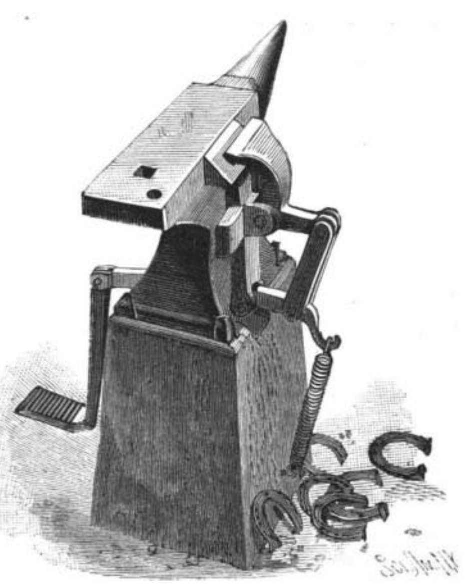
A LIGHT AND SIMPLE MOTOR.

A motor to be operated by the hands and feet, which may be used for driving flying machines and other purposes, and is designed to bring into play all the muscles of the body, is shown in the accompanying illustration, and has been patented by Mr. Theodore A. Stark, of Ottawa, Ill. In use for a flying machine, as shown, the motor is provided with a light open frame having an open central space large enough to receive the body, the frame being suspended from an aeroplane, which may or may not be inflated. The motor consists of a straight hollow bar, with a central slot for a driving shaft and pulley, an endless belt wound once or twice around the pulley running also over pulleys journaled in forks at the ends of the bar, the forks being adjustable to give the proper tension to the belt. On the bar near its ends are slides, one to be moved by the hands and the other by the feet, and the slides have on each side projecting grooved abutments through which passes the driving belt, a swinging leaf or link being so arranged in each abutment that when the slide is pulled in one direction the leaf on one side will permit the slide to move freely along the belt, but when moved in the other direction the leaf binds the belt in the abutment, and the movement of the slide is imparted to the belt. In side extensions of the frame are journaled propelling wheels, whose hubs have grooved pulleys connected by a belt with the driving pulley, whereby the motor is operated as a flying machine, the propeller blades being arranged at such angle that they will lift upward on the machine, and also move it forward.

A HORSESHOE SHARPENING APPLIANCE.

A novel anvil attachment designed to facilitate the sharpening of horseshoes is shown in the accompanying illustration, and has been patented by Mr. Jerome W. Rapp, of Pineville, Pa. A vertically adjustable keeper is fastened to the front of the anvil by a bolt passed through a slot, and on the face of the keeper are teeth engaged by teeth on a shank which carries at its upper end a die at the side of and at an angle to the top or face of the angle, the same bolt also fastening the shank in place on the keeper. On the sides of



RAPP'S HORSESHOE SHARPENER.

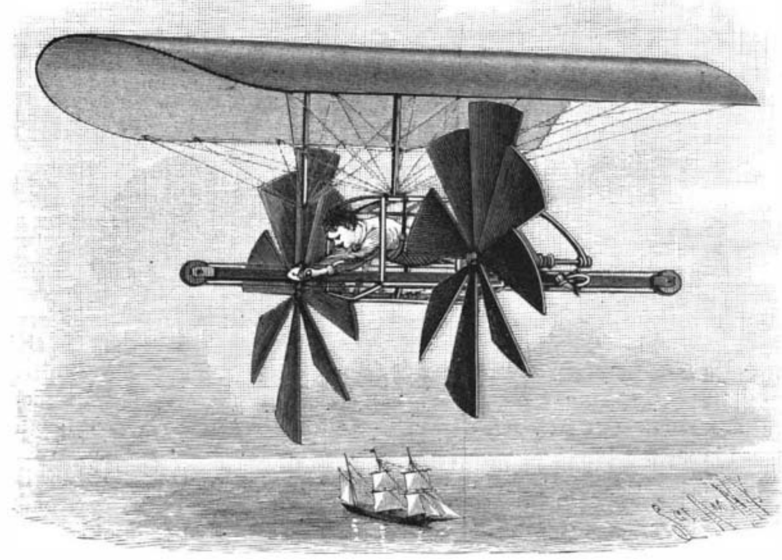
the shank are lugs carrying a pivot for a lever which has an upper curved end extending opposite the die, the lower end of the lever being connected by a link with a pivoted lever passing through a slot in the foundation, and having at its end a downward extension and footpiece. The clamping lever is normally held away from the die by a spring, until the operator presses upon the foot piece, after the shoe has been placed in position to sharpen the calks. With this construction the operator has both hands free to manipulate and work on the shoe, which is held securely in place on the anvil by simple pressure on the foot piece.

