The names of the contributors to this volume are largely the same as those given in the first. Certain subjects are the extension of the same topics treated before. Thus, the chapters upon the outlying towns of Dorchester, Roxbury, Chelsea, and Charlestown are by the hands which prepared those in the earlier volume. Mr. Bynner continues his account of the topography and landmarks, Mr. Whitmore his notes on Boston families, and Mr. Scudder his general portrait of life in Boston. The efficient help of Dr. H. M. Dexter, Mr. W. F. Poole, and Mr. D. A. Goddard has been secured, and the writers, having fewer topics to discuss, are able to give to their several chapters a more continuous and comprehensive character. The illustrations are an advance upon those in the first volume; they are more copious, and drawn from more interesting material. The editor, finally, besides his constant annotation of the pages, has furnished a very important introduction to the volume, in which he brings together a great deal of valuable material for forming a distinct notion of the external appearance and the division of estates in Boston at the time. There is a satisfaction in seeing so desirable a work as this carried forward with so much intelligence and spirit. It is not overloaded with useless antiquarianism, nor does it neglect any phase of the subject which properly comes within its scope. It is readable as well as authoritative.

Munger's "On the Threshold." *

OF making books of advice to young people there is no end, and of good books of such advice we have but very few. Mr. Munger talks to young men as freshly and admirably as if the theme had never been touched before. He speaks to them about purpose, friends and companions, manners, thrift, self-reliance and courage, wealth, reading, amusements, faith. Mr. Munger is a minister, but in his book there is none of the mannerism of the pulpit. It is the frank, wise, inspiring work of a man who carries a high ideal into the circumstances of an average American community. It is remarkable in its union of enthusiasm with good sense. Mr. Munger has in him much of the poet. He is an idealist, a man of intuitions, quick to see and keen to feel the higher spiritual aspects of the world. But he has evidently had large experience among American boys, who as a class are not poets or idealists, whose temptations are of a very unromantic character, and who have got to make a living as well as to obtain the kingdom of God. He speaks wisely and shrewdly about thrift and health, at the same time that he speaks inspiringly about courage and purpose. In his detailed counsels there is much suggestiveness; but, more than this, there is the contact everywhere of a strong, uplifting personality, a full vitality that is fed from the highest sources. The writer strikes always at the central principle of his subject. He draws his listeners toward the large, satisfying interests, so that vice and vulgarity shall appear not only odious, but contemptible and unattractive. There is nothing ascetic, nothing narrow, in the type of life he commends: his influence goes toward a manhood which is large, vital, and joyful, as well as sound and faithful.

* On the Threshold. By Theodore T. Munger. Boston: Houghton, Mifflin & Co.

THE WORLD'S WORK.

Reproduction of Pompeian Pavements.

EXPERIMENTS recently have been made in this country with our native marbles, to test their value as materials in making mosaic pavements resembling those found at Pompeii. These pavements were formed by bedding irregular bits of colored stone in a matrix of mortar, the various colors serving to form designs or rude pictures. A familiar example of this work is the figure of a black dog on a white ground, with the legend, "Beware of the dog." The experiments formed a good basis for a new art-industry, and a number of public and private buildings have already been supplied with marble mosaic floors or pavements that are exact reproductions of those found in Pompeii. The great variety of colors in our marbles gives a wide selection of colors in forming the designs, and good Portland cement, with a slight admixture of sand, makes a suitable matrix. The stones are roughly shaped into pieces about two centimeters (three-quarters of an inch) long, having one end cut or ground smooth and flat. No attempt is made to have the end square. Any form will answer, provided it is fairly regular and symmetrical and about one centimeter in diameter. The design of the pavement is drawn and colored on paper the full size of the work, and from this the workman selects the colored pieces of marble, and sets them in position in the plastic cement by hand. The work is not laborious, and may be readily done by young women, all the skill required being easily learned in a few weeks. The pavement, whether the floor of a church, a vestibule, a sidewalk, or a hearth, does not have any seams when finished, although all the work is done in small squares varying from twenty to forty centimeters in diameter. Wooden or iron molds are prepared, and so much of the design as may be included in the inclosed space is made in the mold. Each piece of marble, when bedded in the cement, is brought to an exact level with all the other pieces, great pains being taken to have all the marbles of about the same texture. When the cement has set firmly, the block in its mold is placed under a marble-polishing machine, driven by steam power, and all the pieces of marble are polished, the cement being cut away at the same time so as to bring the work to an even surface. The blocks, when finished, are taken to the place where the pavement is to be laid, and carefully removed from the molds. The sides of each block are then broken away with a hammer, so as to leave an irregular or ragged edge. The blocks are then put in position, and the spaces between them are carefully filled with cement and fresh pieces of marble. The design is thus restored completely, and no seam remains between the blocks. The new portions are then polished by hand, to bring the whole work to one uniform surface, and the work is complete. As the pieces of marble stand on end, and are firmly bedded in the cement, the colors and designs can never wear out, and the work will endure constant usage for an indefinite time. The pavements examined were partly of modern design and partly exact copies of Pompeian floors. The colors were clear and the outlines sharp and well drawn. At the same time, as might be expected, all the work preserved the antique character. The pavement may be confidently recommended as a new flooring material, and welcomed as the product of a new industry.

New Type-writer.

THE type-writer, like the sewing-machine, appears to be one of those tools firmly fixed in a permanent field of usefulness. It has been greatly improved within the last few years, and only the price seems to stand in its way. If it were cheaper it would become a general household tool. The cost of the machine has stimulated invention, and a great number of efforts have been made to produce a cheap and reliable type-writing (or hand-printing) machine. Among the most promising of these is a machine designed to be used with one hand, and to print the letters by direct contact. The machine examined appeared to be well designed, and to be constructed in a thorough manner. It had been in use for some time, and must be regarded as a practical apparatus for general purposes. It aims to print one letter at a time at the same spot, and to move the type and feed the paper in the direction of the printed line after each letter has been impressed. To accomplish this, there is a sheet of thin rubber, having, arranged upon it in regular order, about fifty letters, small and capitals, figures, etc. These are raised slightly above the rubber, and make the type. Above this is a small lever, hinged at one end; with this any one of the types may be pressed down by hand upon the paper under the types. Under the type-plate is an inking pad for moistening with ink all the types, except the one in use, each time a letter is impressed on the paper. Above it is a metallic plate, covering the back of the types everywhere, except in one place at the center. The type-plate is supported by a triple set of parallel levers that give it a universal lateral motion, and, as this system of levers is connected with the hand lever, the type-plate may be guided into any position desired by moving the lever. Thus, if it is desired to impress a letter in one corner of the type-plate, the lever is placed over that letter and pushed down. The next letter may be in quite another part of the plate. The lever is moved to this letter, and the type-plate follows the lever, so that, while the lever is really pushed down at precisely the same spot, the letter under the lever has been changed. A finger-bar serves to feed the paper between the letters, and in this manner the writing is done. The lever, held in the forefinger and thumb of the right hand, is moved over a guide-plate marked with the letters, and each one is touched gently in turn while the little finger moves the finger-bar between the letters. To feed the paper between the lines, either hand may be employed. All the types are inked between the letters by an automatic device, and the writer has only to touch one letter after the other to make the printed copy. At the same time, if it is desired to repeat a letter, there is no inking between the letters. If the letter or figure is not repeated more than three times, the letters appear to be reasonably distinct. All the parts likely to wear out can be easily replaced, and new type may be put in for a few cents. The machine has the merit of cheapness and simplicity.

