POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

The Association held its regular weekly meeting at its room at the Cooper Institute, on Thursday evening March 30, 1865, the President, S. D. Tillman, Esq., in the chair.

A FEAT IN CASTING.

Mr. Norman Wiard described a novel method adopted by him for casting an iron tunnel. When the preparations for casting his great gun were nearly completed a need was discovered for a broad flat tunnel some ten feet in diameter. Not having conveniences at hand for making it of boiler plate, it was necessary to cast it, and as there was not time to make a pattern, he determined to cast it flat, and attempt to shrink it into dishing form as it cooled. He swept an open mold and filled it with molten iron. The center was first cooled, and as the edges began to harden levers were placed under opposite sides, and weights were hung upon their ends, tending to pry up the edges while the center was held down. Thus the rim was started up a very little, and then as it cooled and shrunk around the previously hardened center, it arose ten inches, giving this depth of dish to the tunnel.

TANNING.

The regular subject of the evening being tanning, the President explained that this is a simple chemical process. Raw hide is composed to a large extent of gelatin, which is soluble in water and is subject to decay. If gelatin is brought in contact with tannic acid the substances combine to form a new compound, which is insoluble and very permanent. The action is instantaneous, but when tannic acid is applied to raw hide it causes the fibers to contract, thus closing the pores and preventing the acid from penetrating the interior. Hence the necessity for soaking the hides several months in the liquor.

Mr. Smuhl, a retired leather dealer, gave a brief history of tanning in this country. Most of the improvements have been mechanical, improved arrangements of the vats and apparatus to save labor in pumping the liquid and handling the hides. As the tannin combines with the gelatin, the weight of the hide is increased by tanning; 100 lbs. of dry hide can be made into 180 lbs. of tanned leather, and 2000 lbs. of bark are required for the operation. Formerly the manufacture was conducted mostly in this city, and Colonel Edwards was the first who adopted the plan of carrying the hides to the bark, instead of transporting the bark to the hides.

Many efforts have been made to concentrate the tannin extracted from the bark, and by bringing that to the city, save the great expense of transporting the hides back and forth. But none of these efforts have proved successful.

A patent has recently been taken out by Mr. Pinkery for extracting a further quantity of tannin from the spent bark by means of steam, and the right for this State has been sold to one of our shrewdest tanners for $25,000. The plan is simply to saturate the spent bark with steam till it gets as hot as the steam, and then drench it with clean water. There is a notion that leather is improved by lying in the vat many years. This is a mistake. Provided the leather be thoroughly tanned the more quickly it is tanned the better. As good leather is made in this country as is made in any part of the world, but it is not as universally good as the English leather.

It may interest some of our citizens to know that New York is the largest market for sole leather in the world. More sole leather is bought and sold in this city than in Liverpool, London, and Paris combined.

From such facts as I can gather, I estimate that about 10,000,000 hides are tanned annually in the country. This would require about 700,000 cords of bark, and as the average yield is about 10 cords to the acre, there must be not far from 70,000 acres of hemlock forest cut down every year. As hemlock does not sprout again we are rapidly diminishing the area of our bark producing forests. The principal growth of hemlock is in Maine, New York, Michigan and Iowa, and I estimate that the area of hemlock forest in these states is not less than 40,000 square miles, 25,600,000, acres which would furnish 70,000 acres a year for 366 years.

A STEEL wire may be made from an iron one by plunging it into melted cast-iron.

FARMERS' CLUB.

The Farmers' Club of the American Institute held its regular weekly meeting at its Room at the Cooper Institute on Tuesday afternoon, April 4, the President, N. C. Ely, Esq., in the chair.

From the several subjects discussed we select the following:

IMPROVED PLAN FOR TAPPING MAPLE TREES.

Mr. N. Smith, of Delhi, Carrol County, Ind., sent a communication, saying that he had found in tapping maple trees that a tin tube turned round a seven-inch wire and inserted in a gimlet hole in the tree would yield as much sap as could be obtained from an augur hole. This small hole will not injure the tree, and the plan enables very much smaller trees to be tapped.

PRESERVING LEAVES WITH THEIR NATURAL COLOR.

Solon Robinson read a letter inquiring the best plan for preserving leaves with their natural color.

Mr. Dodge replied that the best method is to wet the leaves well, and then iron them with a hot flat in precisely the same way that linen is ironed.

Mr. Robinson said that dipping the leaves in gum-arabic or glycerin has been recommended.

THE EASIEST WAY TO PULL STUMPS.

Mr. Carpenter, in reply to an inquiry, said that he had tried several plans for getting rid of stumps, and the one that he found the cheapest and most satisfactory is to let the tree pull its own stump at the time it is felled. Instead of chopping off the tree above the surface, the ground is dug away, and two or three of the principal roots are cut off at a sufficient depth to escape the plow; then the first moderate wind blows the tree over, stump and all. I think the expense is no greater than that of chopping the tree in the usual way, and I get an increased yield of wood.