Cold Storage for Silks.

The cold storage of furs and woolens as a preventive against moths is now quite familiar to the public, but the cold storage of silks is, we apprehend, a new suggestion for which the trade has to thank the observing New Yorkers. The theory and practice are thus described by a recent writer:

"Raw silk is sold by weight, and when stored in ordinary warehouses the silk dries and naturally decreases in value. By storing it in a cold vault the moisture is preserved and the silk keeps its weight. There is another curious fact in regard to the cold storage of silk. Many large dealers in silks and ribbons keep their bales and bolts in cold storage with the temperature reduced below the freezing point. It was discovered some years ago that silk in winter usually had a finer luster than in summer. The cold air was supposed to be accountable for the change, and an experiment was tried in keeping bales of silk in cold rooms for comparison with others on the store counters.

"The cold silk then appeared to be of a much finer quality, when in reality it was from the same loom. As soon as this fact became generally recognized the large silk dealers went to the cold storage warehouses and had their silks placed in freezing vaults. In some cases the thermometer is kept as low as 10°, and when the bales are taken out they feel like blocks of ice. Some firms keep most of their stock in storage, and only take silk out in quantities equal to the anticipated sales of the day, for the luster acquired by freezing soon disappears after exposure on the bargain counter. It is asserted that an inferior grade of silk while extremely cold has the feeling and appearance of a much higher grade which has not been frozen; while, on the other hand, it has been found that the best grades are not improved by the arctic treatment."



STARK'S MOTOR FOR FLYING MACHINES, ETC.

AN IMPROVED FIRE APPARATUS.

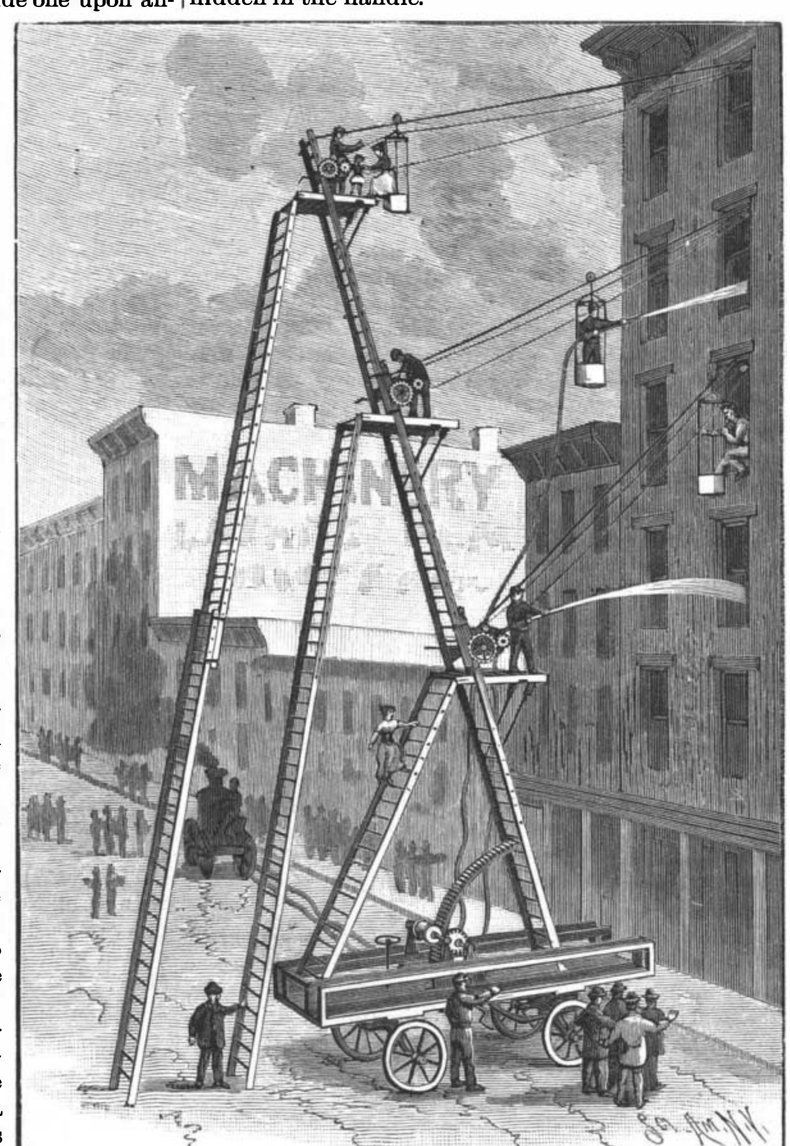
The accompanying illustration represents a combined fire escape and fire extinguisher patented by Mr. M. A. Pauly, of Eau Claire, Wis. It is designed to be raised in the center of the street, so that the firemen may work over telegraph and other wires strung on poles, and is provided with insulated shears for cutting all kinds of interfering wires. The apparatus is carried by a frame upon a wagon body, the wheels being mounted to make short turns. At one end of the body is a shaft to which is secured the lower section of an extensible ladder whose sections slide one upon another. The lower ladder section is raised to the desired angle by means of a bowed rack bar, acted upon through a crank and connected gearing, and at the top of each ladder section except the top one is an arrangement of cables and pulleys whereby a crankshaft may be worked at the top of one section to raise the next section, and so on until all the sections are raised. Near the top of each ladder section is a swinging platform, connected with which are detachable ladders, bracing the main ladder and connecting it with the ground, to facilitate the carrying up of hose and afford further means of escape. In the upper end of each laddersection is a drum carrying a strong rope adapted to serve as a track for a life car, one end of the rope to be thrown to a window in the building, where it is to be made fast, when the drum is turned to take up any slack. Beneath this drum is another on which is the carrying rope for a life car, the arrangement being such that by turning the drum the car will be moved quickly backward and forward to convey people from the building to the landing. The car is also supplied with a small rope with which a fireman may raise a line of hose, to direct a stream upon the building from the car. When not in use the sections are run down to make the ladder as short as possible, and so that all will lie horizontally on the frame.