New Domestic Motor.

THERE has been within the past few years a demand for small motors, both for the shop and the house. A large number of domestic motors have been brought out, but the greater part have apparently failed of general approval. Steam, air, and gas engines of small size and low price are readily found, but for domestic use, the fact that all require more or less skill in using them seems to prevent their general introduction. There is also at least one good water-motor suitable for light work in the house. This is a simple overshot wheel, driven by a small stream of water from any house service where there is a moderate pressure or head of water. The wheel is hung vertically, and is inclosed in a casing supported by iron legs. A new form of water-motor recently introduced suspends the wheel, in the form of a thin metallic disk, at the end of a vertical shaft. From two to four streams may be directed against the cup-shaped vanes on the wheel, and, as the wheel is suspended freely, the waste water has plenty of room to escape below. The wheel is inclosed in a casing having a dishing shape below, with the outlet for the water in the middle, to prevent clogging or stopping of the wheel by excess of waste water. The motor is designed to be screwed directly to the faucet, and to discharge the waste water into the sink, or by a pipe into the house drain. The motor is made in several sizes, from a small machine of one-sixteenth horse-power which can be carried easily in the hand, up to one-horse-power machines.

It may be remarked, in connection with this motor, that there is also a new steam motor constructed on the same plan. A small jet of steam is thrown against the vanes of a wheel inclosed in a metallic casing. While this motor is theoretically wasteful of the steam, it has the advantages of great simplicity and entire safety. No special care is needed to run it, and these things may outweigh the waste of power that must follow from the use of steam in this manner.

Novel Foundation for Sea-shore Structures.

IN constructing a marine signal-station at the Delaware Breakwater, it was found desirable to place the building on one of the hills of loose shifting sand near

Cape Henlopen. The sand was so deep that no suitable foundation could be found by digging, and a novel method of securing the structure against the action of the wind was tried, that seems to have been suggested by the common device employed by builders to secure the base of the poles of their stagings. In parts of New York the streets are laid out on solid rock, and in erecting a building-staging it is the custom to set the ends of the poles in barrels and to fill the barrels with sand. In like manner, the new signal-tower was weighted with sand. A pit was dug at the top of the hill, and in this was laid a heavy sill of yellow pine. The sill was square, and at the corners were erected timber uprights, each 7.93 meters (26 feet) long. The sill was 1.83 meters (6 feet) below the surface, and, when the sill had been bedded in the sand, a floor was laid over the sill, the sand under it being rammed in tight. The sides of the pit were also boarded in, thus making a cellar with wooden floor and walls under the tower. The first floor was laid at a level with the surface, and under the floor the entire space was filled with sand. By this arrangement the tower was securely anchored in place, and, when finished, it was found to be more stable than any wooden structure resting on masonry. The idea of making a wooden cellar and weighting it in this manner is certainly a good one, and may prove of value when erecting seaside structures of all kinds, or wherever the character of the soil makes it difficult to secure good foundations.

New Cooking Utensil.

THE ordinary range and cook-stove, in which the fire-box is placed at the side of the oven, or in which the products of combustion pass over the top, have the disadvantage of an irregularly heated oven. The sides and top are hotter than the bottom and ends or other side, and, as a result, the bread or other food is improperly cooked—perhaps burned at top while badly done at the bottom. To correct this defect in ovens, a simple appliance has been devised for causing the air in the oven to circulate, and thus carry the heat obtained by radiation to all parts of the oven. A sheet of metal bent into the form of the top and one side of the oven is supported on wire standards and placed in the oven. In the narrow space between the sheet-metal and the hot side and top of the oven, the air is heated more than in the main body of the oven, and by expansion it rises and moves over the top of the oven, toward the cooler walls. The arrangement, simple as it is, appears to be founded on a good idea, and is reported to work well in practice. The apparatus examined was portable, and is designed to be put in the oven by the cook whenever an even heat is needed.

New Tension Belt.

BRASS-AND-STEEL wire has been recently used as a material for belting. The wire is wound in a close spiral, thus making a continuous coil spring. Placed in pulleys having a round grooved face, it is found to make an admirable means of conveying power. The elasticity of the coil gives the belt a varying tension, so that, when properly adjusted, it keeps a firm hold on the pulleys and conveys the power with economy. In passing over the pulleys it stretches and turns partly around on its axis, so that its motion is spiral, like the flight of a rifled shot. The belting examined seemed to do its work well, and to have the merit of great freedom of movement in passing around corners or in crossing or twisting. The belts are made in sizes from three to nineteen millimeters in diameter. For conveying more power, two or more belts of the largest size are to be used in groups on the same pulley. For joining the ends of the belts, common screw-hooks are intended to be screwed into the end of the coil. The material also makes a good cord for supporting window-sash weights, and a cheap and simple form of door-spring.

New Device for Exhibiting Fabrics.

AN ingenious application of an old and familiar experiment in optical reflection recently has been made in the carpet trade. Four mirrors of equal size, placed upright and facing each other at a true right angle, will give reflections of any object placed between them, in its true proportions in every direction. This fact is the basis of an apparatus for exhibiting carpets. The four reflectors are placed on an iron frame or table, and under the table are two rollers provided with hand-cranks. From one roller to the other extends a band of some light fabric that is passed over guide rolls and under the four mirrors. On this belt are sewed the samples of carpeting that are to be displayed. Each sample is of the same size as the space between the four mirrors, so that when the band is moved each sample in turn passes under the mirrors, and may be stopped and held in position while being examined. The mirrors are about thirty-five cm. high, and they inclose a space of about forty-six cm. (eighteen inches). On looking into the inclosure the pattern appears to be repeated in every direction, and to cover about two square meters. The apparatus is a great improvement on the systems of mirrors now used to accomplish the same thing, and it would appear that it might be made equally useful in displaying wall-papers, by placing the box of mirrors upright and putting the rollers on each side.

New Boat's Mast.

TO REDUCE the weight of the masts of racing yachts, it has been the custom to bore out the heart of the stick for the whole or a part of its length. While lightness is thus gained, strength has been lost, and to compensate for this loss, a new form of hollow mast has been recently tried. The stick was carefully cut into two equal parts, and then the interior was gouged out in short sections. Spaces were left uncut between the sections, so that when the two parts were put together the stick would be an exact copy of the interior of a rod of bamboo, the stem of which is hollow, and reënforced at short distances by thick rings of woody matter that nearly close the tube made by the stem. This form of structure is light and yet very strong, and it is claimed that this form of mast will be stronger than the usual hollow mast, and very nearly as strong as a solid mast. The two parts are fastened together by putting in dowels at the reënforced places. When finished, the mast is smooth on the outside, and gives no intimation of its internal structure.

