 bushels, valued at \$475,491. The quantity exported in the previous year amounted to 50,910,000 bushels, the largest amount ever exported in a single fiscal year, and nearly 70 per cent greater than the previous year. It must be borne in mind that the exportation of corn, as well as wheat and other cereals, bears an important relation also to the size of the relative crop, as well as home prices. The enormous crop of 1875, which was exported the following year, bore such low prices in the Western markets as to suggest the practicability of a greatly enlarged export trade. From low prices and freights then prevailing, it was calculated that corn could be laid down in the British markets so as to be sold, with a fair margin of profit, at 26 shillings per quarter. The profits of this movement, it may be remembered, somewhat overbalanced its losses. This was one of the causes that has so greatly enlarged the export of corn during the past two years. No. 2 corn is now quoted at from 54 to 55 $\frac{1}{2}$ cents per bushel, against 37 to 39 $\frac{1}{4}$ in 1872.

The rye product of 1872 was 14,048,654 bushels, valued at \$11,363,600, against 20,374,000 bushels last year, valued at \$13,635,000. In 1872, No. 2 rye was quoted at 73 and 74 $\frac{1}{2}$ cents, against 70 and 75 cents at the present time. The export of this cereal is comparatively slight, and was only one per cent more than in the previous year. In this connection it is a singular fact that in no instance during the last dozen years has its export equaled two per cent of the product. Less than 2,000,000 bushels were sent abroad last year. During the past three years the difference between the averages of its export values has been 49 cents, 11 cents, and 14 cents per bushel, amounting to \$2.48, 56 cents, and 70 cents per barrel. The same causes are doubtless operative in this case as in that of wheat flour and corn meal.

Turning to the subject of meats, we find a gradual but large increase in the packing of pork and the slaughtering of cattle since 1872-73, but prices have varied considerably during the period, influenced more or less by the size of the product and the foreign demand. In 1872 mess pork was quoted, in March of that year, at \$11.95 to \$12.20 per barrel; the rates at the present time are substantially the same. Mess beef, which sold at \$8.75 to \$9, and extra at \$10.75 to \$11, is now quoted at \$10 to \$12.50, and \$14 for the best. The center of the hog and beef trade is at Chicago. There has been a great annual development of the pork-packing business since 1870, and this business is one of the prominent facts in both agricultural and commercial matters. A new feature of the pork business is the great increase of hogs in Texas, which sent to market last year over 2,000,000 head. The production of swine in that section of the country has improved of late years,

the "razor backs" of the past generation having given place to improved breeds. In northern Texas the best strains of Chester White, Essex, Berkshire, etc., are being propagated. In this connection it is noticeable that the immense enlargement of swine products, without any adequate evidence of equivalent decrease in the rate of home consumption, has only been accomplished by increase of average weight, or large increase of numbers in proportion to population.

A comparison of prices for 1876 with the present time shows the following, so far as the Boston market is concerned: Ham, superfine, spring, \$4 to \$4.25; good to fancy, \$6 to \$9. March, 1878, \$4.25 to \$4.75; good to fancy, \$6.50 to \$8. Pork, two years ago, that sold at \$22.65 to \$22.80, and \$18.50 to \$21.50, is now sold at \$10 to \$10.50, and \$12 to \$14 per barrel.

In the matter of dairy products, there is little or no difference in the prices that prevailed six years ago and now. Then New York and Vermont butter was quoted in March at 18 to 35 cents; cheese was a few cents higher, ranging from 14½ to 17½, against 12 and 14½ cents at the present time; while two years ago prices for these articles were a cent or two higher than the prevailing rates. Lard is now selling at 7½ to 8 cents, against 13 to 13½ cents in 1876, and 9¼ to 10 cents in 1872. The article of hay, of which there were produced in 1872 23,969,000 tons, valued at \$348,000,000, sold in that year in Boston, in March, from \$22 to \$32 for Northern and Eastern, and \$25 to \$30 for Western choice. The quotations now stand at \$20 for fancy Northern, and \$16 and \$19 for other kinds. Two years ago Eastern and Northern hay was cheaper than it now is, having sold at from \$13 to \$20 per ton. The hay crop of 1876 was estimated at 30,867,000 tons, valued at \$300,000,000. The crop of 1872 was estimated at 23,000,000 tons, valued at \$345,000,000.

