IMPROVED OPTOMETER.

We give an engraving of a novel instrument for measuring the focal lengths of lenses, which is capable of measuring the focus of any lens from three inches to seventy-two inches, while the length of the instrument is only thirteen inches. This is effected by the employment of a convex lens of short focus which shortens the focus of the lens under test. The instrument is in some respects similar to a camera, the object being held in the short detached tube, the lens to be tested being placed between the two tubes; the image of the object is formed on a ground glass carried by the movable tube. There is a scale on the movable tube, and when the image on the ground glass is sharp, the scale indicates the focal length of the lens.

The great utility of this instrument will be understood when it is known that scarcely any spectacle or eye glass has the correct focus marked upon it; and it is often very essential that the exact focus of a lens be known, for example, in matching a glass when its mate is broken, or in supplying spectacles which are but very little different from those already worn.

This instrument is as well adapted to testing concave as convex lenses, and it may be used by any light. It is an ornament to the showcase of a dealer, and will be found very useful by any one dealing in spectacles as well as the regular optician.

This invention was recently patented in this country, and is manufactured by Messrs. Scharpf & Adam, Smith's Arcade, Rochester, N. Y.

NEW OPTOMETER.

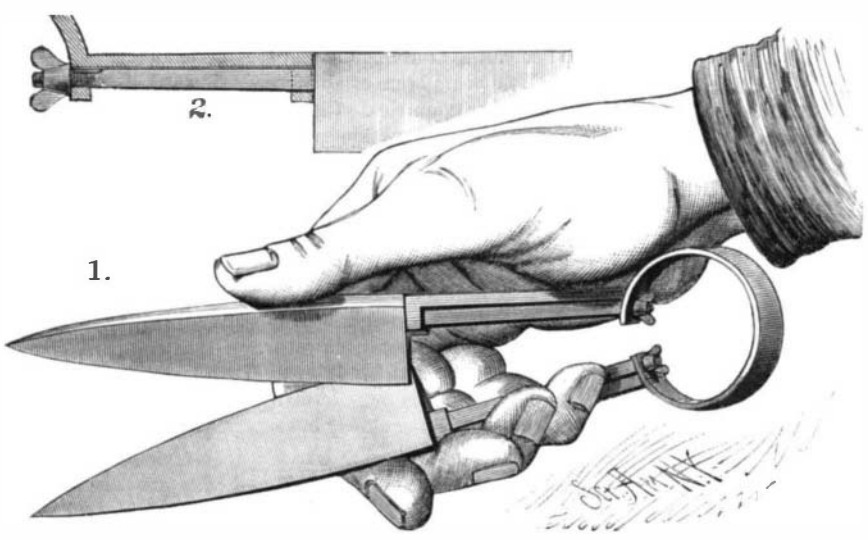
IMPROVEMENT IN ANIMAL SHEARS.

The shears shown in the engraving differ from ordinary sheep shears in having the blades separable from the handle. This construction admits of readily detaching the blades so that they may be ground separately, saving a great deal of time in grinding and avoiding rounding the points and corners and breaking the spring, a thing that often happens with shears of the ordinary construction.

The construction of the shears will be understood from the engraving, Fig. 1 showing the article complete, Fig. 2 being a detail view of a portion of the spring and the end of the shear blade.

The handle of the shears is made with a central spring in the usual manner. On the outer and inner ends of the arms of the handle are formed sockets to receive the shanks of the blades. The apertures of the eyes are made square and slightly tapering, and the shanks are made square and are tapered, so that when the shanks have been drawn snugly into the eyes the blades will be held firmly and rigidly. On the ends of the shanks are cut screw threads to fit wing nuts, by which the shanks can be drawn snugly into the eyes and held securely. The backs of the blades project a little beyond the shanks to form shoulders to rest against the ends of the arms of the handle, so that the backs of the blades and of the arms of the handles will be in line and will form a smooth surface.

This invention was lately patented by Messrs. C. Benavides and J. P. Arthur, of Laredo, Texas.



IMPROVED ANIMAL SHEARS.

The Piute Census.