Quick Tanning Process.

BICHROMATE of potash appears to be coming into use as a tanning material. The action of this chemical upon gelatine, under the influence of light, is well known, and is used in certain photo-printing processes. The leather prepared by the use of the new material is known as chrome leather, and from all accounts it appears to resist decay quite as well as leather prepared by the use of tannin obtained from oak bark. The chief gain of the process is a material shortening of the time—good leather, it is said, being obtained from raw hides in two weeks. No change in the process seems to be introduced. No intimation is given in the accounts of the new process whether the leather, while in the bath of bichromate, is exposed to light or not. The action of light upon the bichromate when combined with gelatine is to produce a hardening of the gelatine, which causes it to resist water (this being the basis of the photo-printing processes), and as the tanning is a hardening of the gelatine, it may be presumed that the new process is partly actinic.

Welding Nickel with Iron.

THE great value of nickel as a coating for iron has led to experiments to see if it could be applied to the surface of sheet and wire iron by some mechanical means, in place of the usual electro-plating process. The experiments appear to be so far successful that both nickel and cobalt have been welded to iron, and the united metals have been afterward stamped and rolled into various shapes, such as plates, kettles, and kitchen utensils, and drawn into wire having an iron core covered by a nickel or cobalt skin. Alloys of nickel also have been made, and these alloys have been used to weld with iron. Cobalt alloyed with zinc also has been welded to iron. In all these experiments it appears to be essential that, during the welding under the hammer or rolls, the air must be excluded. This has been done by wrapping the iron and nickel, before welding, in thin sheets of iron. The iron skin was welded on at the same time, but was removed afterward by dissolving the outer skin of iron in acids, the nickel surface under it not being affected by the acids. Another method, used to exclude the air during welding, is to heat the iron and nickel in an atmosphere of carbonic oxide or carbureted hydrogen. It was also found that pure nickel could be welded over a core composed of an alloy of nickel and copper. The experiments were conducted by Dr. Theodor Fleilmann, of Iserlohn, Germany, and are regarded as opening a wide field for commercial enterprise in the manufacture of nickel-plated stamped ware and nickel-covered wire.

Self-Registering Hand-Stamps.

THE hand-stamp used in post-offices to print the postmarks, and in counting-rooms to impress on letters the style of the house, usually implies two motions every time a letter is stamped. One motion is to press the type on an inking-pad, and the second is to make the impression on the paper. To find the number of letters that have been stamped, the clerk must count each one. By two simple appliances that may be used in connection with any form of stamp, whether held in the hand or used as a lever to be pressed down by hand, the counting may now be made automatic. By one method the handle of the stamp is made hollow, and a rod holding the stamp is placed inside the handle and given a slight vertical play. On top of the handle is screwed a small counting mechanism. Each blow of the stamp causes the rod in the handle to move the counter once, and in this manner the act of stamping causes the counter to report one letter stamped. As the motion of inking the stamp also causes the counter to mark one, the first wheel of the counter has twenty instead of ten teeth. This would give too many, and by a simple arrangement of the parts the first wheel only reports ten while receiving twenty impulses. The second method uses the inking-pad in connection with a small battery and electrical counter. Each time the pad is struck by the stamp, the circuit is closed and a figure is changed on the counter. To accomplish this, the inking-pad is placed on a short lever, hinged at one end and supported by a spring. The blow from the stamp overcomes the spring, presses the lever down, and closes the circuit.

Electrical Progress.

EXHIBITIONS serve a useful purpose in showing from time to time the actual progress made in any particular art or manufacture. The recent Electrical Exhibition at Paris clearly showed, in this way, not only the rate but the direction of progress in the application of electricity to business. Briefly summed up, the advance in electrical science appeared to be almost wholly in the direction of perfection of details in electrical appliances. There were no pronounced steps forward such as marked the Centennial in the first exhibition of the telephone. Nearly all the more important electrical inventions shown at Paris have already been described in this department, and the improvements made upon them seem to be chiefly in a better adjustment of the various inventions to the wants of business, and in a slightly wider field of usefulness. As an incidental effect, may be observed the increased attention that has been paid to the sources of power for the dynamo-machines, so that it may be truly said that the dynamo-machine has been an incentive and aid to the steam engine. Very superior high-speed engines of a variety of interesting patterns have been brought out by the demand for fast and steady motors to be used in generating electricity. It may be fairly said that the Paris exhibition marks the industrial stage of electricity, because it shows that the narrow field of the telegraph has been left far behind and that the electric current has found a firm foothold in many arts, trades, and manufactures.

Pneumatic Bell-Call.

A SYSTEM of pneumatic call-bells and annunciators that has been in use for some time in England has been recently modified and improved for introduction into America. It consists essentially of a small bellows, an air-tube, and a second bellows, that may be used to strike a gong-bell or control the dials of an annunciator. The bellows, which is quite small and intended to be operated by hand, is closed by pressure of the finger on a push-button, by pulling a handle, or by pressing on a rubber bag that forms the tassel or end of a cord hung from the wall. The closing of the bellows sends an impulse of compressed air through a small tube, and causes a circular bellows to expand. At the end of this bellows is an upright rod that moves a segment of a geared wheel. A smaller wheel geared to this segment moves with it, and causes the hammer of a gong-bell to give a series of rapid strokes. The bell "chatters" like an electric bell for a moment, and the pressure being removed, the ringing mechanism returns to its original position by its own weight. No clock-work or spring is required, all the parts being self-acting. The invention, in its present condition, seems likely to be of value in dwellings, small hotels, and on board steam-boats.

The Secondary Battery.

THIS battery—which, in a modified form and under a new name, was brought out a few months since—does not seem to have realized the very high estimates that were put upon it at the time. It can hardly be said to store electricity as a holder stores gas, or a tank stores oil. After it has been connected with a dynamo machine, it will continue for some time to give out a current, even if it is removed from its source of supply. The battery, however, has been made the subject of experiment as a source of power for electric lamps that must be used in difficult or dangerous situations. The experiments were made in connection with the Swan incandescent light. A single lamp of two-candle power has been kept lighted at the bottom of a fiery coal-mine for six hours, by the aid of a secondary battery weighing about five kilograms (ten pounds). To renew the light, the battery must be again connected with a dynamo machine for a short time. This, it was suggested, could be done by bringing it to the wires from the machine that lead down the shaft to the bottom of the pit. On being charged, the battery could then be carried to a distant and more dangerous part of the mine, where the light was needed. It may be remarked, in passing, that the Swan light is under experiment as a light for mines, the dynamo machine being at the surface, by the pit's mouth, and the wires laid down the shaft and along the galleries. So far, the experiments appear to be highly successful, though the question of the absolute safety of any form of incandescent light in mines liable to take fire is still under debate. The secondary battery, it has been suggested, may yet find a useful field in connection with windmills. While the wind moves the mill, the battery could be charged, and the energy thus obtained be afterward utilized when the mill is idle in calm weather.

New Photographic Convenience.