The apparatus being placed in position the gears upon the frame are turned to actuate the rack bar, raising the sections to the desired angle, when a fireman goes up the first section, cuts interfering wires, and runs up section two to its position, swinging the platform of the first section horizontally, adjusting its front standards, and fastening the back short ladder to the back end of the beams of the platform. A small rope tied to a hook and pulley at the loose end of the life lines is then thrown to a window in the building, where the hook is placed in a ring in the window casing or ceiling, after which the life lines are adjusted to the proper tension, and the fireman begins to operate the gears above the platform to move the car back and forth. Another fireman, in the meantime, runs up the third section, and in a similar manner adjusts its platform and back ladder, and makes the life line connection. To overcome any liability to sag back of the section being raised, a triangular arm ending with a gear wheel runs in a rack bar in the outside of each side frame of a section, being firmly fastened to the outside of the side frames near the top of the stationary section. The platforms are designed to be sufficiently strong to prevent the sectional ladders from being pulled forward or sagging backward.

Anticholerin of Klebs.

Professor Klebs, reasoning that every organism during its lifetime produced substances which if allowed to accumulate would result in the death of such organism (in the case of man and animals these products are carbonic oxide, bile, urine, etc.), has realized success in the treatment of tuberculosis by a preparation, "*tuberculocidin*," made from the cultures of the tuberculosis bacillus (*Am. Jour. Pharm.* 1891, 599); the failure of Koch's *tuberculin* is explainable by the presence of products which have specific toxic action upon man along with the products which are destructive to the bacilli; by removing the former substances (called alkaloids) a preparation is obtained not injurious to man, but fatal to the bacilli. *Anticholerin* is a preparation in which these reasonings are applied in the purification of an extract from the culture of the comma bacillus, and which has given very encouraging results in the treatment of cholera in a Hamburg hospital; while only the most serious cases were treated with it, the number of fatal cases was 16–17 per cent less than was the case with other treatment. The preparation is a clear, brown-yellow viscid liquid, having an odor reminding of cholera patients; it is injected into muscular tissue of the stomach, or into the subcutaneous tissue of the thigh. —*Dr. Manchot* (*D. Med. Wochenschr.*), *Pharm. Ztg.*, *1892, 719; Am. Jour. Pharm.*

THE newest walking-stick is verily a light unto his feet and a lamp unto his path—an electric light is hidden in the handle.



