Tumefaction of Starches.

Some time since, Mr. W. H. Symons exhibited at the Royal Microscopical Society a hot and cold stage for the microscope, by means of which the exact temperature at which different starch cells swell or tumefy could be observed. By means of this instrument this observer determined the tumefaction point of a number of different starches, and as some of them are largely used by brewers, we give his results:

Starch.	A few swollen.	Majority swollen.	All swollen.
Potato	55° C.	60° C.	65° C.
Sago	64° C.	68° C.	74° C.
Bermuda arrowroot	62° C.	69° C.	73° C.
Wheat	60° C.	65° C.	70° C.
Maize	65° C.	70° C.	77° C.
Oat	65° C.	70° C.	77° C.
Rice	70° C.	75° C.	80° C.

It will be observed that, as a rule, the largest starch cells tumefy at the lowest temperature; and in accordance with this, rice requires the highest temperature of all the starches experimented on for the complete tumefaction of its cells. It was further proved by Mr. Symons that prolonged exposure to a temperature a little below that of tumefaction not only does not tumefy the granules, but enables them to bear a slightly higher temperature than they otherwise would do. When starch granules are gradually heated, the majority do not burst their integument by splitting it from the nucleus in all directions, as when they are subjected to a sudden rise of temperature, but a small bladder-like process is thrown out near the nucleus; and if the temperature be kept constant the swelling increases, although still confined to that portion of the granule, bursts, the granulose oozing out, and if sufficient time be allowed, the integument, still retaining the original size and shape of the truncated granule, is all that is left.

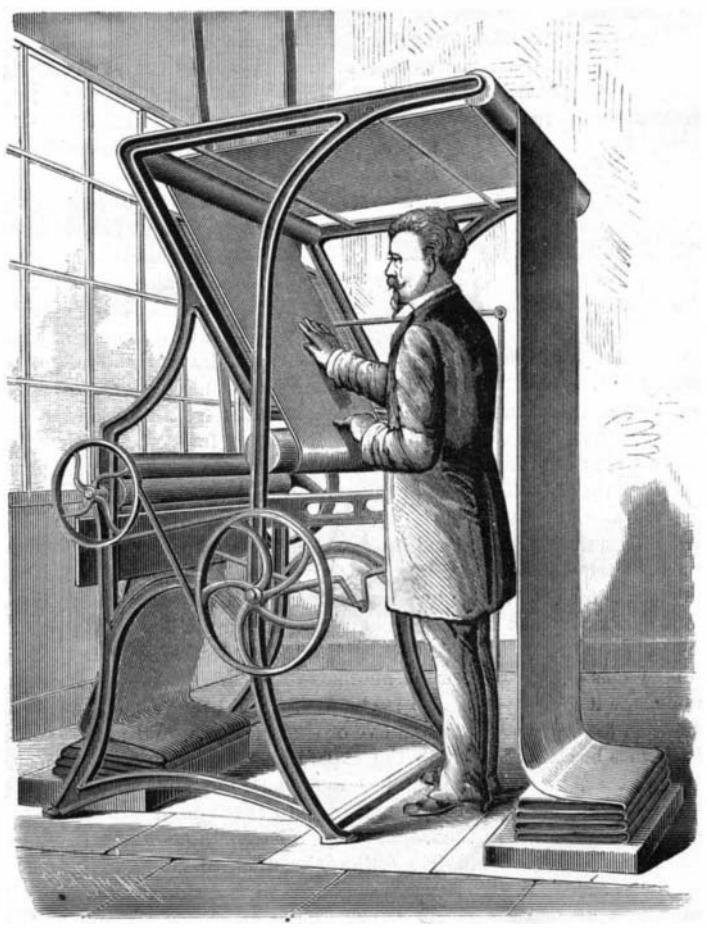
MACHINE FOR EXAMINING GOODS.