SHEEP DESTRUCTIVE TO FLEAS.

Mr. Collins, of Otsego County, N. Y., said that it is well known that sheep occupying barns or premises will soon rid them of fleas. He supposed the fleas get entangled in the wool and perish.

CHEDDAR CHEESE.

Mr. Collins exhibited a sample of cheese made by him in imitation of the famous cheddar cheese of England. He said the most interesting thing in relation to it is the fact that it brings forty cents a pound by the case in this market. The essential points in the manufacture are, first, not to scald the milk; the milk is warmed about 90°, and the rennet is introduced at this temperature; then the curd is handled with so much care that the butter globules are not broken, thus preventing the butter from being washed away in the whey.

The French Ammonia Engine.

They are discussing just now in Paris a proposal for propelling omnibuses and other vehicles by means of ammonia. The engine which it is proposed to apply to this purpose is the invention of Mr. Tellier, and is a very simple and ingenious contrivance. A brief description of it will enable the reader to judge for himself how far it is likely to prove of practical value. Ammonia, under ordinary conditions, is a gaseous body, but there are various methods by which it can be readily condensed into a liquid, when in which state, unless it be restrained by sufficient pressure, a temperature below that of the freezing point of water is sufficient to convert it into gas again. Mr. Tellier takes advantage of this property of that body as follows:—He places liquefied ammonia in a suitable vessel, connected by a pipe and stop-cock with a cylinder having a piston fitted to work in it. When the stop-cock is opened, a portion of the liquefied ammonia becomes converted into gas, which rushes into the cylinder and raises the piston. When the gas has thus forced the piston to the top of the cylinder, a little water is admitted under the piston. Water and ammoniacal gas having a most eager affinity for each other, this water instantly absorbs all the gas, thereby causing a vacuum under the piston, and so enabling the pressure of the atmosphere to force the piston back to its original position. When the piston is once more at the bottom of the cylinder, the stop-cock in the pipe communicating between the cylinder and the vessel containing the liquefied ammonia is again turned, more gas is thus admitted beneath the piston, and all proceeds again as before. For obvious reasons, there should be at least two cylinders—M. Tellier prefers three—to each engine. The quantity of liquefied ammonia required per horse power per hour is stated not to exceed three gallons, weighing twenty-two pounds. The water used to absorb the ammonia, after it has re-assumed the gaseous form and in that state has done its work under the piston, is not thrown away, but is saved for the recovery of the ammonia from it,—which may be effected by simple evaporation, with certain precautions,—in order that the recovered ammonia may be re-condensed and so used over and over again.

For use in this way ammonia possesses great advantages over air. In the state of gas, ammonia occupies more than twelve hundred times the bulk which it occupies in the liquid state, and yet liquefied ammonia, if the vessels containing it be surrounded by some frigorific mixture, which need neither be costly nor difficult to prepare, will not exert against them a pressure of more than a few pounds per square inch, whereas, if it were practicable to compress air to the same extent, the air so compressed would exert against the vessels containing it a pressure of more than three-quarters of a tun per square inch,—a pressure, of course, which no vessel of any considerable size could possibly be made capable of bearing. In practice, however, it would not be possible to compress air to anything like the same extent as ammonia. It would probably be difficult, working on the great scale, to condense air much beyond the point at which it would press with a force of a hundred pounds on every square inch of the interior surface of the vessels containing it, at which degree of condensation it would be just two hundred times more bulky than the quantity of liquefied ammonia capable of doing the same amount of work, while it would be much more than two hundred times less portable, since the vessels used to store it in, while having two hundred times the aggregate capacity of those used for storing the liquefied ammonia, would have to be capable of bearing on every inch of their enormously greater surface a pressure twenty times greater than the vessels containing the ammonia need be capable of bearing per inch. Moreover, a force-pump worked by a steam engine would be the only practicable means of condensing air on the great scale; but ammonia can be condensed by a much more simple method. A steam engine is simply a machine for converting into mechanical force the heat developed by the combustion of the coal used under its boiler. The force exerted by the steam engine all comes from the coal burnt; it is, in fact, the heat given out by the coal in burning, in another form. In condensing air by means of a force-pump, worked by a steam engine, we employ the heat obtained from coal to convert water into vapor, and employ this vapor to drive machinery which shall work the piston of the force-pump, and so compress the air. Gaseous ammonia may be condensed in the same way; but it may also be condensed without the intervention either of a steam engine or of any piston-and-cylinder apparatus whatever. A common laboratory and lecture-room experiment consists in placing at one end of a bent tube some compound capable of giving off ammonia under the influence of heat, applying heat at that end of the tube, and keeping the other end of it cool,—both ends of the tube having been carefully sealed. Gaseous ammonia is given off at the heated end of the tube, and by its own pressure becomes converted into a liquid at the other end. Ammonia admits of being condensed on the great scale on precisely the same principle as in this experiment. Altogether, therefore, M. Tellier may be regarded as having fairly found in liquefied ammonia what inventors have sought so long, and so vainly, in compressed air,—a cheap and convenient method of storing up mechanical power, so as to admit of reservoirs of it being transported to a distance from the spot at which it was generated, and of the stored-up power being there applied useful to do work by means of light, simple, cheap, and safe machinery. We shall be surprised if it do not prove that the ammonia engine has much good work to do for the world in many ways besides that of propelling carriages.—*Mechanics' Magazine.*

