UTILIZATION OF WASTE PRODUCTS.

At the last meeting of the Polytechnic Association the regular subject for discussion was the utilization of waste products, and Prof. Joy, of Columbia College, being called on by the President, made the following remarks:—

WASTE FROM GAS-WORKS.

Constant progress has been made in the utilization of the waste substances produced in the manufacture of illuminating gas. At one time the companies paid persons for carting away the lime used for purifying the gas. The lime absorbs bisulphide of carbon, sulphureted hydrogen, and sulphur, coming from the distillation of the coal, and when exposed for a long time to the atmosphere it absorbs oxygen and becomes the sulphate of lime or plaster. This is now understood by a sufficient number of farmers to make a demand for the waste lime at a moderate price.

Mr. Cleland, the director of the Liverpool gas works, states that he has largely reduced the cost of purifying gas by using oxide of iron, and saving the sulphur and ammonia. The material from the purifiers is heated to about a thousand degrees Fah. in a close iron retort. A portion of the sulphur combines chemically with the iron, while the balance is distilled over. As soon as the sulphur ceases to come over, the contents of the retort are drawn and moistened, and in this state exposed to the action of the atmosphere. The oxidation is rapid, and the mass glows unless frequently wet and stirred. In a few weeks a sulphate of iron is produced containing 30 to 40 per cent sulphuric acid. The salt is decomposed by passing the vapor of ammonia from the waste waters of the hydraulic mains through it. In this way sulphate of ammonia and an oxide of iron are obtained. The oxide of iron can be used again. The sulphate of ammonia is purified by crystallization. Mr. Cleland says that he has obtained 100 tuns of sulphur in this way.

PREPARATION OF SAL-AMMONIAC.

About two per cent of ammoniacal gas water goes over with the tarry products and is collected at the end of the hydraulic main in cisterns. This was formerly a waste product, it is now saved and the greater portion of sal-ammoniac of commerce is prepared from it. In London alone 840,000 tuns of coal are consumed every year in the manufacture of gas. This yields about 37,000,000 pounds of gas water. The water is subjected to distillation in two retorts, the first of which is heated directly by the fire, and the second by the latent heat of the steam from the first. The steam and gas are passed through a worm to be condensed, and flow into a large leaden tank containing muriatic acid. Uncondensable gases pass out of the tank and are conducted through the fire, where the sulphureted hydrogen is consumed, into the chimney. The muriatic acid is saturated to neutrality, and requires very little further treatment for the formation of beautiful white crystals of sal-ammoniac. This sal-ammoniac is the starting point in the manufacture of the salts of ammonia, and can now be obtained in great abundance by the above method.

OIL OF WOOL WASTED.

There is a great waste in our woolen manufactories of a valuable substance; that is, the oil of the wool. When wool has been thoroughly cleansed it is found to have lost thirty, forty, or in some cases as high as sixty per cent of its weight, and the most of this is oil—an excellent oil for some purposes, and especially for soap. There is an establishment in England that takes wool to cleanse for the oil; making no other charge for the work.

OIL AND FAT FROM REFUSE COTTON, GLUE, ETC.

Edward Tonybee digests the refuse material in about half its weight of concentrated sulphuric acid contained in leaden vessels and warmed by steam. They are thus dissolved and the fat separated. After standing, the fatty acids collect on the top, and can be removed and further purified by distillation. To the residual solution sufficient finely-divided phosphate of lime is added to neutralize the sulphuric acid, and a valuable compost containing phosphates and nitrogenous matters obtained.

LIEBIG AND WASTE SEWERAGE.

When I was last in Europe I talked a great deal with Liebig, who has contributed more than any other man to the utilization of waste products; it has been the principal labor of his life; he has invented many processes himself, and has directed the attention of the world to the subject. His great grief is the waste of fertilizing material in the sewers. He spoke repeatedly of the loss of this material which is going on in the city of New York.

SLAG IN IRON FURNACES.

I also visited Mantsel, where Luther went to school 300 years ago, and saw the iron mines in which Luther's father worked. At this place the slag has accumulated in mountains. People are constantly at work, you may be sure, at plans for extracting something of value from the waste slags. At Mantsel the slag is now run into molds of about a cubic foot each, and distributed to the workmen. Each man takes his share of the blocks in an iron wheelbarrow and wheels them home, when they still contain heat enough to cook the meal for the family. After they are cooled these rectangular blocks are an excellent material for building walls.