One of the most important duties in a mill or warehouse is that of examining the goods made or bought. With the best of machines and the most careful workmen faults and defects may occur, but, considering that all machines are not always perfect, and that all work people are at best only human, we must be prepared to find in every class of goods faulty parts. To detect this, to put the faulty pieces aside in order to draw the attention of the delinquent to them, and, if necessary, to fine him or her, and also to mark the goods as damaged and indicate a certain allowance on them —these are functions which ought to be intrusted to vigilant persons, and the task of examining the goods ought to be made as easy as possible.

In most cases the cloth is laid upon a table before a window, and layer after layer turned over by hand, which is not only a tiring but also a tedious proceeding, and, on that account, liable to be done sometimes inefficiently. We have, therefore, in many places seen a roller affixed to the ceiling of the room, and the cloth drawn over it by hand; this, when done before or behind a window, as the goods may require, shows all faults of weaving, but not always those of dyeing. A foreign machine maker has carried this arrangement a little further, and constructed a machine for the purpose, which is driven by a strap, so that the examiner has only to attend to his duty, and, his hands being free, can mark the cloth or brush it up, or otherwise attend to it more closely.

The construction of the machine will be easily understood; it is shown as placed before a window; the cloth is laid before it on a board, then passes upward through a couple of drag rollers, over a guide roller, and then in front and over a strong sheet of plate glass, and then over a pair of upper rollers down to the floor behind the examiner. The latter thus sees through the cloth as it passes the glass plate, and is able to detect all faults and blemishes of weaving; by means of a treadle he can put a brake on and stop the course of the cloth any moment, for the purpose of marking a faulty place or other reason, and his work being thus performed without bodily exertion, can be more thoroughly relied upon.

In our illustration the machine is shown driven by a strap, which is the most convenient arrangement in a mill; but as much of the work of examining goods is performed in warehouses, the machine is also made to be turned by a treadle, which the examiner has, in that case, to work by his foot, and thus can also stop the machine when required.—*The Textile Manufacturer.*



MACHINE FOR EXAMINING GOODS.

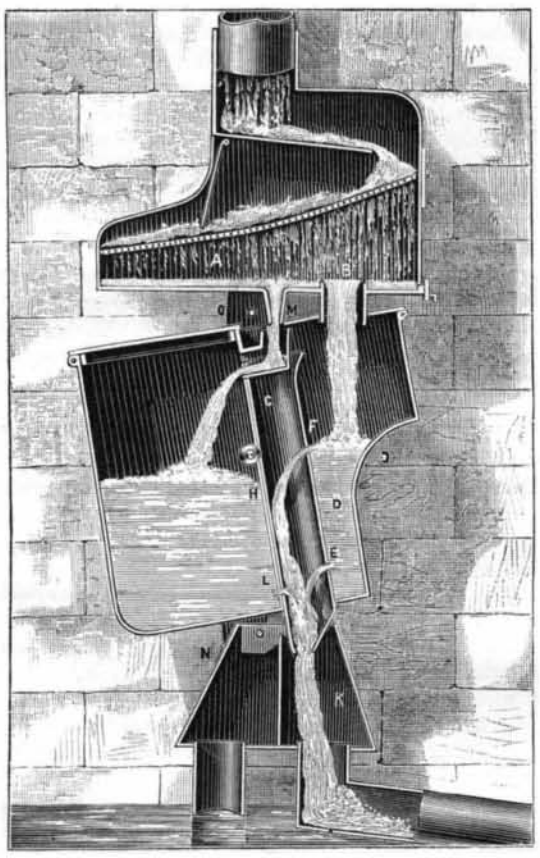
Heating by Acetate of Soda.

The heating of small pits and greenhouses is, in spite of the numberless apparatus in use, a source of trouble. To such folk—and their number is legion—the new plan of heating by acetate of soda seems as if it might be developed into something serviceable. According to an article in *Nature*, the plan is largely adopted on the London and North Western Railway for foot warmers.