THE dark cloth thrown over the head of the operator while adjusting the focus of his camera has several serious disadvantages. Unless very carefully placed it fails to exclude the light. Out-of-door work is impeded by the flapping of the cloth in the wind, while the way in which it must be used is a source of great annoyance to ladies and young people who wish to use the camera. Several devices have been brought out that are designed to take the place of the focusing cloth. These have taken the forms of hoods for the eyes and face, and resemble the old wooden stereoscopes. A new apparatus consists of two leaves of card-board joined together by some soft, dark fabric and open at each end. One end is designed to fit over the back of the camera, and the other end is cut out on one leaf to fit the forehead just above the eyes; the other leaf fits the nose and face just below the eyes. In use, the larger end is fitted over the camera, a fringe of the cloth excluding the light at the edges of the box, and the smaller end serves as an eye-piece through which to view the darkened glass-plate. The two leaves fold together like a thin book, and take up very little room. The size of the apparatus depends on the size of the camera; its length is determined by the distance between the eyes and the glass-plate best suited for a good view of the picture, and this is easily determined by experiment. This invention will not be patented, and is a free gift to all who care to use it; and this notice also prevents any one from applying for a patent on it.

Slow-burning Construction.

SO LONG as wood must be used for floors and roofs there can be no such thing as fire-proof building. It is therefore proposed by one of the leading fire insurance companies that all new structures, and particularly factories and shops where wood is be used, shall be made fire-resisting or slow-burning. The plan suggested is worthy of attention, because it often happens that, if the fire can only be confined to the interior of the building for even a few moments, much property, and perhaps many lives, can be saved. For the floors it is proposed to use heavy timbers 30.5 centimeters by 30 centimeters (12 by 14 inches), and on these to lay matched planks 7.6 centimeters (3 inches) thick. Over these planks is to be a layer of roofing-felt or mortar, and in this mortar is to be bedded flooring-boards of the usual thickness. Such a floor would burn, but so slowly that fire would be a long time in eating its way through. The aim is to gain time, for time is the one element of safety at all fires. For the roof, the supporting beams are to be of the same size, and the top is to be of matched planks 7.6 centimeters thick, and covered on the outside with any form of roofing that may be desired. The ends of the beams are to pass through the outer walls, and to be finished as brackets to support the planking that is carried to the ends of the beams.

Protection for Workmen.

THE hydraulic shield for protecting workmen standing before steel furnaces, from the heat, and already described in this department, has proved useful in a number of works. Any apparatus of this kind that is really efficient should be welcomed and adopted. The vital force that is required to resist heat, cold, dust, rain, or bad air, is just so much taken from the force the workman has to expend at useful work in his trade. Anything that adds to his comfort is therefore a good commercial investment. The latest device in this direction is the making of masks or shields of thin sheets of mica. Mica is now found in abundance in this country, and sheets large enough to cover the face are comparatively cheap. It is a good non-conductor of heat, is light, and may be bent sufficiently to form a curved mask over the head. It is transparent enough for all purposes, and worn before the face, it protects the eyes and skin from the heat, and from flying particles of metal thrown off from a forge or grinding wheel. The mica shields are made of single pieces or sheets, as thin as possible, and are fastened to a hood or cap for the head. There is room for eye-glasses beneath the mask, and for a circulation of air. For dusty places, as in mills or in grinding-works, a tube is fixed to the lower part of the mask to admit fresh air through a damp sponge. Provision is also made for the escape of the respired air at the top of the mask. The lower part of the mask may also be fitted to fire-resisting clothing worn over the head and shoulders. It is to be hoped that so simple and useful a device as this mica mask will not be patented. If the men are permitted to make them, or can buy them for a low price, they will be largely used. If a bonus must be paid the inventor, it would be better for some manufacturing company to purchase the patent and make it free.

New Material for Wall Decoration.

A NEW material for covering interior walls has recently been introduced into the United States that deserves attention. The material has already been thoroughly tried in England, and appears to have met with general favor. From the samples examined, it appears to be one of the best substitutes for wall-paper ever introduced. It comes in rolls or sheets, is pliable, like stiff cloth or leather, and is from two to seven millimeters thick, according to the use to which it is to be applied. The basis of the material is linseed oil, mixed with a light and elastic material to give it thickness and body. Coloring matter is also incorporated with the oil, so that when finished the sheets are of one solid color and may be cut or carved without injury. The oil is dried or oxidized till it is perfectly hard and impervious to moisture, and to give it the proper form as thin sheets, it is spread on canvas, which forms a backing. It is tough, strong, elastic, and pliable, so that it may be bent to cover curved surfaces, and it will stand quite severe blows without injury. It may also be washed with soap and hot water or with weak acids. It readily takes the printing-roller and may be stamped into any raised pattern, or be painted, gilded, or bronzed. The material examined was in the form of wall covering, as thin sheets printed like wall-paper in oil colors, or as plain sheets in various colors incorporated in the body of the material. The cheapest form is a simple sheet having a slight mat, on which the decoration is applied. More expensive kinds examined had ornamented surfaces in relief, either in a single color or painted, gilded, or bronzed after it was put in place on the wall. Another and very useful form in which the material is made enables any one wishing to decorate a part or the whole of a wall, a fire-screen, panel, sideboard, columns, wood-work of all kinds, and any surface intended to be ornamented, to apply the decoration without the aid of a paper-hanger. For this purpose the material is made in the form of panels and tiles of all sizes, borders, bands, and narrow strips. These can be fitted to any surface, either flat or curved, that will hold a tack or paste. The sheets may be nailed into position or may be fastened by a mixture of paste and glue (two-thirds paste, one-third glue). The making of the material in these shapes and sizes gives a large field for ingenuity and skill in household decoration, and the low price at which it can be sold will no doubt make it popular. Small tiles from ten to thirty centimeters square cost from twenty-five to fifty cents each, and narrow borders from five to ten centimeters wide are about fifty cents a meter (or yard). A large piece of paneling for a wall or fire-screen will cost from ten dollars upward, according to the richness of the design.

Mechanical Refrigerator.

A LOW temperature is now as useful in many arts as a high temperature, and within a few years a number of inventions in the form of ice machines, chill rooms, and refrigerators have been successfully introduced. Among these, perhaps, the most simple and the most convenient for use on land or shipboard is a new process for obtaining cold air by mechanical means. The apparatus consists essentially of a compressor driven by steam, a supplementary engine driven by compressed air, and a cold room or freezing chamber. It does not appear important what form of air-compressor is used, though in the machine examined the steam cylinders are directly connected with the air-compressors, one piston-rod serving for both. The heat generated in compressing the air is reduced by a jet or spray of water thrown into the compressor at the time the compression takes place. The air is then taken to an upright tank or tower, where it is cooled still more by passing through a shower of water. The air-pipes for conveying the compressed air from the tower are carried into the chill room through other pipes, in which the air is cooled still more. It then returns to a cylinder placed beside the steam-engine. In this cylinder the compressed air expands while doing useful service, as this cylinder is directly connected with the steam-engine, and assists it in its work. The exhaust from this cylinder is then allowed to enter and expand in the chill room. The novel feature of this system appears to be in the use of the compressed air to drive the supplementary engine. It is claimed, and apparently with good reason, that by employing the air to do useful work in an engine, it enters the chill room at a very much lower temperature than if allowed simply to expand naturally on entering the chill room. The process has been applied to steam-ships, and one vessel is reported to have brought a cargo of frozen fish from Hudson's Bay to England in good order, while a larger cargo of fresh meat was brought from Australia in safety.