The statistics of the Nevada Indians were collected by Indian enumerators, whose outfit consisted of a pencil and a sheet of paper. A circle on the paper represented a wigwam or a camp. Within each circle the enumerator placed figures to represent the number of persons counted, squaws and children being represented by different signs. Chief Numana, the supervisor of the Indian count, made up his report from the paper sheets by taking a number of sticks of various lengths to denote adults and children of different sizes, notching those representing females, and sending the sticks in bundles to the Census Office.

This method, though rude, has served to furnish an accurate census of the Piutes.

Proposed Lake Erie and Ohio River Ship Canal.

A report of surveys made by Major John M. Wilson, U. S. Engineers, describes two possible routes for a ship canal connecting Lake Erie with the Ohio River.

The first is by way of the Erie and Wabash Canal to the navigable waters of the Wabash River, which would then make the connection through to the Ohio. This would necessitate the enlargement of the entire route from Toledo to Lafayette to a width of 70 feet at surface and 52½ feet at bottom, with double locks 110 feet long, 18 feet wide, with a depth of 7 feet on the miter-sill, enabling it to pass boats of 240 tons burden, capable of carrying 8,000 bushels of grain, the amount transported by a train of 20 ordinary freight cars.

The second route is by the Miami and Erie Canal, which joins the Wabash and Erie Canal, 10½ miles south of Defiance, thus connecting Toledo and the Lake with the Ohio River. It is proposed to enlarge the entire canal from the Ohio River to Junction City, Ohio—where it unites with the Wabash and Erie—to the dimensions of the New York and Erie Canal: the prism to be 70 feet wide at water surface, 52½ feet wide at bottom, with a depth of 7 feet; all locks double, with a length of 110 feet, width of 18 feet, and a depth of 7 feet on the miter-sill; all canal structures of solid masonry, the superstructure of highway and railroad bridges of iron.

The estimated cost of the first plan from Toledo to Lafayette, Ind., is $24,236,135.17; that of the second, from Toledo to the Ohio River at Cincinnati, is $28,557,173.13.

IMPROVEMENT IN WATER ELEVATORS.

Although the devices that have been invented for elevating water are almost numberless, it must be admitted that there is nothing so free from objections as the old open bucket. The old-fashioned devices entailed considerable labor in raising the filled bucket, but no one doubts that the water was sweeter and better than it would have been had it been drawn from a closed well with a pump of any kind.

Our engraving shows a water elevator embodying all that is good in the old open bucket, and having new features which avoid all objections to the windlass and bucket. In this elevator there are neither brakes nor springs, and the mechanism is so contrived that no accident can occur from the running back of the empty buckets. There are two buckets, worked by the same windlass, one ascending while the other is descending, thus insuring a perfect balance of the buckets and doubling the capacity of the elevator. Ratchets and pawls are dispensed with and noise avoided, yet the bucket is stopped automatically at any given point in its ascent or descent. The mechanism bywhich this is accomplished is exceedingly simple, consisting of rubber balls placed in tapering pockets on opposite sides of a wheel on the windlass shaft, and in a lever operated by the tilting bucket so as to displace one or the other of the balls and allow the empty bucket to descend, while the ball, remaining in contact with the wheel, serves as a check on the filled bucket being raised.

This elevator is adapted to a well of any depth, since its buckets are perfectly balanced. The shaft of the windlass is mounted on roller bearings, reducing the friction to a minimum.

For the sake of convenience an indicator is placed on top of the housing and connected with the lever that shifts the rubber balls, and shows which way the handle of the windlass should be turned. The size of the curb is two feet by two feet four inches.

Further information in regard to this useful invention may be obtained by addressing Mr. Samuel I. Demarest, agent, Englewood, Bergen county, N. J.

IMPROVED WATER ELEVATOR.

Dangers of Athletic Training.

Absolute health is attained only by the symmetrical development of all parts of the body. The man with muscles of steel and a diseased heart cannot be said to be in good health, and diseases of stomach, heart, and nervous system are often—it may even be said usually—produced by that system of development known as training. At a recent rowing match in Philadelphia, two plucky lads in contesting boats fainted as soon as the race was over. Their condition, which was apparently good, was actually abnormal, and their systems gave way because the strain which their muscles met was too great for their vital functions. Recently a similar but more serious calamity occurred at Sag Harbor. A Brooklyn lad who had taken part in a pedestrian contest, when removed from the track, fell down dead. He had prepared himself for walking and running, and depleted his vital organs to build up his limbs. When the strain came the impoverished and most important part gave way. The severe muscular exercise of college athletes has carried off many fine young men by consumption, heart disease, and other disorders, directly traceable to the absurd overwork required of their bodies. There is a limit of human endurance. That limit is reached when the body is impaired in one quarter to benefit special organs. The severity of the test by which athlete prizes are won seems designed rather to award the laurels to him who is the least healthy, because more unevenly developed, than to the really best man.—*Boston Jour. Chem.*

MISCELLANEOUS INVENTIONS.