FATS and vegetable acids may be cooked in hot copper sauce-pans without danger, since the metal is not attacked by them except when cold.

Artificial Limbs.

The engravings published herewith represent artificial limbs which have novel features not heretofore obtained in them. India-rubber is largely used in their construction, the feet and hands particularly being constructed of this substance.

No. 1 presents a full length leg standing erect, to be applied in all cases where amputation occurs above the knee joint.

No. 2 represents a leg to be applied where the leg has been amputated below the knee joint, and the stump is flexible enough, and sufficiently long, to enable the wearer to use it in walking. It also represents the leg with the heel compressed, and in its position after taking the step, or and when firmly planted on the ground.

No. 3 is termed a knee bearing leg; it is to be applied where amputation takes place below the knee, and where the stump is too short, or contracted at right angles, so the knee joint cannot be used in walking. This figure represents the leg slightly bent at the knee, and bearing well upon the toe, as in the act of lifting it to take the next advance step.

No. 4 is a view of the India-rubber foot before being applied to the leg. This rubber foot constitutes the main feature in the legs shown in the figures. This foot is made mostly of india-rubber of a very spongy, light and elastic character. A piece of willow wood, nearly filling the rubber heel at the top or surface, where the leg rests, runs down about one-fourth of the distance towards the lower part of the heel; also forward and downwards to the joint at the ball of the foot, as shown by the dotted line. This piece of wood is the base upon which the foot is built, and is also the medium whereby the foot is joined firmly to the leg. The leg itself is made of light, tough willow, in all cases except the thigh piece shown in figure 2, and the front part of the thigh piece in figure 3, which are both made of leather. The entire leg and foot in all cases is covered with fine buckskin, neatly coated with a life-like water-proof finish, making it both light and strong.

It will be seen that there are no movable ankle-joints in these limbs the necessity for which being entirely obviated by the elastic rubber foot, which gives all the motion required in walking, and also the ease, firmness, elasticity and reliance absolutely necessary in a perfect artificial leg.

It would seem at first sight that no one could walk well on any artificial leg without the moving, flapping ankle joint, but practice proves this to be erroneous.

The rubber foot, also, gives all the required lateral motion to the foot when stepping upon sidling or uneven ground. This leg dispenses with all machinery of whatever character, and has been in use for the last two years giving great satisfaction.