ZINC WASTED IN GALVANIZING IRON.

A large portion of the zinc used for coating iron is evaporated and lost. Plans for preventing this loss are worthy of the attention of inventors. The whole history of zinc is that of a waste product. It was first found in chimneys where ores of other metals were being smelted, and people were thus led to seek for it in its own ores.

SOUP FROM BRINE.

Prof. Joy then spoke of Mr. Whitelaw's plan of making soup from brine, described on page 309 of our current volume, and remarked that parchment paper is as good a dyalizer as bladder or other animal membrane. All that is required is to make boxes with the sides of this parchment paper, fill them with brine, and set them into pure water. In a short time all of the crystallizable matter in the brine —the salt, niter, etc.—will pass through the paper, while the juices of the meat, all uncrystallizable matters, will be retained in the boxes, and may be used for making soup. The speaker exhibited specimens of parchment paper, such as is used by chemists, and observed that it is made in pretty large quantities.

On the Alloys of Silver and Zinc. By M. Peligot.

In consequence of the increasing scarcity of silver money in France, which is constantly disappearing from circulation on account of the continued rise in the value of the metal, the French Government is about to lower the standard of the silver coinage by the addition of about 7 percent more copper. The new money will be made of an alloy consisting of 835 parts silver and 165 parts copper. M. Peligot is chemist to the French Mint, and he has made experiments to ascertain how the introduction of zinc or the complete substitution of zinc for the copper would affect the alloy. He has found that alloys of the legal standard in which part or the whole of the copper was replaced by zinc are remarkably malleable, and when rolled are perfectly homogeneous. They are of a beautiful white color, but the binary alloy of silver and zinc is somewhat yellowish. The fusibility of the zinc alloys is greater than the copper; they are very sonorous and elastic, and if made brittle by hammering, the malleability is restored by heating. The study of the atomic alloys showed curious results. Equal equivalents of silver and zinc, or two equivalents of silver to one of zinc, gave malleable alloys, while the compounds $Ag + 2Zn$ and $2Ag + 3Zn$ are too brittle to be rolled. As a matter of economy, the author recommends that his Government should employ zinc to reduce the value of the present money, the price of zinc being only one-fifth that of copper. Another recommendation to the zinc alloys is the fact of its blackening less readily with sulphureted hydrogen than the copper compound, copper, indeed, seeming to increase the discoloration. An alloy of 800 of silver and 200 zinc will keep its whiteness in a solution of polysulphide which will rapidly blacken the legal alloy of copper and silver. This, as the author points out, will be useful information to the makers of jewelry. The absence of verdigris under the action of acid liquors is another advantage. In conclusion, the author mentions a fact of no great importance to us, namely, that the introduction of zinc into money is nothing new. French copper money contains one per cent of zinc, and the small coins of Switzerland contain zinc, silver, and nickel.

The Way to make an Eolian Harp.

Of very thin cedar, pine or other soft wood, make a box five or six inches deep, seven or eight inches wide, and of a length just equal to the width of the window in which it is to be placed. Across the top, near each end, glue a strip of wood half an inch high and a quarter of an inch thick, for bridges. Into the ends of the box insert wooden pins like those of a violin to wind the strings around, two pins in each end. Make a sound-hole in the middle of the top, and string the box with small catgut, or blue first-fiddle strings. Fastening one end of each string to a metallic pin in one end of the box, and, carrying it over the bridges, wind it around the turning pin the opposite end of the box. The ends of the b should be increased in thickness where the wood pins enter by a piece of wood glued upon the insi Tune the strings in unison and place the box in t window. It is better to have four strings as scribed, but a harp with a single string produces exceedingly sweet melody of notes which vary w the force of the wind.

Suspending Life.