PAULY'S FIRE APPARATUS.

The Glacial Period.

RALPH S. TARR.

It is not generally known, even among people well educated in lines non-geological, to what an extent we are indebted, as a people, to a certain accident or incident which occurred to a portion of the earth in times not very remote. If one will examine a map of New Jersey, he will find to the north of a line somewhat irregular, but extending from near New York to a point a few miles south of Delaware Water Gap, that there are many lakes, while south of this there are none. Moreover, if he is acquainted with the State, he will recall the fact that south of this line the streams flow uniformly in broad valleys with moderate slope, while north of it the valleys are sometimes narrow gorges, and the course is often marked by rapids and even falls. The same description holds true for the country on either side of this line continued northwestward to Dakota.

One who has traveled in the North and South can hardly have failed to notice this remarkable diversity in scenery, if he has traveled with his eyes open. Who would mistake the scenery of Maryland or of Virginia for that of New England? To be sure, the grander features of the topography in the two regions differ, because of difference inherent in the rock structure in large measure; but the details vary because of this accident. The gorges, the falls, the lakes, the pitted sandy plains, the grand knolls, and the lenticular drumlin hills which occur, for instance, in Boston Harbor and near Worcester, all these are found to the north of this line; but to the south of it they do not occur. This must not be accepted as strictly true, for all know that lakes do occur, that waterfalls and gorges are found south of this line; but they are rare, and are of different origin.

The line of which I have spoken is the terminal moraine on the southern limit of a great continental glacier that covered all the land north of it with an ice sheet, compared with which the inland ice of Greenland is small in extent and probably also slight in thickness. When this came, how long it remained, when it disappeared, and just what its exact history was we have not yet sufficient knowledge to state; but that it came upon a land which had previously been inhabited by plants and animals, and that it stayed a long time before disappearing we know to be facts, and can demonstrate to the satisfaction of even the most skeptical. Soils were removed and others put in their place, some valleys were deepened and hills lowered, other valleys were clogged with *debris* and the river turned aside or ponded back by dams of drift, and even hills had their form changed by the accumulation of drift upon their slopes and summits. Our excellent water power of New England was made possible, in large part, by the glacial changes, the strong though rocky soil of the same region was given it by the ice, the scenery was modified by it, and even the harbors of that coast seem, possibly, to have been the indirect result of the presence of the glacier.

It was very early noticed that in Europe and Northern America there were accumulations of bowlders, gravel, sand, and clay, sometimes stratified as if laid down in water, sometimes totally unstratified as if merely dumped there; and to this material was given the name drift. Certain deposits in southern regions, chiefly near rivers, which we now know to be of different character, were classed with the drift, and the whole mass was ascribed to the Noahcian deluge and was pointed to as proof of this deluge in answer to the criticisms of biblical skeptics. As the materials were studied, however, they presented many difficulties which the more acute students could not account for. It was noticed, for instance, that the bed rock was often scratched and grooved, and that these scratches were uniform in a given region, and even over as large an area as New England that the grooves pursued a nearly uniform northerly and southerly direction, though varying slightly from place to place. Large bowlders of rocks, of granite, for instance, were found stranded upon rock of an entirely different character and without a granite outcrop often in many miles. Studying this phenomenon, it was found that if one went in a northerly direction, toward the point to which the glacial scratches extended, an outcrop of this rock could usually be found. Little by little it became apparent that these bowlders came from the north, and a study proved that this was so. It was then found that one could trace these bowlders to their source, and that from knobs of rock there were southerly extending trails, which in the case of certain distinctly marked rocks were easily followed.