This subject of comparative prices might be pursued to an almost indefinite extent. Potatoes, for instance, the crop of which, six years ago, was 113,516,000 bushels, grown on 1,331,000 acres, and valued at \$68,000,000, were sold in that year at the rate of 90 to 95 cents per bushel for Early Rose, and the same for Jackson Whites. The crop of last year was estimated at 124,000,000 bushels, grown on 1,741,000 acres, valued at \$83,000,000, while the prevailing prices range from 35 to 60 cents, according to quality. The average value per acre of the crop six years ago was \$51.14, last year \$48.14, the average price per bushel being 65½ cents.

The apple crop has also varied a good deal, both in the quantities raised, the export demand, and the prices obtained. Although this is a national fruit, and has become an important article of export, yet the Government statistician has furnished no good data of facts respecting the trade in this article. Respecting jobbing prices, however, it appears that in 1872 prices for a good article ranged from \$2.50 to \$3 for Western, and \$2 to \$2.50 for Eastern, as against \$4.25 and \$5 per barrel at the present time.

Not omitting some of the more material products that enter into the manufacture of textile goods, the ups and downs of the wool market afford a good study. In 1872 the range of prices was as follows: Picklock XXX Ohio and Pennsylvania, 57 to 85 cents per pound; medium XX Ohio and Pennsylvania, 56 to 85 cents; Michigan, 52 to 82 cents; Western, 50 to 82 cents. In 1876 (at this season of the year) prices ranged from 38 to 52½ cents for Ohio and Pennsylvania, 42 to 46 for Michigan, 35 to 47 for pulled, 42 to 65 for combing fleece, and 14 to 33 cents for California. Present quotations: Ohio and Pennsylvania, 42 to 43 cents for medium; Michigan, Wisconsin, etc., range from 38 to 40 cents; and low and coarse fleeces from 34 to 37 cents per pound; combing and delaine are nominal. The wool market is very dull at the present time.

Respecting the future prices for farm products the matter is enigmatical, but the hope is that a business revival may soon come and advance and strengthen prices for all kinds of produce, and thus enable the farmer to realize a fair profit and a good market.—*Boston Cultivator.*

What Kills.

In the school, as in the world, far more rust out than wear out. Study is most tedious and wearisome to those who study least. Drones always have the toughest time. Grumblers make poor scholars, and their lessons are uniformly "hard" and "too long." The time and thought expended in shirking would be ample to master their tasks. Sloth, gormandizing, and worry kill their thousands, where over-study harms one. The curse of Heaven rests on laziness and gluttony. By the very constitution of our being they are fitted to beget that torpor and despondency which chill the blood, deaden the nerves, enfeeble the muscles, and derange the whole vital machinery. Fretting, flageeting, ennui, and anxiety are among the most common causes of disease. On the other hand, high aspiration and enthusiasm help digestion and respiration, and send an increased supply of vital energy to all parts of the body. Courage and work invigorate the whole system, and lift one into a purer atmosphere, above the reach of contagion. The lazy groan most over their "arduous duties," while earnest workers talk little about the exhausting labors of their profession. Of all creatures, the sloth would seem to be the most worried and worn.—*B. G. Northrop, Conn.*

The cabin fittings of the new Cunard steamer Gallia are being made in Japan. It is stated that the work will be cheaper and better than if made in England.

THE PHILADELPHIA LAWN MOWERS.

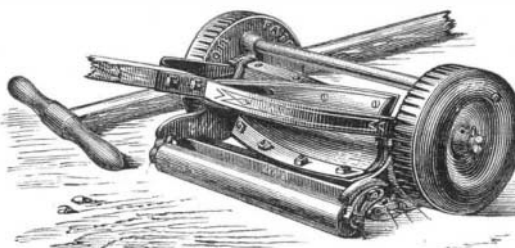
We illustrate herewith two forms of an improved lawn mower, which is claimed to run easily, work efficiently, and to be strongly and durably constructed. Fig. 1 represents the 6½ inch driving wheel machine, of which five sizes are made, suitable for large and small lawns. The construction will be readily understood from the engraving. Fig. 2 is a new 15 inch mower, with 8½ inch driving wheels, and 6½ inch wiper or revolving knife cylinder. It weighs 51 lbs.,



THE PHILADELPHIA LAWN MOWER.—Fig. 1.

runs light for one man, and can be adjusted to cut from ½ to 1½ inch high. For large open lawns this mower is especially well suited.