Novel Method of Molding Plastic Materials.

In making parabolic mirrors for reflectors for lamps, it has been found that the familiar potter's wheel could be used to make such reflectors in an entirely new way. Upon the wheel, which is driven by some convenient power, is placed a circular vessel, the vertical axis of the vessel corresponding to the axis of the wheel. That is, a vessel resembling a wash-basin is placed exactly on the center of the horizontal wheel. This vessel is filled with some plastic material, like plaster of Paris in a liquid form. The wheel is then driven at a moderate and perfectly uniform rate of speed, when the liquid plaster rises by centrifugal force around the sides of the vessel. The surface of the liquid sinks in the center, and assumes a parabolic form. The motion of the wheel being maintained, the particles of plaster are practically at rest, and the whole mass hardens and becomes stiff while in the form given to it by the centrifugal force developed by the motion of the wheel. The shells thus made are taken out of the vessel, and may be silver-plated on the inside for lamp-reflectors. In experimenting with this ingenious device, it has been found that the vessel that is placed on the potter's wheel should be of a hemispherical shape, so that the plastic mass that is placed in it will readily rise at the sides and assume the parabolic form. Plaster of Paris, a solution of mastic, and fusible metals have been tried in this way with most interesting results. In making other forms, such as flatter mirrors, or hollow vessels of all kinds, different shapes may be used. One thing, however, appears to be indispensable. The motion of the wheel must be uniform, for variations of the speed at which it turns produce changes of form in the plastic mass while it is hardening. Steam-power seems to be too irregular in this respect, and dynamo-electric machines, moved by a battery, are found to be the best motors. The plastic material, when put in the revolving vessel, should be quite thin and liquid, so that it will harden slowly and not become fixed before sufficient speed is attained to give it the right shape. This invention, while it did not originate in the pottery trade, is one that may yet prove of the greatest value in the manufacture of plastic ware. It is practically a new extension of the potter's art, and should be made the subject of thorough experiment to test its value. Thin "slips," or very liquid clay, placed in vessels of different forms, and given on the potter's wheel different rates of speed, will, no doubt, give some new forms of plates, and other vessels. The liquid, while revolving in the vessel, can be made to assume different forms by altering the speed, or by placing wooden guides on the inside of the vessel to direct the liquid into any shapes desired. Gas flames could also be used to solidify the liquid when the revolving vessel has caused the clay to assume the desired form.

New Gas-motor.

Gas-engines have proved so useful in places where a low and easily managed power is in demand, that many efforts have been made to reduce the cost of such motors, and to make them as effective as possible. Of these motors one, at least, has proved quite successful, and has been already described in this department. A more recent invention in this field deserves attention, because it appears to give a decided gain in economy over others of its class. This springs from the fact that every second stroke of the piston, or every revolution, develops power, some other motors of this class giving power only on every fourth stroke. No gas-engine appears likely to develop power on every stroke, as the mixture of air and gas burned in the cylinder will not escape, like steam, from the cylinder after it has done its work. It appears to be necessary to wash or sweep out the products of combustion after each explosion in the cylinder, to make the machine work.

In the new machine two cylinders are employed, one called the displacing cylinder (or displacer), and the other the working cylinder. It is the duty of the displacer to remove the products of combustion, and then to recharge the working cylinder after each outward stroke. This motor is interesting because of the peculiar arrangement and duties of these two cylinders. Their actual position and connection with the other parts of the machine are of less importance, and need not be considered. The displacing cylinder is much larger than the working cylinder, and they may, for our purposes, be imagined as placed side by side, with the piston rod of each connected with the crank-shaft at right angles. If the engine has just completed a working stroke, the piston of the displacing cylinder is just ready to advance. During the first half of its stroke, it draws into the cylinder the mixture of air and gas that is to be burned in the working cylinder. At mid-stroke the inlet port is closed, and another is opened, admitting pure air during the remainder of the stroke. At this point the piston in the smaller cylinder is just finishing its effective stroke, and the connection between the two is opened. The fresh air, taken in during the last half of the stroke of the displacer, is now free to enter the working cylinder, and, as its exhaust is still open, the pure air enters and passes through the working cylinder, driving out the products of combustion and escaping, in turn, after washing or cleaning it out on its way. At the right moment the exhaust is closed, while the explosive mixture that follows the pure air enters and fills the cylinder. The piston, on its return, compresses the mixed air and gas, and at the right instant it is fired, and the explosion drives the piston back on its effective stroke. The points of interest here appear to be in the employment of the second cylinder, and the use of pure air to wash out the working cylinder and drive off the products of combustion before the gas is admitted and compressed. There is, besides the gain of making the working cylinder perform its duty at every second stroke, the economy of moving a lighter piston to prepare the charge of gas at the same time that work is being performed. The current of pure air forced through the working cylinder cools the parts, and puts out any sparks that might still burn after the explosion, and that, if not extinguished, might cause a premature explosion. This motor has been made the subject of exhaustive experiment, and was exhibited at work at the Paris Electrical Exposition, where it seemed to meet with approval.

The Hydromotor.

A GREAT many attempts have been made, both in America and in Europe, to employ steam power in moving vessels by the use of some machinery other than the screw and paddle-wheel. The object sought has been to apply the power in such a way that the motion of the screw or wheels will not create troublesome waves, as it is well known that the waves made by passing boats sometimes cause great damage to river banks by washing away structures put up to restrain floods or to control the current. The plan hitherto followed, and with some success, has been to put a steam-pump on the boat, and to take in water at or near the bows, and to propel the vessel by driving the water out by means of the pump through a much smaller pipe at the stern. The form of the nozzle used in ejecting the water has varied greatly, from a single opening to many small openings arranged along the under side of the hull; sometimes thin sheets of water have been tried.

The most radical improvement in this direction has been tried with apparent success recently upon a steamship 33.55 meters (110 feet) long, 5.18 meters (17 feet) beam, and drawing 1.83 meters (6 feet). The water-jets are discharged from two large nozzles, placed one on each side of the keel, and close to the boiler and engine. The chief interest in this steamer lies in the new motor used to force the water through the nozzles. The engine is evidently based on the form of steam-pump known as the pulsometer, in which the direct action of the steam is used to move the water in the pump. The engine consists of a pair of upright cylinders, each being connected at the lower end with a large pipe leading to the two discharge-nozzles outside the boat. At the top of each cylinder is an inlet for the steam and an outlet for the exhaust that is taken by a short pipe to the surface condenser. There is also a large inlet at the base of each cylinder, and a pipe communicating with the condenser, so that sea-water can be taken from outside the boat through the circulating pipes of the condenser to the cylinder. This inlet is provided with a valve opening inward. Inside each cylinder is a float that nearly fills it, thus making a loose-fitting piston. The piston has a rod extending upward through the top of the cylinder, that controls by the movement of the piston the steam and exhaust ports.