That floods of water unaided could transport great blocks of rock, often weighing scores of tons, in some cases many miles from their source, seemed improbable, particularly since many of the deposits of drift were not stratified, but consisted of fine clay and bowlders indiscriminately mixed, plainly showing that they were not assorted by water. Violent currents were assumed by some, but the view most commonly accepted was that these currents carried with them icebergs which buoyed up the blocks of stone and carried much drift, which, when they were stranded, fell down without being assorted. It was, it is true, necessary to assume currents with remarkable uniformity of direction; but since no other explanation offered itself, this seemed a necessary assumption. There was, however, one fact which, more than all others, made the theory weak, and this was that large bowlders were often found upon hill tops, to which they were borne from a much lower region. It was not noticed then that there was a line quite distinct in character, south of which the glacial drift does not occur, and that this line is not a height of land, but varies, sometimes crossing the plains, sometimes the mountains. Had they noticed this, they must have given up the theory, for surely no flood could occur which would cover hilly New England and the Highlands of New Jersey but fail to pass over the arbitrary line often to much lower land.

While these difficulties were puzzling many geologists, Louis Agassiz came to America and with his wonderful perception saw that the drift deposits and the glacial phenomena of New England were an almost exact repetition of the phenomena in the valleys of the Alps below the glaciers which had once been occupied by ice, and he saw that, since the facts were the same, the explanation was probably the same. Since he published his views there has been a careful study made of the whole problem, facts have been accumulated with great care, and all point to the truth of his theory, until now it is supported by overwhelming testimony.

The ice front stood, as has been said, in an irregular line, extending from Dakota through Wisconsin, Ohio, Southern New York, Northwestern Pennsylvania, Central New Jersey, and south of New England at Long Island, Martha's Vineyard, and Nantucket. Its extension seaward east of New England is not known; but it stood somewhere in the sea, probably discharging icebergs, just as does the Greenland glacier to-day.

The land north of this line was ice-clad. A great plateau of ice covered all the country and buried even the highest peaks. We know this because glacial striations are found on the high peaks, such as Wachusett in Massachusetts and Monadnock in New Hampshire, while even upon Mount Washington transported blocks of rock are found well up toward the summit.

This is what we know about its existence. Unfortunately we cannot say with equal definiteness why it came nor why it went. That there has been a change of climate is certain, but why? It is not difficult to suggest plausible reasons, but it is very difficult to say that this or that one is the true cause, or even that it is an efficient cause. Any part of the earth can be transformed into an ice-covered waste, provided the climate can be made sufficiently cold and the rainfall transformed to snow. In tropical regions this can be done by elevation, and Kilima-Njaro nearly under the equator rises above the snow line at 16,000 feet above sea level, while in Spitzbergen and in Greenland the snow line is at sea level.

If we could raise the northern part of America and Europe a thousand feet, the region of perpetual snow would be moved much farther south than now. It must be borne in mind that there is no necessity of making the line of snow, which is the place where snow remains unmelted throughout the year, coincide with the limit of the ice; for where snow accumulates it presses out by some path of escape and extends beyond the line of perpetual snow, as in the valley glaciers of the Alps, where their terminus is several hundred feet below the snow line. So in the case of the great continental ice sheet the snow line may have been in Canada while the ice front was in New England.

There is evidence enough that the continent was higher in times preceding the glacial incursion than it is now, but I cannot go into this in detail. This evidence is, briefly, that there are many valleys evidently river formed which are now partly or entirely submerged, such, for instance, as the Saguenay of Canada and the many fjords and bays and harbors of our eastern coast. It was for this reason that I said, in the first part of the article, that the harbors of our east coast were perhaps the indirect result of the glacier, for there are some who suppose that the accumulation of the ice was so great that the earth's crust was pressed down and once elevated land submerged. I would not care to insist that this former elevation was the cause of the glacial period, though it seems probable that it was at least a part cause.

(*To be continued.*)

Photography on Wood According to the Method of Lalleman.

The surface of the wood, and that only, is imbued with a solution of alum and allowed to dry spontaneously or at a gentle heat. The entire block is then coated with a mixture of animal soap, gelatine, and alum. We have used the following compound:

Water	100 parts.
White soap (castile)	2 "
Gelatine	2 to 3 "
Alum	1 part.

The solution should be used warm. When dry, the surface which is to receive the image is placed for a minute or two in a solution of hydrochlorate of ammonia (chloride of ammonium 2:100), and again allowed to dry. It is then sensitized with a bath of nitrate of silver 1:5 and dried in the dark. A negative either on glass or on paper is then applied on the surface of the wood in a pressure frame made for that purpose, which allows the progress of the printing to be watched. The image is fixed in a strong solution of hyposulphite of soda, and then washed for five minutes only.