An excellent feature of these machines is that they are self-sharpening; and all wear of the wiper journals can be taken up by set screws. The weight of the 6½ inch mowers ranges from 32 lbs. to 50 lbs. Large mowers adapted to be



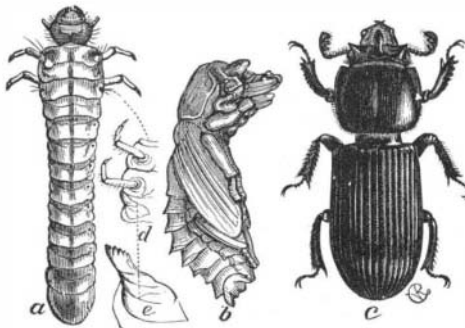
THE PHILADELPHIA LAWN MOWER.—Fig. 2.

drawn by a horse range from 315 to 450 lbs. For further information address the manufacturers, Messrs. Graham, Emlen & Passmore, 631 Market St., Philadelphia, Pa.

THE HORN BUG.

BY PROFESSOR C. V. RILEY.

One of the most common and most interesting American beetles met with at this season of the year in wooded regions is what is popularly called the "horn bug," and entomologically known as *Passalus cornutus*, Fabr. Few insects are more familiar to the Western farmer's boy, who finds it in every old stump or under every old log that he digs into or turns over. The polished, rather elegant creature, with its slow, clumsy motions, makes a very good plaything for little folk, who are fond of causing it to draw diminutive objects hitched by means of a thread to the curved horn on its head. How few of them, however, ever interest themselves in its development, or ask themselves where it comes from and how it grows! When disturbed, this beetle makes known its displeasure by a peculiar half squeaking, half hissing sound, produced by the friction of the horny terminal joints of the abdomen against the inside of the hard wing covers.



Passalus Cornutus.—a, larva; b, pupa; c, beetle; d, sternum, showing atrophied third leg; e, this last enlarged.

Common as is the beetle, its larva and pupa are but seldom met with, and the natural history of the species was first published in the fourth and fifth Reports on the Insects of Missouri. The eggs are deposited under the loose bark of decaying logs, are ovoid, and 0.12 inch long. The shell is smooth, flexible, but tough, and of various shades of olive green. The eggs hatch in July, and the larva acquires full growth in the amazingly short period of six weeks. The larva is very exceptional, in that it possesses but two pairs of well developed thoracic legs, the third pair being so rudimentary as to be almost invisible. The form is, in other respects, grub-like, the thoracic joints being slightly enlarged and flattened.

The color is bluish white, except the head, which is a light

rust brown. It transforms in the autumn, within the decaying wood upon which it feeds, to a bluish white pupa, in which the front pair of legs of the future beetle are thrown forward under the head, and the horns are plainly visible on top. It remains in the pupa state only about two weeks.

ASTRONOMICAL NOTES.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, April 20, 1878.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated.

PLANETS.

	H.M.		H.M.
Mercury sets	8 22 eve.	Saturn rises	4 10 mo.
Venus rises	3 27 mo.	Uranus in meridian	7 56 eve.
Mars sets	10 53 eve.	Uranus sets	2 48 mo.
Jupiter rises	1 42 mo.	Neptune sets	7 09 eve.

FIRST MAGNITUDE STARS.

	H.M.		H.M.
Antares rises	10 08 eve.	Sirius sets	9 44 eve.
Regulus in meridian	8 06 eve.	Procyon sets	11 56 eve.
Spica rises	6 00 eve.	Aldebaran sets	9 3 le. w.
Arcturus in meridian	0 17 mo.	Algol (2d-4th mag. var.) sets	10 13 eve.
Altair rises	11 19 eve.	Capella sets	1 24 mo.
Vega rises	7 43 eve.	7 stars (cluster) sets	9 13 eve.
Deneb rises	8 46 eve.	Betelgeuse sets	10 18 eve.
Alpharatz rises	2 18 mo.	Rigel sets	8 43 eve.