The duration of heat in a warming pan with acetate of soda is claimed to be four times that of hot water alone. This is due to the amount of heat required in the first instance to change the acetate of soda from a solid to a liquid state, which heat is liberated as the acetate gradually resumes the solid form. It is stated that only about half the heat is required to produce the same effect as in the case of hot water. The acetate does not require to be renewed except at long intervals. To restore the heat in the pans after cooling, they have simply to be plunged in boiling water for half an hour.

ROBERT'S AUTOMATIC RAIN WATER SEPARATOR.

In a goodly number of countries where water is scarce the precaution is taken to collect rain water in cisterns, whence it is drawn in measure as it may be needed. In



ROBERT'S AUTOMATIC RAIN WATER SEPARATOR.

certain slightly favored countries such water constitutes nearly the sole resource of the inhabitants. It will be understood, then, how important it is to collect it, and especially to preserve it. The first and greatest precaution to be taken is to admit into the storage reservoir only the second water, for the time which elapses between successive showers allows the roofs and other surfaces that collect the water to become dirty and thus foul the first water that falls. And such water, if care be not taken to lead it into the drain, will dirty and pollute the entire quantity stirred up.

The Robert separator is designed to overcome the above named annoyance automatically and regularly. It prevents the first rain water that has washed the roofs and gutters, from entering the cistern, and leads it into a special reservoir or carries it to the drain.

The annexed figure will permit the very simple arrangement of the apparatus and its mode of operation to be readily understood. It is situated at the base of the leader, and its dimensions vary with the superficies of the roof to be drained. It includes a stationary and a movable part. The former of these, which is connected with the bottom of the leader, carries a movable perforated disk for arresting the solid particles, and an outlet, B, at the lower part. The separator, which is movable around a horizontal axis, is seen at C, and is divided into small compartments, D, into which falls the first rain water. E is an orifice proportioned to the surface of the roof, F is a wider orifice to permit the flow of water during ordinary rains, and G is a discharge pipe. During heavy rains the water fills the compartment, D, and bows over the upper orifice of the discharge pipe. H is a small orifice in the partition behind the pipe, G. When the entire amount of water that has fallen is unable to flow through E, it rises in the compartment, D, and, passing through the orifice, H, slowly fills the compartment, I. The apparatus is then inclined as shown in the figure, and the clean water changes its direction, passes through K, and enters the cistern. L is a small aperture near the bottom of the compartment, I, which permits the latter to empty, and M is a pipe through which flow the last drops of water when the rain ceases. N is a hook which prevents the separator from swinging and permits the whole of the water being sent to the drain when, for any reason whatever (a repair of the cistern, for example), it is desired to admit no more rain water.

When the apparatus is empty and the water begins to fall the latter is sent to the drain; but, as soon as the water increases, and the time has elapsed necessary to wash the roof, it flows through H, fills the compartment, I, and tilts the apparatus, and then begins to flow through K to the cistern. When the rain ceases, the compartments empty and the apparatus tilts anew to prepare itself to send to the drain the first water of the next shower, and so on. Everything is arranged, then, so that the cistern shall receive only clean water which has been freed from every kind of impurity that fouls the roof.—*La Nature.*

Test for Ammonia.

A sensitive test for gaseous ammonia is proposed by Gustave Kroupa. He dissolves magenta in water, and gradually adds dilute sulphuric acid, until the yellowish color passes into a yellowish-brown. Unsized paper is saturated with this solution, and then assumes a yellowish color, becoming crimson on exposure to the vapor of ammonia. This test is declared to be exceedingly sensitive, and as simple and easy to prepare as turmeric paper. The magenta test papers must be preserved from contact with the air, in closely-stoppered bottles; and it is not stated whether the test must be made wet or dry, or what minimum proportion of ammonia will be detected thereby, in order that it might be seen whether the new test possesses any advantages in this respect on the universally used turmeric test.

Examining Trainmen for Promotion.