With vulcanizers in which the required temperature is obtained by confining the steam, especially those used by dentists, the proper regulation of the temperature is of the utmost importance, and has heretofore been attended with difficulty. The usual method is to regulate the flow of gas to the steam generator by hand; but such method is unreliable. Mr. William E. Gwyer, of New York city, has patentedan improved governorfor vulcanizing apparatus worked by the steam pressure, by which the pressure, and consequently the temperature, is maintained at a nearly uniform point. The invention consists in a gas cock opened by a spring and closed by steam pressure, for regulation of the flow of gas.

An improved snow shovel, which is simple, light, and durable, has been patented by Mr. Henry E. Vosburgh, of Auburn, N. Y.

Mr. James H. Egan, of St. Johnsville, N. Y., has patented an improved cone attachment for stoves which is designed as an improvement on the cone attachment for which letters patent No. 229,684 were granted to the same inventor July 6, 1880, and its object is to supply air to the cone without interfering with the draught through the grate.

An improved umbrella and sunshade has been patented by Messrs. J. T. Liley and F. S. Liley, of London, England. This umbrella or sunshade is provided with means for automatically expanding or opening it when released from the catch or tip cup which retains it in the closed position.

Mr. Charles R. Gorgas, of Wooster, Ohio, has patented an apparatus that may be readily used by the surgeon without assistance, and in the case of fractures dispenses with bandages. The invention consists in a frame provided with an extension slide that is fitted for operation by a rack and pinion, so that the power required may be readily applied.

An improvement in spoons and forks has been patented by Mr. Norman S. Boardman, of East Haddam, Conn. The invention consists in combining with the bowl of a spoon or tines of a fork a brass wire and glass tip. The wire is soldered to the bowl at one end, and provided at the other with a glass tip cast on.

Mr. Thomas Harding, of Brooklyn, N. Y., has patented an improved reclining chair that may be readily adjusted to form a reclining chair or bed, and also folded closely for transportation.

An improved road grader has been patented by Mr. James F. McGarry, of Caldwell, Ohio. The object of this invention is to furnish a road grader so constructed that it can be readily turned and used in narrow places, will throw no weight upon the horses' necks, either when loaded or unloaded, and when dumped can be readily drawn back to the place of loading.

An improved nose piece for eyeglasses has been patented by Mr. Fred Terstegen, of Elizabeth, N. J. The object of the invention is to allow the nose rest to be moved in or out of the same plane with the glasses, and by the pressure of a spring to be confined in any particular position, thus insuring firmness to the nose rests, and avoiding the chance slipping of the glasses from their position, and thus injuring the wearer.

An improved stove board has been patented by Mr. A. I. Griggs, of New York city. The object of this invention is to produce a stove board that will not tarnish, and that may be made ornamental without the labor and expense of varnishing and baking the boards.

An improved steam chest for hot-air drying, patented by Alexander Winward, of Accrington, county of Lancaster, England, consists in a sheet of tubes provided with cross pipes as well as inlet and outlet pipes. These tubes may be separate for the greater portion of their length and connected to each other at either end, the tubes opening at each end into a cross pipe or steam way, in such a manner that the steam may pass through them all; or the outsides of the tubes may be joined to each other by a central web extending the whole of their length.

An improved self-chalking holder for chalk lines which chalks the line perfectly, and does not waste or break the chalk, has been patented by Mr. Chauncey Wing, of Greenfield, Mass. The invention consists in a tubular roller or barrel, upon which the string or line is wound, the barrel being provided with two loose end pieces united by a spindle, upon which a cylindrical piece of chalk is loosely mounted and pressed against and into one end of the end pieces by an adjustable spring in such a manner that the end surface of the piece of chalk is pressed against the string or line, which passes through a recess formed by the end surface of the piece of chalk, and a laterally projecting flange of the corresponding end piece.