A scientific German publication states that, amo other curiosities, Dr. Grusselbake, professor of chemistry at the University of Upsal, has a little serpent which, although rigid and frozen as marble, can, by the aid of a stimulating aspersion, discovered by the Doctor, be brought to life in a few minutes, becoming as lively as the day it was captured, now some ten years ago. Dr. Grusselbake has discovered the means of benumbing and reviving it at his pleasure. If this principle could only be carried out for man as well as for reptiles, death would lose its empire over mankind, and we should preserve life as the Egyptians preserved their mummies. Dr. Grusselbake's pr cess is nothing more, apparently, than simply lowering the temperature, just to that point where the cold produces a complete torpor without injuring any of the tissues. In this state the body is neither dead nor alive, it is torpid. The professor has laid his scheme before the Swedish Government, and proposes that a condemned criminal shall be handed over to him for the purpose of experiment! The savant purposes, if he can only get his man, to benumb him as he benumbs his little serpent, for one or two years, and then to resuscitate him from apparent death by his *aspersion stimulante*.

Action of Light on Honey.

Honey fresh from the comb is a clear yellow sirup, without a trace of solid sugar in it, but upon straining it gradually assumes a crystalline appearance, and ultimately becomes a solid mass of sugar. It has not been suspected that this change was due to a photographic action, but this appears to be the case. M. Scheibler has inclosed honey in stoppered flasks, some of which he has kept in perfect darkness, whilst others have been exposed to the light. The invariable result has been that the sunned portion rapidly crystallizes, whilst that kept in the dark remains perfectly liquid. It is thus seen why bees are so careful to work in perfect darkness, and why they obscure the glass windows which are sometimes placed in their hives. The existence of their young depends on the liquidity of the saccharine food presented to them, and if light were allowed access to this, the sirup would gradually acquire a more or less solid consistency and would seal up the cells.

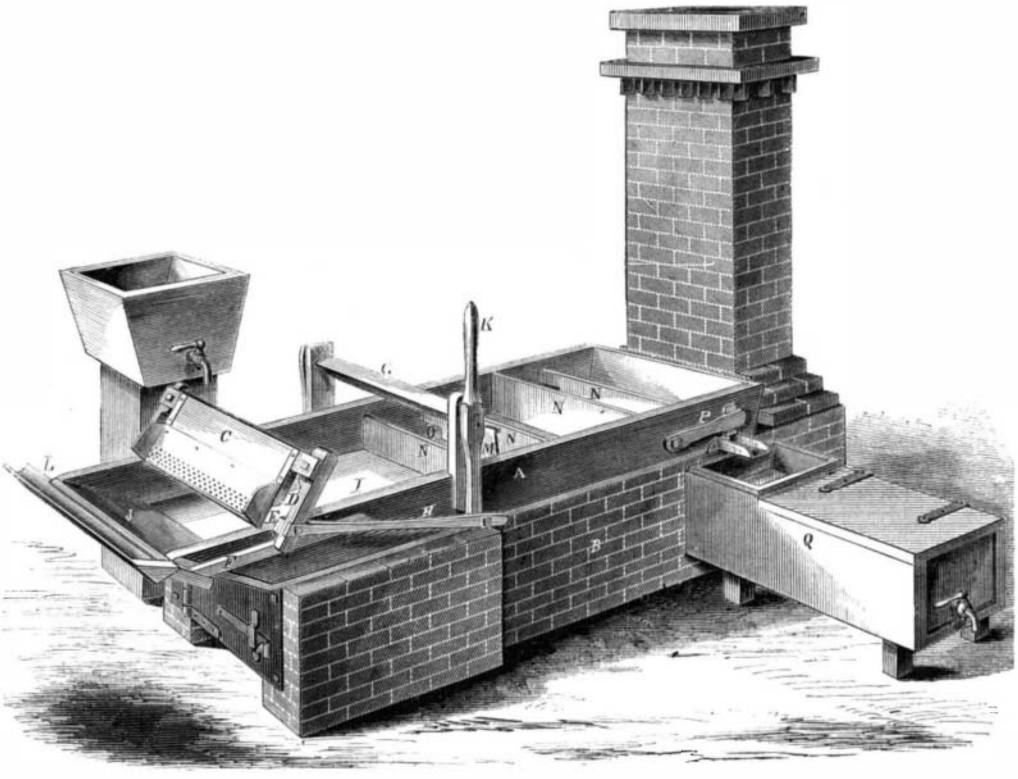
Work for Boys.