To understand the action of this novel water steam-engine we may imagine one cylinder to be full of sea-water. The piston floating on top of the water is at the top of the cylinder, and in this position its rod opens the steam-port. Steam under high pressure enters the cylinder and drives down the piston, expelling the water with great force through the nozzle under the boat. The recoil of this jet against the outside water is the direct means of moving the boat ahead. When the water is all driven out of the cylinder, the piston through its rod opens the exhaust-port (the steam-port having been closed at the right time by the same means), and the steam escapes into the condenser. The partial vacuum then created in the cylinder opens the inlet valve below, and the cylinder is quickly filled with sea-water. A small quantity also enters through the nozzle at the same time. The piston, raised to its first position, again admits the steam, and the action is continued precisely as in an ordinary steam-engine. The cylinders are always worked in pairs, alternately, and any number of pairs may be used that seems desirable, or that the boilers will supply with steam. Each pair has its own set of discharge-pipes under the boat, or they may all combine their streams into two large jets.

In addition to the two nozzles directed astern, the hydromotor is provided with a smaller pair turned the other way, and intended to move the boat backward. These are closed by valves and gates while the boat is steaming ahead, and to reverse, it is only necessary to open them, and the full force of the engine is directed the other way in an instant, and without shutting off steam or stopping the engine. A small steam-engine is placed near the discharge-pipes of the cylinders, and by the movement of a lever in the pilot-house steam can be admitted to this engine, and a single stroke of its piston closes the larger nozzles, and opens the valves into the smaller pair. Thus the main engines are practically reversed by the pilot without signaling the engineer or stopping the engines.

In this motor, it is readily seen, the expansive force of the steam is brought to bear directly and with very little loss from friction. Though the amount of water driven by such an engine through the nozzles may be less than could be delivered by a centrifugal pump driven by an ordinary marine engine using the same amount of steam, yet the results obtained are regarded as satisfactory. The economy of space and reduction of cost in the engine are certainly greatly in its favor. All the expense and cost of maintenance of the shaft and screw are dispensed with, and the boat moves through the water with probably much less disturbance than by screw or paddle. Compared with the *Waterwitch* and the *Rival*, two much larger boats than the *Hydromotor* and both using hydraulic systems of propulsion, it appears from reliable reports that the new engine drives its jets from the nozzles at a much higher speed, and in less volume, and at a great economy of power. No comparison of the speed of the boats has been made, nor has the new boat been compared with screw-steamers.

Novel Air and Water Pump.

LOCOMOTIVES intended to run long distances without stopping are often fitted with apparatus for taking up the water they need without stopping at the usual water-tanks. Long, narrow, and rather shallow tanks are placed between the rails, and kept full of water by a stream from some neighboring brook or spring. The tender is provided with a pipe, bent into a quarter-circle, that may be lowered between the rails till the open end of the pipe dips into the water in the long tank. The forward movement of the engine drags the pipe through the water, and it rises in the pipe and pours in a powerful stream into the tank on the tender. This simple device for lifting water into a moving train has been made the basis of a new kind of pump, in which the theory is the same while the process is reversed. Instead of causing the bent pipe dipped into the water to move, the vessel containing the water, and consequently the water itself, is made to move rapidly while the bent pipe remains stationary. Centrifugal force is used to give the water a high velocity. This, it may be observed, has been employed before in raising water. An upright cylinder, having a series of vanes placed on a vertical shaft inside, has already been used in lifting water. When the vanes are made to revolve rapidly, the water that fills the lower end of the pipe rises and overflows at the top. Such pumps have been used to raise water 39.95 meters (131 feet). In the new pump the upright shaft carries a flat circular vessel, designed to be kept full of water by a pipe from the source of supply. The cylinder or turbine is nearly closed, so that there is only a small annular space on top, next the upright shaft. The supply-pipe is simply turned down into the turbine. The pipe through which the water rises turns outward, on entering the turbine, till it reaches the outer edge under the cover. Here the open end is exposed toward the water, in the opposite direction in which it moves. This rising main is so arranged that it will present the least resistance to the water, and has a sharp edge to guide the water past the pipe with the least disturbance. On causing the shaft to revolve rapidly, the water entering the turbine is driven by centrifugal force to the outer edge. It meets the fixed pipe in the line of its movement, and a part enters the pipe and rises to a great height. From the experiments made with this form of pump, it is said that the height to which the water may be raised is only limited by the resistance of the materials of which the turbine is made to the centrifugal force which tends to pull it to pieces.

The position of the pump may be varied in regard to the source of water supply. It may be placed at the level of the water to be raised, or it may be put at any point between the supply and the point to which the water is to be lifted. If the pump must be placed above the water supply,—and this is the most common position of every pump,—the turbine must be fed from a reservoir at the same or a higher level. The stream delivered by the pump is taken downward to the source of supply, and here the pipe enters a hollow cone suspended under the water, the cone being connected by a pipe with the reservoir above the pump. The pipe and cone act as an injector, and the stream from the pump carries up with it a portion of the water surrounding the injector. The stream of water flowing from the reservoir must be subtracted from the amount actually raised by the pump; on the other hand, the head or force given to the water by its descent from the turbine must be added to the force given to it by the movement of the pump.

This form of pump has also been used as an air-pump. In this case the delivery-pipe from the pump is made to enter an upright cylinder and deliver its jet directly upward. At the top of the cylinder is a second pipe or nozzle, in the shape of an inverted cone. This nozzle increases in diameter inside, just beyond the open end, and the two nozzles are in a direct line, and the jet of water from the lower nozzle enters the upper nozzle with nearly its whole force. The cylinder in which these two pipes meet is connected with the air-receiver that is to be exhausted. The action of the water-jet in passing from one pipe to the other is to carry along with the water a small quantity of air. This air, as soon as the water meets the open reservoir above, escapes from the water in bubbles that rise to the surface. The water returns by another pipe to the turbine, and goes again upon its circuit.

Economy of Heat.

THE plan of heating the air needed for combustion, and known as the regenerative plan, invented by Siemens, has successfully been applied to iron and steel furnaces, and lately to gas-burners and common domestic grates. The waste heat of the fire or lamp is used to warm the air needed for combustion, at a very great gain in the amount of heat or light obtained from the fuel. A later improvement, by the addition of steam power, brings the regenerative system more directly and thoroughly to ordinary stationary boilers, at an undoubted economy of fuel. Upon the top of the boiler, at the rear, next the chimney, are placed two blowers to be driven by steam power, the "Root" pattern being suggested as the best. The products of combustion pass from the fire-box under the boiler to the rear, and return through the tubes to the front. At the top of the boiler-casing, and extending backward to the chimney, is a flue divided into a number of small tubes by partitions. The best thing it can be likened to is a surface condenser, for through half of these tubes flow the products of combustion toward the stack, and through the other half flows the air needed for combustion. The blowers each control one of these currents, as the cold-air current would require some pressure to drive it through the pipes that are heated by contact with the smoke-pipes. The cold-air pipes are carried downward into the ash-pit to assist combustion, and to openings over and behind the fire. The smoke and flame, drawn through the small tubes by the blowers, impart their heat to the air passing downward through the adjoining pipes, so that it enters the fire at a high temperature. This is a great gain, as more heat is obtained from a given amount of fuel when the air needed to make it burn is heated, than when it is cold. The heat thus saved would be, in the ordinary furnace, totally lost by escape up the chimney.