Mr. John Nagele, of Clarendon, Ark., has patented an improved vehicle wheel hub designed especially for buggies and light wagons, and also adapted to heavy vehicles. The invention consists of a hub provided with open-sided spoke mortises for staggering spokes, of annular caps or flanges fitted over the ends of the hub against the outer faces of the spoke tenons, and of a projecting band or collar, in combination therewith, that encircles the hub between the two sets of spokes and supports them on their inner faces.

MANUFACTURE OF REAL LACE BY MACHINERY.

Considerable attention has lately been paid in Europe to the manufacture of lace by machinery. A company has been organized in Paris with a capital of 2,500,000 francs to develop M. Malhère's lace loom.

This loom is a marvel of mechanism, having from 1,800 to 2,000 spindles, which are put in motion at the same time

Fig. 1.

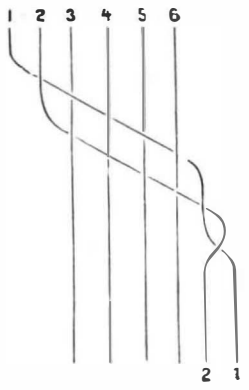


Fig. 2.

that 200 to 300 pins are placed or displaced. But the inevitable complication of the members of which it is composed, though a just object of admiration, is a legitimate cause of apprehension as to the regular working of the apparatus. In order to work economically the lace machine must move with great rapidity, and without very frequent interruptions; but whether these conditions can be realized is a matter that can be proved only by experiment.

This loom makes real lace, imitating hand work. We give a photographic reproduction of a sample of Valenciennes lace made with this machine, also a study of the rounded mesh of Valenciennes from Bruges. The pattern is not the work of a regular designer of lace, but was composed spontaneously by M. Malhère, who invented the loom: this explains its lack of elegance.

It is claimed that this loom can produce all kinds of lace, and that competent judges, and even lace-makers, confound the lace which it produces with that made by hand. The microscope demonstrates to the incredulous that the weaving is the same as hand-made lace, without the least resemblance to the imitation.

For the principal facts we are indebted to the report written on this subject by M. Jousselin, engineer. The report begins by explaining how the inventor was led to construct the machine.

M. Malhere, in studying with a magnifying glass the intertwining of the thread of the lace made by hand, ascertained that in all kinds of lace, in the network and in the flowers, the thread is subjected to the same operation. This was the first conception of the possibility of producing these operations mechanically. Indeed, if one considers a twist forming the mesh of the Valenciennes and the knot of the figure constituting the flower, it is ascertained that the thread No. 1 (Fig. 1) crosses successively over thread No. 2, over thread No. 4 (which was crossed over No. 3), and under No. 3, in order to return, passing over and under the threads until it resumes its original direction, forming thus, with the three other threads, a twist of four threads. In Fig. 2, the adjacent threads, 1 and 2, pass suddenly in a transverse direction, twisting with a half revolution, and passing in alternation over and under threads 3, 4, 5, 6.

This problem, then, is reduced to making a twist of two contiguous threads from right to left or from left to right, according to the requirements of the design, and making it in such a manner that this twisting will be effected at will from right to left or from left to right in order to reverse the thread below or above.

In consequence of this it is necessary to accomplish mechanically the transposition of the threads in order to put in proper relation those threads which are destined to be worked together, and M. Malhere conceived the fundamental idea of making a machine employing rotative disks, which contain two threads capable of being twisted together by a half revolution or a complete revolution. These disks are tangent and in pairs, capable of transferring the thread from disk to disk, and are arranged in the segment of a cylinder, in order that the threads between the disks and their converging point may be as nearly as possible of a uniform length. The lace is produced in the geometrical center of the segmental frame. Several bands of lace are produced simultaneously by the superposition of the thread carriers. M. Malhere has also invented a comb with independent teeth which replaces the pins of the hand lace worker. The movements of the several independent members of this machine are controlled by the Jacquard arrangement of perforated cards. Such is the succession of ideas which led to the invention of the lace loom.

The lace from the spindles of the hand lace-worker is not made like net or imitation lace, by two distinct groups of threads, warp and woof, but by veritable twisting, in the interlacing of which all the threads may concur, following the fancy of the designer.