In the present emergency of the country every hand ought to be well employed. The war has absorbed the working power of the country to an alarming degree, and as a consequence the amount of agricultural productions are much diminished. There are droves of boys in this city who ought to be profitably employed, and it would be a good service to them as well as to our farmers if they could be got out of the city to assist in farm labors. They can be used for all kinds of light labor, and especially in the approaching hay and harvest season. We would be glad to see some energetic movement started in our larger cities to send to the farmers such boys as are not otherwise profitably employed.

Improved Evaporator.

The annexed engraving represent a new evaporator for manufacturing sorghum sugar. When the article just alluded to becomes a staple product at a low price, we shall certainly owe a great deal to the ingenuity and perseverance of inventors, for they are doing all in their power to provide the community with the requisite apparatus for its manufacture. Appended is a description by the inventor. A represents the sides of the pan, B the furnace, and C the skimmer, at each end of which are attached head-blocks, D. These head-blocks have inward projections, E, which form bearings on the rods, F; these act as slides to elevate the skimmer, C, in its backward movement. The rock-shaft, G, has levers, K, attached at each end, the lower ends of which are pivoted to the rods, H, and the front ends to the head-block, D.

The operation is as follows:—The cold juice is let into the front or defecating apartment, I, and when it commences to boil all the scum flows forward and is deposited on the inclined end, J. After a quantity of scum has gathered, the operator takes hold of the long lever, K, and draws the skimmer back until it drops off of the rods, F F. The skimmer is then moved forward to and upon the inclined end, J, depositing the scum as it goes in the gutter, L; after the skimmer is thus moved forward the rods drop back to the position shown. When the juice is sufficiently cleansed, the gate, M, at the first partition is raised and the juice allowed to flow into the back part of the pan (previously supplied with water), which is divided into sections by the partitions, N; these partitions have openings, at alternate ends, which cause the juice to flow in a transverse channel until it reaches the outlet at the gate, P. When the juice is concentrated to the proper degree for sirup or sugar, it is let out into the cooler, Q, which is furnished with a strainer to catch all the pomace and dirt which is not skimmed off when boiling. These evaporators have given general satisfaction wherever they have been introduced during the past year; and the invention is covered by two patents issued through the Scientific American Patent Agency to Thomas J. Price, Industry, Ill., they bear date respectively Jan. 28, 1862, March 15, 1864; all further information can be had by addressing T. J. & J. M. Price, manufacturers, Industry, McDonough county, Ill.



PRICE'S SORGHUM EVAPORATOR.

The Hessian Fly and its Remedy.

Mr. Lewis Bollman, of Bloomington, Ind., gives this description of the Hessian fly in his article on wheat, in the Report of the Agricultural Department of the United States Government:—

"The received account of the introduction of this fly into the United States is known by every person, for its common name refers to it. That it was brought in some straw with the Hessian troops, employed in the Revolution against us, is possible; but the history of like pests shows that sooner or later they spread over the whole earth where their favorite food may be grown and climatic influence will permit. The bee-moth and the curculio are instances of the fact that nearly all the products of the farm have their enemies. It is not necessary to describe this fly, nor particularize the nature of its depredations, except to say that it deposits its eggs, from twenty to forty in number, in the hollow of the blades of the wheat. The egg hatches a small, light-colored worm, in from four days to three weeks, according as the weather is warm or cool.

"The worm crawls down the leaf between the sheathing of the leat and the stem, firmly fixes itself there, sucking the juices or sap of the plant on which it lives. It gradually becomes imbedded in the stem by the latter growing around it. As it increases in size, it becomes in color, size, and shape, like a flax seed; hence this state of the larva is called the flax-seed state. In this condition it remains during the winter, unaffected by the severest cold. In May it is changed into the fly, and this fly lays its eggs higher upon the same stalk, and on others around it, and also on the spring wheat. These eggs hatch, and the worms undergo the same changes until in August, when they appear as flies, ready to deposit eggs on the young fall wheat plants. The fact that of so many eggs but few hatch (for not more than two or three worms are found in the same plant) shows that the Hessian fly has its deadly enemies. This is true; two of which I will notice, being parasites of this parasite. Both these are flies, one of which deposits its eggs within the egg of the Hessian fly. Both these eggs hatch, but the worm from the last-deposited egg is within the worm of the Hessian fly, and it lives upon it, gradually destroying it, until, having undergone its various changes, it emerges from the skin of the Hessian worm a fly, ready to deposit its eggs in those of the Hessian fly. The other parasitic insect lays its eggs in the larva when in the flax-seed state, which hatches within it and lives upon it. It is to these friendly insects we owe the fact that the Hessian fly does not spread over large districts of the wheat region, nor, indeed, in any part of it to any great extent, and that it is seldom destructive in the same place for more than a season or two. The friendly flies, by their rapid increase, soon drive the Hessian fly to other portions of country in order to shun their fatal attacks. The usual remedy against the Hessian fly is late sowing of the winter wheat. Whilst this may afford some protection, it leads to habitual late sowing, by which the plant is weakened and rendered less able to endure the changes of our winters. A greater loss is thus occasioned than would result from an occasional entire destruction of the crop by the fly. A strong-rooted plant will more easily overcome a serious attack of the fly than a late sown and weak one can resist the freezing out, to which it is certain to be exposed."