A Jersey City paper gives the following account of the way promotions are made on the New York Division of the Pennsylvania Railroad: For the past three weeks twenty-nine brakemen and baggage masters on the Pennsylvania Railroad have been attending school in the reading room of the Jersey City depot. In anticipation of a big passenger business the coming spring and summer, the company has thought fit to supply itself with more conductors. Capt. Osborn, the ticket receiver at Jersey City, who has the railroad ticket business at his finger's end, is instructing the class of twenty-nine men. He shows the men the privileges accorded the different classes of tickets, and how to act when a passenger tenders a ticket which is worthless for passage.

Captain Osborn will soon begin to examine the twenty-nine men. This will take two weeks at least. A number of the men have been brakemen for ten or twelve years.

After each one in the class has undergone a rigid examination, Captain Osborn will recommend about ten of those who pass the best examination. The names he selects will be referred to Mr. Pettit, the superintendent. These men will then be sent to the general office of the company, on Fourth Street, where they will be subjected to another examination of a week's duration, which will be conducted by an examining board appointed by Max Riebenack, the general auditor of passenger receipts. This is the final examination, which decides the fate of the aspirant in the ticket technicalities of the position. After this the candidates for conductorships who have passed at the Fourth Street office go back to Jersey City, where Mr. Adams, the trainmaster, takes them in hand, and finds out what they know about transportation, how they would act to prevent accident, and what they would do in case of a smash up. If they pass in this branch, then they receive their commissions as conductors. As there are hundreds of different kinds of tickets, whose privileges and value are of several conditions, and the knowledge required of the aspirant as to transportation is very intricate, a man has to have a goodhead to get through. He must be possessed of natural intelligence, and must have acquired a vast amount of experience before he can hope to be made a conductor.

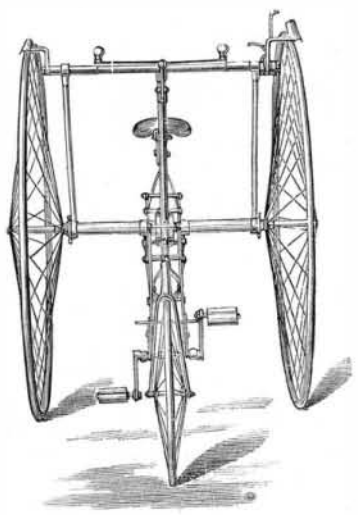
AN International Exhibition will be opened at Calcutta next December. Two thousand square feet of space have been reserved for American exhibitors.

Heat and Magnetism.

L. Pilleux has lately called attention to the heating of iron during its magnetization. The fact had been previously observed by D. Tommasi in some researches, which are not yet published, upon the comparative study of the chemical properties of ordinary iron and of magnetized iron. In order to obtain a constant magnetic intensity, he employed an electromagnet of a single branch in place of an ordinary magnet. When the current, even if it was produced by a weak battery, had traversed the coil for some hours, the magnetized bar became perceptibly warm. He at first attributed the heating of the iron to the heating of the coil; but he was greatly astonished, one day, when he had removed the bar in order to clean it and had forgotten to interrupt the current, to find that the coil was not heated at all.—*Les Mondes.*

IMPROVED TRICYCLES.

In the "Leicester Safety" tricycle the rider is placed upon a saddle vertically above the pedals, and can therefore



THE "LEICESTER SAFETY" TRICYCLE.

employ the effectual downward thrust so approved of by the medical profession. He has before him a safety bar upon which he may rest his hands, from which he may steer and apply the brakes, and which also serves to prevent his falling forward when moving down hill. The tricycle is a front steerer, which adds still more to its safety in the descent of hills. The gearing has the advantages of backward and forward double driving combined in one central endless chain passing from the pedal crank to the axle. Steering is effected by the front wheel, which, from the construction of the entire machine, must always have a large percentage of the rider's weight pressing upon it to insure its efficacy. Behind the rider, to prevent all possibility of a fall backward, is a bar or tail, which adds also to safety in mounting and dismounting. The brakes act upon the tires of the driving wheels by a movement of the wrists, the right or left being applied as desired, or both together, while the steering can be effected at the same time, and without moving either hand from the safety bar.