The sizing protects the wood from any moisture, and an eight months' experience has proved that the use of alum, instead of loosening the texture of the wood, gives it a great toughness which is favorable to the engraving.

The Arrowroot Plantations of Coomera and Pimpama, Queensland.*

BY H. L. THOMPSON.

The arrowroot grown in the township of Coomera is the purple variety—the *Canna edulis.* It sometimes grows to a height of eight feet, bears a pretty scarlet flower and a dark purple seed pod follows, which is generally sterile. The best variety of arrowroot, the *Maranta arundinacea*, which is grown so extensively in the Bermudas, thrives well in this district, but its cultivation has been almost abandoned, owing to the difficulty of manufacture. This kind attains the height of two feet, and bears, at maturity, a small white flower somewhat resembling the potato blossom. In the districts of Coomera and Pimpama there are from 250 to 300 acres under cultivation.

The mode of cultivation is as follows: The ground is plowed in ridges of about forty-six feet wide, and thoroughly harrowed and scarified. Nine rows are placed in this, five feet apart, leaving six for the row in which the by-furrow comes. Shallow furrows, five inches deep, are run with the plow, then the smaller bulbs, about the size of a small apple, which are found growing at the bottom of the stems, are placed four feet six inches apart in the drill, and covered by turning a furrow from each side on to the top of the bulbs. Afterward, cultivation is carried on by keeping the ground clear of weeds by means of horse hoes or scufflers. When the plant reaches the height of about three feet, the space between the rows is turned up with a one horse plow, the soil thrown toward the plant, and a furrow left in the middle. It requires nothing further till it is dug up for the mill. When the tubers have come to maturity, which is generally in ten months or a year, the crop is ready. The stalks of the plant are then cut off as close as possible to the tubers with a cane knife or strong reaping hook. The tubers are then raised with grubbing hoe or mattock. With all speed they are placed in carts and conveyed to the mill, for the color is seriously affected by being exposed to the sun or weather before grinding. Sometimes as much as 50 pounds of tubers are obtained from one plant.

The machinery consists of a six horse power engine, a root washer, grinding mill, cylinder sieves for separating the farina from the fiber and pulp, and a centrifugal for drying. The root washer is a trough ten feet long, three feet deep, and two feet in diameter. This has a half circular bottom, through which a stream of water is constantly running. A spindle having pegs about four inches apart, and of a sufficient length to reach within an inch of the bottom and sides, revolves in the trough. The pegs cleanse the bulbs of all dirt and they gradually work down to one end of the trough. A wooden rake pushes the bulbs out into a continuous belt elevator, and thence they are conveyed to the hopper of the mill. This is a wooden drum two feet six inches on the face and two feet in diameter. It is covered with a sheet of galvanized iron, punched and placed on with the burr on the outside. The drum revolves at great speed, and a stream of water falls on it from tanks fixed above. Thus the bulbs are grated up, the bulbs and the water passing through the sieve No. 1, which is a cylinder eight feet long with the bottom half perforated with holes about the size of a No. 7 wire nail. Within this a beater revolves, forcing the water and farina through the holes, and being placed on the screw the pulp and fiber are forced out at the end. The farina and water pass into sieve No. 2, which is similar to No. 1, only with holes about the size of a large pin head in the bottom of copper. After this the liquid runs along a trough two feet wide, six inches deep and seventy feet long. The farina is deposited at the bottom of this, and the water passes off. The farina is now dug out, and passed through sundry more sieves, washed by hand and in tubs, then finally left to subside. When pretty firm it is taken out and passed through a centrifugal machine. It is now placed on the drying frames. These are wooden frames about six feet six inches long, with marsupial netting and calico stretched upon them. They are placed away from any dust or smoke, and the wind passing underneath, as well as the sun above, aids in the drying process. But the sun and air are not alone trusted with the drying. A drying house has been erected, capable of accommodating 180 frames. This is heated by steam pipes to 140° Fah. The value and market price of arrowroot depend so much on the color and quality, that the greatest care is necessary throughout its manufacture, and only very clear water is used in the washing.

* From the *Pharmaceutical Journal of Australasia.*