A CITIZEN of Biddeford, Maine, who, a little more than a year ago, worked as a machinist in Laconia repair-shop for one dollar and a half per day, now pays a tax on a net income of $27,000—made in the manufacture of cotton machinery.

THE London *Times* says that the English Government has bought the Laird rams for £225,000.

The Iron-clad Steamer "Tonawanda."

This formidable monitor, now in rapid course of completion at our navy-yard, was designed and built under the supervision of Henry Hoover, Esq., Naval Constructor, attached to this station. The hull of the *Tonawanda* is one solid mass of live oak. Her extreme length is 272 feet 9 inches; length between perpendiculars, 260 feet; beam molded, 40 feet; beam extreme over armor, 53 feet; depth of hold, 12 feet 2 inches; area of greatest traverse section, 568 square feet; depth of armor amidships, 5 feet 9 inches; weight of wooden hull per section, 1,386 tuns; launching draught, mean, 8 feet 9 inches; load draught, 12 feet 2 inches; displacement, when ready for sea, 3,300 tuns; projection of overhang, 12 inches. At the underside of the beam, at the load line, the clamp or backing is 3 feet thick, reduced to 7 inches at a distance of 5 feet 9 inches, falling in fair with the ceiling. Thickness of timber in hull, 9 inches; planking, 7 inches; lagging, 12 inches; armor, five-inch plates—thus offering a solid resistance of 38 inches of live oak and 5 inches of iron-plating, to which must be added the zones or armor-bearers, which pass longitudinally around and encircle the whole ship. They are of iron, 6 inches deep by 4 inches thick, and placed 4 inches apart, making the plating in reality 11 inches thick; the weight of the side armor and zones is 729,494 lbs. The deck beams are of oak, 12 by 14, and 36 inches from center to center. The deck consisist of, first, an oak planking $6\frac{1}{2}$ inches thick, then two $\frac{3}{4}$-inch iron plates —on top of this comes a yellow pine planking three inches thick.

The *Tonawanda* has two turrets, the forward one carrying the pilot-house. They are 23 feet diameter inside, 9 feet high, and composed of eleven one-inch plates. Each turret, with machinery, weighs 316,340 lbs., pilot-house 45,400 lbs. Four 15-inch guns comprise her armament, each gun, with its carriage, weighing 66,000 lbs. The amount of fighting expected may be judged from the fact of her carrying 12,000 lbs. of powder, 50,000 lbs. of shell, 60,000 lbs. of solid shot. The magazine and shell-rooms are on either side of the turrets. Her engines, by Merrick & Sons, are horizontal, direct-acting, 30 inches diameter, 21 inches stroke. There are two screws of brass 10 feet diameter and 14 feet pitch. Steam is supplied by two of Martin's vertical tube boilers having a front of 38 feet 6 inches, 11 feet deep, $9\frac{1}{2}$ feet high. There are 16 furnaces in all, each $6\frac{1}{2}$ feet by 3 feet. Each screw is driven by its own independent engine. By this arrangement the ship can be steered by the propellers alone, in case the rudder should become damaged or be carried away. The anchor, when let go, takes the chain directly from the locker without overhauling. It can veer away chain with perfect safety, and is easily controlled while riding heavily. In one minute the chain is passed to the capstan, and all is then ready to heave away. In ordinary cases the chain is taken in at the rate of three fathoms per minute, when the anchor is chain-bitted. This is all performed without handling, the chain paying itself in and out of the locker.—*Philadelphia Bulletin.*

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