The invention is certainly an improvement over any regenerative system that has been applied to steam-boilers. At the same time, it might be suggested that a double stack, or a chimney having two divisions, each filled with fire-brick loosely laid in, would probably be better. The products of combustion could be sent up one stack till it was well heated, and then directed into the second stack. The air for combustion could then be taken downward through the hot brick-work, precisely as in the regenerative furnace. As far as can be learned, no experiments have yet been made in this direction, and this is only offered as a suggestion.

ing the apparatus merely ring a bell instead of controlling the steering engine, a watch would be set on the pilot at all times. The ringing of a bell should be the limit of this application of electricity to the compass. If not already patented, this suggestion will be free, and by its announcement here, all persons are debarred from taking an American patent on this application of electricity to a ship's compass. Another invention of somewhat the same character has been recently announced, that seeks, by means of a signal light, to give an indication in the night of a ship's course. A powerful light of some kind—an electric light being preferred by the inventor—is arranged near the bows in such a manner as to throw a beam of light directly ahead. Upon the ship's wheel are placed two electrical contacts, in such a position that while the ship is steered directly ahead no connection is made with either contact, precisely as the index on the compass-card is used in the first invention described. When the wheel is moved and the course changed, connection is made by the wheel with one of these points, and the current causes a reflector behind the lamp to move and deflect the beam of light to the right or left. This movement of the beam of light seen by approaching vessels indicates the change in the ship's course and the direction of the change. After the course has been changed and the vessel has fairly started in the new direction, the movement of the wheel opens the circuit and the reflector automatically returns to its first position of straight ahead. Approaching vessels see both the intended or changing course of the approaching ship by the movement of the beam of light, and are at the same time informed if the new course is maintained. A device resembling the one already suggested also rings a bell in the captain's room each time the reflector of the lamp is turned. A shutter, or shade, is also provided for preventing deceptive reflections on the water whenever an electric light is used with this apparatus. The movement of the reflector in the lamp, as first designed by the inventor, was to be performed by hand independently of the wheel, but the electrical arrangement is evidently better. This invention will not be patented, and is hereby given freely to the public.

White Slates.

SCHOOL slates are now being made of white card-board, covered with a film formed by the action of sulphuric acid on tissue paper. This covering is probably a modification of celluloid. The slates can be used with a lead-pencil or with ink, and, to remove the marks, the slate is washed with cold water. A special ink is also prepared for use with the white slates. It is composed of harmless mineral coloring matter mixed with dextrine, and is aptly called "children's ink." It can be removed from the slate with a wet sponge. Another form of slate is made by coating the white card-board with water-glass. It may be used with lead-pencils or colored crayons. When the surface becomes soiled the water-glass may be rubbed off with sand-paper, and a new film may be put on with a sponge or brush dipped in water-glass. The ordinary black slate and white pencil is well enough for mere writing and outlines, but for pictures requiring shading it misleads the child by presenting the picture with the lights reversed, or in a negative position. A white slate and black pencil is, therefore, better, as following nature in the matter of shading and giving pictures that are positives. The new slates have not yet been introduced in this country, but it would seem that they might prove of value in our schools. Perhaps a celluloid slate, if properly made, would be equally good, and might be sold at a low price.

New Tripod.

A NOVEL form of portable tripod for holding field cameras has been introduced which presents some features that may make the invention of value in a number of ways. It consists of three wooden legs, each eighty centimeters long, and hinged at the top to a small brass plate. This hinge is formed by a brass pin that passes through the top of the wooden rod or leg and gives it a free motion in two directions, while the frame of the hinge prevents any lateral motion of the rod. The screw for holding the camera on top of the tripod is fixed in the brass plate, and the camera is screwed down upon it by turning it round. This device saves the trouble of carrying a separate screw for this purpose. On the outer side of each rod is a T-shaped channel, cut in the wood the whole length of the rod. Three more rods of the same length are arranged with a projection on one side that will fit into the T-slots on the rods. These six pieces, when put together, one rod sliding on another, make a tripod that may be extended to a full length of one hundred and sixty centimeters (five feet three inches), or may be shut up to half the length. Brass rings hold the two parts of each leg together, and set-screws are used to keep each leg extended in any position desired. This arrangement enables the operator to adjust the tripod to any convenient height and to any uneven surface quickly and securely. When shut up, the tripod makes a small, light bundle, easily carried in the hand or trunk. By fixing a table to the top of the tripod, it may be used as a drawing-table for sketching out-of-doors, or for a dressing or dining table in camping out. It may also be used, by placing wooden leaves at the top, as a rack for holding sheet-music for bands. A larger tripod of wood or metal might also be used as a portable frame-work for a small field-tent, by covering the tripod with canvas or tarpaulin.

Improvement in Stoves.

THE tendency in the manufacture of all kinds of apparatus for burning fuel, whether it is merely to obtain heat for warming a room or in making steam, is toward a greatly increased radiating surface. The aim is to increase the radiating pipes, flues, or other parts of the stoves, so that as much heat as possible may be absorbed and given off to the air or water, instead of being thrown away up the chimney. The latest experiments in this direction have been made with a stove that was suggested by the ordinary surface condenser for steam. In this familiar apparatus, the exhaust steam from the engine is made to enter a chamber filled with a great number of small pipes. Through these pipes flows cold water, and the steam meets a large surface of the cold pipes and is condensed quickly, hence the name "surface condenser." In the new stove, the chimney or stove-pipe over the fire-box was formed by a great number of small copper pipes placed in a cluster directly over the fire. The products of combustion were made to pass in many minute streams through this multiple chimney, and so great was the surface exposed to the air that only a very small percentage of the total heat of the fire was lost at the top of the chimney. It does not appear to make any material difference what kind of a stove or fuel is used, provided the tubes are small and enough of them are used to carry off all the gas and smoke. The experiments made seem to prove that it is possible to give a stove sufficient radiating surface to save nearly all the heat without making the collection of small pipes inconveniently large. The only objection to the use of a great number of small pipes in this way would be the trouble of keeping them clean, but the cost of cleaning would be probably more than offset by the economy of fuel.

New Water Meter.

A NEW apparatus for measuring the consumption of water has been introduced, that appears to have the merit of simplicity and cheapness. It consists of two cast-iron cylinders, placed together at the bottom, and inclined from each other at an angle of about twenty degrees. They are supported on a pivot, and on this they are free to rock from side to side, as the weight of the water in one or the other causes it to move. These cylinders are connected with each other at the bottom, and are partly filled with quicksilver. There are also inlets and outlets for the water, controlled by the oscillation of the cylinders, which serves to move a registering device that marks the quantity of water that passes through the apparatus. The water, on entering one cylinder, drives out the quicksilver and it passes over to the other cylinder. Here the weight of the quicksilver serves to rock or upset the cylinder, and its movement on the pivot opens the outlet port and closes the inlet port. At the same time, a second inlet port is opened and the water flows into the second cylinder, driving out the quicksilver. The same operation follows in the first cylinder, and thus the continuous passage of the water is secured, while the oscillation of the cylinders controls the registering apparatus.