The interlacing threads are collected and fixed in the central part of the machine (corresponding to the pillow of the hand lace-maker by means of pins. This hand method of making lace suggested to M. Malhere the peculiar form which he has adopted for the frame of his automatic loom. It consists of two concentric cylinder segments supported at a convenient height upon a cast iron table. As all parts of

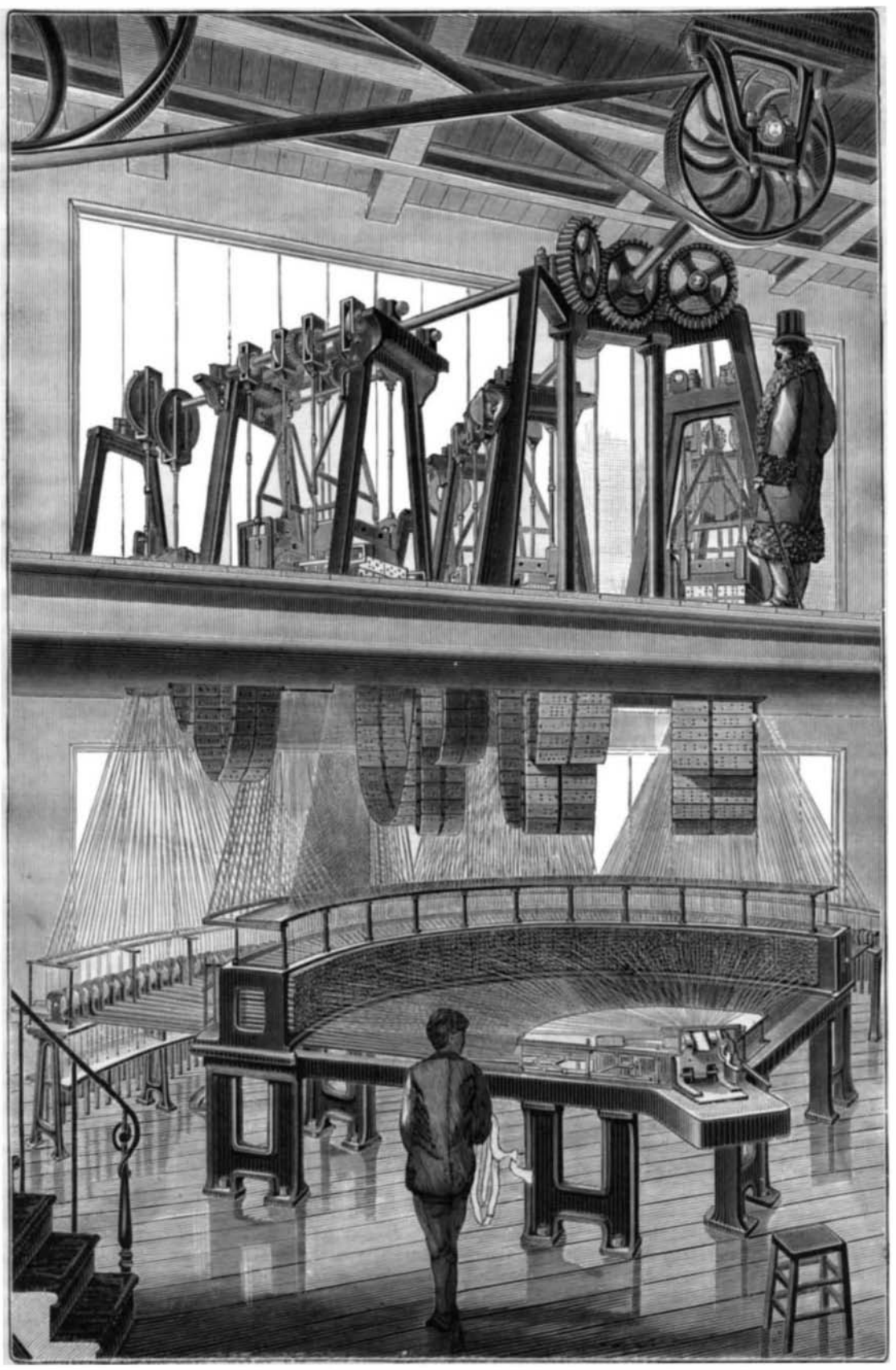


Fig. 5.—MALHERE'S LACE LOOM