In order to provide a tricycle for use in India and other countries where native labor is abundant, and the climate such that a European finds all outdoor exercise impossible, a tricycle has been devised to be propelled by cooly power, which our engraving clearly shows. The brake is applied to a drum on the gearing box. The standard size of the driving wheels is 48 inches, and these can be geared either level or slightly down; for hilly countries the latter is recommended. It is made single to seat one European, driven by one cooly, or in a double form to seat two Europeans, propelled by two coolies. The native driver sits behind, pedaling and steering the machine, which becomes, as a matter of fact, a cheap kind of carriage, requiring no horses, and no stabling or coach house.

A Place where They Have no Flies.

A correspondent of *Science* says: I remember, years ago, seeing a dried specimen of the house fly sent to Boston in a letter, as a great rarity there—the only one the sender had seen in a year's residence in Manila. As this is one of the constant accompaniments of man, and a sure sign of his presence or vicinity, I was at a loss to account for its absence. It is not even found in the sugar yards in any great numbers. I now see why it should be so rare, viz., because it could not of itself pass over the six hundred miles of the windy China sea; and the few which might be transported on vessels, if they got ashore from their distant anchorage, would be prevented from multiplying by their numerous enemies—bats, spiders, birds, lizards, and other reptiles. Some days I would not see one, and rarely more than two, around the table. Were they common, with the other insect pests, life would be almost unendurable in these islands.

IT is now proposed to make nails from Bessemer steel. It is claimed that when made at half the weight of iron, the nail is stiff enough to be driven into the hardest wood, and tough enough to clinch.

Progress of Quarrying.

The Compendium of the Tenth Census, recently issued, contains some figures which will serve to give an idea of the magnitude of the quarrying interests of the country, which in 1880 gave employment to 39,723 men, 8,059 horses, and 851 mules; had 339 machines for quarrying, 2,290 machines for hoisting, 1,308 machines for dressing, and used $192,175 worth of explosives. The capital invested is given at $25,414,497, and the value of the product in the census year at $18,356,055, there being 1,525 quarries in all. Marble and limestone lead the list with 65,523,965 cubic feet, followed by the sandstone quarries with 24,776,930 cubic feet; crystalline silicious rocks, with 5,188,998 cubic feet; and slate, with 457,267 squares, or 4,572,670 cubic feet.

Professor Henry in Bronze.

Story's bronze statue of Professor Henry, for which Congress appropriated $15,000, will be unveiled April 19 in the center of a small triangle at the northwest of the Smithsonian building, Washington. It is seven feet high, and stands on a top and base of Quincy grey granite, with a center of red Beach granite, which adds eight feet to the height of the statue. The name Joseph Henry is cut on the red granite in plain Roman letters, forming the only inscription. The Professor is represented as standing in a meditative mood, with one hand resting on a support, and wears an academic gown. The face and figure were modeled in Italy from photographs and a cast of his face and bust made by the late Clark Mills. President Porter will make the oration.

Nickel for Galvanoplastic Purposes.

Nothing is easier, says the *Central Zeitung fur Optik und Mechanik*, than to cover metals with a thin film of nickel by electric deposition. If we wished to make a very much thicker deposit various difficulties stood in the way, which have but recently been overcome by Boudraux and his son in Paris.

It is generally known that if we attempt to precipitate nickel upon a plaster cast, or wax mould, covered with graphite, as we do copper in electrotyping, as soon as the nickel has attained a certain thickness it cracks loose from the mould and rolls up. This phenomenon is explained as being due to the absorption of hydrogen (occlusion) by the crystalline nickel, which is very porous in comparison with ordinary cast nickel, and is able to occlude 160 times its own volume of hydrogen in twelve hours, when it forms the negative pole of quite a strong galvanic battery.