Fig. 2

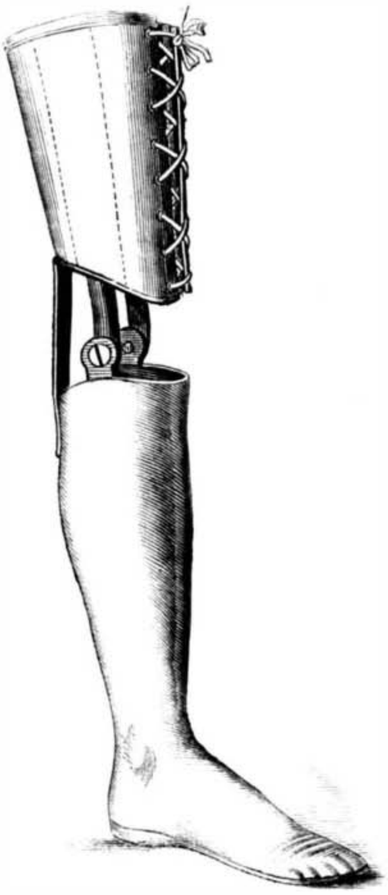


Fig. 1

Fig. 3

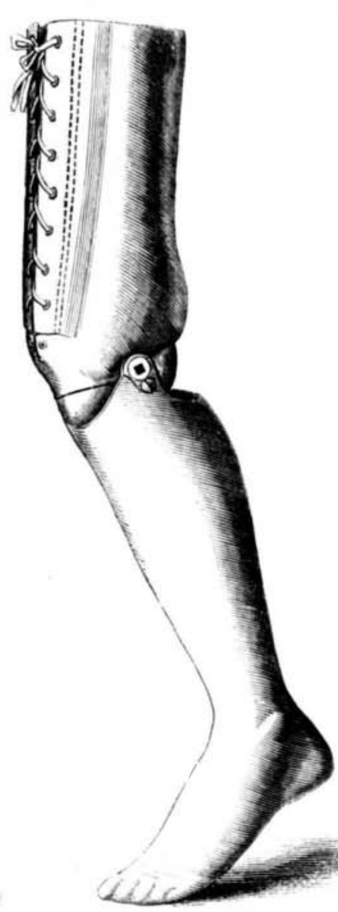


Fig. 4.

Fig. 5.

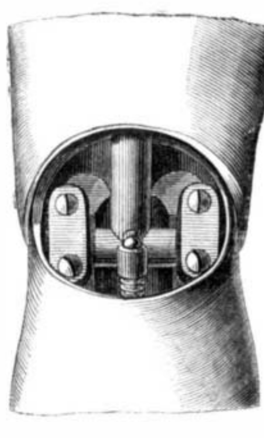
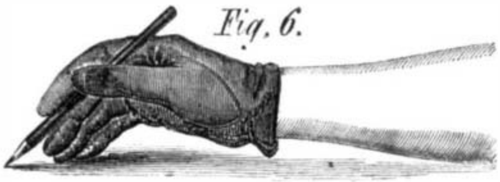


Fig. 6.



MARKS'S ARTIFICIAL LIMBS.

Figure 5 gives a rear view of the knee joint of the long leg, (Figure 1,) the T joint is fastened to the upper part or thigh piece of the leg, and the gudgeons of the T are held in adjustable, oblique boxes which are easily set at any time by the screws passing through the caps into the main leg, and operating upon the spiral spring, so as to throw the foot forward when bent in walking, and so as to hold the foot under when bent at right angles in a sitting position. This feature has been secured by a separate patent, dated March 7, 1865. Figure 6 shows a rubber hand, made same as the foot, of which there can not be as much said, as of the other inventions. It corresponds, however, with the others, in its characteristic features of simplicity and durability, and wholly dispenses with machinery, giving a softness to the feeling and an elasticity which is very desirable. It is as useful as any hand yet invented, which is not probably saying much in its favor, as no art yet shown, if it ever will, can compare with "nature's handiwork." A patent for this hand has also been obtained, as in fact have all of them, through the Scientific American Patent Agency. These inventions have caused a great change for the better in the appearances of those who have lost natural limbs, and must give great relief to the maimed. The inventions, in dispensing with so much machinery, reduce the expenses of repairs very greatly, as there is no complicated gearing to get so often out of order. For further information address the inventor and manufacturer, A. A. Marks, 575 Broadway, N. Y.

Manufacture of Varnish.

Some attentton has been given to the use of acetone in the manufacture of varnish, by M. Wiederhold, according to whom acetone rendered anhydrous by rectification over chloride of calcium readily dissolves cold copal which has been previously heated to the point of fusion. Only 2·8 of acetone are required for 1 of copal, and a copal varnish is thus obtained which dries almost instantaneously, leaving a hard, brilliant and durable coating. A more concentrated and almost syrupy solution is obtained, without separating any copal, by expelling part of the acetone by distillation. Evaporated to dryness, the remaining copal is more soluble in acetone than when in its original state. The solubility of gum lac in acetone varies according to the species of the gum; 1 part of artificially bleached gum lac required only 1·5 of acetone to form a thick solution like syrup; another, a colored specimen of gum lac, was almost insoluble; and a third required 3·5 times its weight of acetone to dissolve it. Acetone dissolves with especial facility, and in considerable quantities mastic and sandarach; dammar, yellow amber, and india-rubber are, on the contrary, almost insoluble. The solution of acetone and mastic produces a very beautiful and brilliant varnish. M. Wiederhold is of opinion that acetone might be employed for the restoration of oil paintings deteriorated by the alteration of the varnish which often becomes opaque from the effect of a molecular modification, and which, from a vitreous and transparent state, becomes crystalline or pulverulent. By carefully applying acetone the opaque varnish may be momentarily dissolved, and will then redispose itself, but in a vitreous state.—*Mechanics' Magazine.*

A METHOD of exhibiting diagrams of apparatus, etc., by which lecturers may be saved the expense of the large drawings generally used, has been suggested by M. Thibierge, of Versailles. His plan is to make a small sketch of the apparatus on a plate of glass, and with a large lantern to throw a magnified image on a screen. The lantern he illuminates by an ordinary gas burner with twenty-four holes, and with two silvered reflectors finds the light sufficient even to give a well defined image of the electrolysis of water.