REMARKS.

Venus, Jupiter, and Saturn are now morning stars. Mercury and Mars are evening stars. Mercury sets 1h. 38m. after the sun, and just as twilight ends, the sun at that time being 18° below the horizon. He is stationary April 26. Jupiter will be morning star after April 25; is occulted by the moon April 24 in the morning. This rare phenomenon is only visible south of 20° south latitude. Their nearest approach in this latitude is at 6h. 25m. morning, at which time Jupiter is about 38' north of the moon. As twilight begins at 3h. 29m. morning, perhaps 4 o'clock in the morning will be the best time to observe them, at which time their relative positions will vary but little from those given above. Jupiter is at his western quadrature April 25.

New Mechanical Inventions.

Mr. T. H. Thompson, of Benson, Minn., has invented a Trace Trimming and Creasing Machine, which trims, edges, creases, and smooths harness traces in a single operation, by means of a combination of adjustable rollers and cutters.

Mr. F. E. Brandis, of Brooklyn, N. Y., has invented a Spindle Attachment for Surveyors' Instruments, by which the upper cone on the parallel rods of the tripod is done away with, the vertical distance between the center of the ball and socket joint and the bubble is reduced, and the biasing of the center by the parallel screws dispensed with.

An improvement in Safe Bolt Works has been devised by Mr. Mayer Adler, of New York city. In this arrangement vertical sliding and lateral swinging bolts are jointly operated by coupled pivot rods of the lock, which are extended beyond the lock or drawn back by a key socket and cam, actuated by a lug on the key.

A Balanced Slide Valve, invented by Mr. R. G. Bishop, of Chetopah, Kan., is claimed to be not liable to leak or wear out. A center chest cast on the cylinder is connected with side chests. At both ends of the center chest are lateral chambers, opening by ports into the cylinder, for inducting and conducting the steam, the lateral ports opening also sideways into the side chests, in which two slide valves, connected by transverse screw bolts, are reciprocated.

An improved Horse Power, patented by Mr. Squire Thomas, of Junction City, Oregon, consists of a wheel placed in a movable frame and arranged to roll upon the ground, and in a stationary frame containing gearing driven by the traveling wheel, as it is drawn around it by the horses.

Mr. Norman Bly, of Crown Point, N. Y., has invented an improved machine for Reducing Wood to Paper Pulp. It consists of a series of thick circular saws and a single thin guide saw of slightly larger diameter, mounted on a mandrel or shaft and driven by a suitable motor.

An improved Lifting Jack has been invented by Mr. J. B. Fayette, of Oswego, N. Y. It combines two essential points, the application of power in a direct line with the slides, thus obviating side strain, and lifting the object the full throw of the machine.

Mr. G. B. Markle, of Jeddo, Pa., has invented a machine for Breaking Coal and similar substances. The breaker plates are each made in two parts, dovetailed together, to enable the inner toothed parts to be readily removed. Power is applied by eccentric arms from the shaft to one of the plates, which is rearwardly inclined, and the other plate is adjustable, by means of set screws, so as to regulate the fineness to which the coal is broken.

Mr. J. A. Morrison, of Karns City, Pa., has patented a combined Elevator and Clamp for the Sucker Rods of Oil Wells, intended to dispense with the use of sucker rod wrenches, to retain the rods steadily in position, and protect their threaded ends. It consists of a main lever, forked at its lower end, and having a clamp recessed to receive the shoulder or neck of the rod, which clamp is fulcrumed in the fork. A safety slide is guided along the shank of the main lever, and may be lowered over the threaded portion of the rod to protect and secure it.

A new form of Windmill, invented by Mr. G. B. Dean, of Lamoille, Ill., is constructed almost entirely of iron, with the exception of the wheel and vane, and so as to dispense with the use of heavy and complicated turn tables, oil boxes, and joints.