The above named Parisians have removed this obstacle and are now able to precipitate nickel electrolytically to any desired thickness. At the Paris electrical exhibition they exhibited electrotypes, and art reproductions, which were not plated on the articles but upon casts taken therefrom, the nickel being more than a millimeter thick. An electrotype has several important advantages over mere nickel plating, the most important of which is that by the former all the fine lines and the delicacy of expression are preserved while they are more or less destroyed by nickel plating.

Nickel offers three times as much resistance to mechanical pressure as copper, while the density of the two metals is nearly the same (copper 8·90, nickel 8·57), so that a copy of any work of art when made of nickel can be made much thinner than if made of copper, and yet have the same

THE "COOLY" TRICYCLE.

strength with much less weight. Copies in nickel can be backed to any desired thickness by depositing copper on them by the galvanic current.

The highly valued qualities of nickel are these: It is as hard as steel, less oxidizable than silver, it is not acted upon by sulphides, it can be stretched, and is tenacious, it does not melt easily, and the prices are daily going down.

Nickel would be very useful for stereotype plates from which a great many impressions are to be taken, as for postage stamps, bank notes, etc. Nickel stereotypes would have special value for color printing, because many kinds of colored ink attack copper (vermilion, for example) and destroy the plates, while their own brilliancy is also affected by the copper faced type and plates.—*Deut. Industrie Zeitung.*

IMPROVED FIRE ESCAPE.

We give an engraving of a light, portable, and simple device for receiving persons jumping from upper portions of buildings in case of fire. The apparatus consists of a blanket made of two or more thicknesses of strong canvas provided with coil spring supports and sustained by a folding adjustable frame of wood.

The frame has four legs pivoted together near the middle, and the canvas blanket is secured to a rectangular frame formed of wooden rods linked together at the ends and pro-

JOLLEY'S FIRE ESCAPE.

vided with rings capable of receiving the upper ends of the legs.

The blanket has pockets containing coil springs, which are attached by their outer ends to the rods forming the frame of the blanket. These springs serve to assist the blanket in resisting the shock of the person falling into it. The legs of the escape are made adjustable to adapt it to a rough or sloping surface, and a ladder is provided to enable persons to reach the ground from the blanket. The fire escape is very light and portable, readily set up, and affords a yielding surface upon which people may jump without injury.

This invention has been patented by Dr. William F. Jolley, of Middlesex, N. Y., who may be addressed for further information.

Use of Hand Tools in the Schools.

Speaking of the refusal of the Massachusetts House of Representatives to pass to a third reading the measure which authorizes instruction in the elementary use of hand tools as a part of the public school course, the Boston *Journal* says: If the true aim of the school is in reality the preparation for active life, that aim cannot be accomplished by exclusive brain development, for even in the most clerical pursuits the hand must often come to the brain's assistance, and with practical skill be employed in practical uses.

How many of our graduates can drive a nail? How many can split firewood in the easiest way? How many can saw, plane, bore, glue, make a box? Many of our youth in the schools to-day, who seem to lose their ordinary wits when a book is placed before them, would become master workmen with tools, if once given the opportunity of their use; and even the most studious scholars would rather gain than lose with this power over inanimate things which is won by the knowledge of the use of tools. Besides the advantage of manual skill, it has been shown by experience that intellectual training is assisted by a carefully arranged and systematic instruction in this branch of industrial science.

Undue attention to purely mental studies is diverted, the intelligence is aroused, and a healthful and revivifying change is brought about by active occupation. The testimony of physicians has shown the advantage to pupils, physically, in the use of tools. If the course of study is already crowded with different branches, there could easily be formed plans of either omitting a not indispensable study or of adapting the scheme of recitations to the addition of the tool practice. Results in Europe and in this country have proved that this course of elementary training is in nowise a burden, but a benefit to instruction in the regular old time branches. As the educational science advances, new ideas work an improvement upon old methods. It is the spirit of the age to ennoble manual labor, and to teach the young to look upon citizenship through labor as a right beyond the right of birth or wealth. If instruction in the hand working trades can assist in inculcating this true spirit of democracy, it is certainly the privilege of schools to supply the elements of instruction.