BRIC-À-BRAC.

The Old Ship of Zion.

OH! eb'rything's ready,—
De wind is steady,
An' de folks keep a-crowdin' to de gospel ship;
'Tis de best time to ride
On de Jordan tide—
Dar's no use o' waitin' for de 'scursion trip!

Dey's a-loosenin' de line,
An' soon she'll be gwine,
For yonder come de deck-hands to push her off de bank;
She's a-puffin'! she's a-puffin'!
An' she nebber waits for nuffin'—
Better git abode, sinners, 'fo' dey *pull in de plank!*

Absence of Mind.

[*Scene:* A sleeping-car. An absent-minded passenger suddenly arises from his seat and looks aimlessly around him.]

"A HEAVY weight is on my mind!
I know I've left *some*thing behind!
It cannot be the brazen check,
For trunks which baggage-masters wreck,
For here it is! My hat-box? No!
It safely rests the seat below!
It must be, then, my new umbrella,
My wife will taunt me when I tell her,
'Your fifteenth since the glad New Year!
Why, bless me, no! How very queer!
'Tis in the rack there, plain in sight!
My purse and ticket are all right!
What fancies crowd an addled head;
There's naught amiss! I'll go to bed."

Full peacefully he sank to rest,
If snores a peaceful sleep attest.
A tuneful hour had scarce slipped by,
When loud uprose an anguished cry—
A crazed man's moan of lamentation—
"I've left the baby at the station!"

Rafting.

(NASSAU MARSH, FLORIDA.)

THE tide ebbs out in Lockler's Creek,
And the moonbeams break through the trees around
On the changing shore where the current sweeps,
And the night-owl hoots at the echoing sound,
As the raftsman cheerily sings:
"Ho, Jennie, gal, oho! oho!
De tide ride high, and de tide run low,
And de water mus' hab its turnin';
But de ebb-tide car' de raf' along
Wid de binders stiff an' de current strong,
An' de trouble' stream a-churnin'."

The tide flows high o'er Nassau's banks,
And the hot sun lights the haze that floats
O'er the waving marsh-grass, tall and rank,
Where the marsh-hen pipes her pointed notes,
As the raftsman dreamily sings:
"Ho! Jennie, gal, de work go slow,
For de tide mus' ebb an' de tide mus' flow,
An' de water am slow ob turnin';
For de flood-tide car' de raf' ashore,
An' we all mus' res' tell de water low'r,
Ef de noon-day sun be burnin'."

The white-caps break on Nassau's beach—
There's a rising wind and a lowering sky,
And out where the mists and the tempests meet
The circling sea-gulls flutter and cry,
As the raftsman, jubilant, sings:
"Ho! Jennie, gal, de win' may blow,
An' de tide may ebb an' de tide may flow,
An' de water hab its turnin';
For de raf' ride safe in de cove alone,
An' I'm here wid you an' de boy at home,
Fo' de lighted fire a-burnin'."

Improved Method of Seed-Planting.

THE tendency of modern agriculture is steadily toward a lessening of the distance between horticulture and agriculture. Many food-plants that were formerly considered field crops have become garden crops, so that now only the grains and grasses may be said to be raised on farms. All the roots, the tubers and fruits, the beets, potatoes, tomatoes, etc., are now raised in market-gardens, and in a large, though purely horticultural, way. This extension of high culture to field crops has made glass more and more important in the market-garden. The shortness of the season, and the steadily advancing value of land, make it now essential that crops should be raised with as much precision as possible. If the gardener has just land enough for ten thousand cabbages, there must be some way of producing exactly ten thousand plants, no more and no less, and all the plants ought to reach a given stage of growth at precisely the same time. If there are more plants than space, there is a waste of plants, if less, a waste of land, time, labor, and interest on capital. If the crop matures irregularly, or even grows irregularly, there will also be waste of labor in cultivating it or in gathering the harvest. Raising seeds in hot-beds and cold frames has been common in all good gardens, for some time. The raising of seedling plants in hot-houses on a large commercial scale is a comparatively new industry in this country. Even in the best market-gardens, where plant-houses, artificially warmed, are used, there is still a very large percentage of waste, and very few gardeners can be found who could fill an order for ten thousand plants without a large percentage of loss in seeds, time, or labor. By the new plan it would seem that this loss can be obviated.

In the work examined, the seedling plants were in every stage of growth from germination up to the condition when they are ready for a second transplanting. The plant-house was of the common span-roof type, about 30½ meters (100 feet) long, and 4.80 meters (16 feet) wide. It was heated by hot-water pipes in the usual way, and there were three tables—two narrow tables next the side, and a broad table in the center. In point of aspect, ventilation, etc., the house was much like those used by commercial gardeners in this country. The tables on which the seeds are germinated were next the side, over the water pipes, and consisted of a flat table or shelf of slate, with wooden edges to keep the soil in place. On these, fine, soft loam was laid about five centimeters (two inches) deep. The object seems to be merely to give the plants a warm, moist support, and to prevent the young roots from being burned by touching the hot slates below. This loam is carefully pressed down smooth, so as to have a perfectly level surface. Over this is carefully spread five millimeters (one-fourth inch) of finely powdered moss. This is the ordinary sphagnum moss used by gardeners, which is found growing wild in low, wet fields. It is dried and then run through a sieve made of wire mosquito-netting. This reduces the moss to the condition of a dry, coarse dust like powdered sponge. When this is done, finely sifted dry loam is spread (or sifted) over the moss to the depth of two centimeters (three-fourths of an inch), and carefully pressed down with a smooth flat board held in the hand. The seeds, whatever their size, are then spread evenly over the surface of the loam, close or wide apart, according to the character of the expected plant. Over the seeds is then sifted a second layer of dry powdered moss. This finishes the planting, and the seeds rest on the surface of a thin sheet of loam, with a layer of moss below and a blanket of moss above. The moss is then gently and evenly pressed down, to press the seeds into the loam without actually covering them. A supply of water from a watering-pot or hose having a fine rose finishes the work. In the ordinary methods of planting seeds, either in the field or plant-house, the seeds are covered more or less deep by the soil. The seed must be in the dark or it will not germinate, or, at least, will germinate badly. As the seeds are not all buried to the same depth, those nearest to the surface will start first. This irregularity of growth will make it difficult to select a day for transplanting when all the young plants will be equally ready for the change of soil. When a seedling plant begins to grow in ordinary soil, it sends down its single rootlets for some distance before it begins to branch out. By placing the seeds in loam over a layer of sponge-like moss, the root at once finds water held in the moss which is a partial obstruction to its progress. The result is that the root at once divides into a number of short branches, forming a thick mass or bunch of roots, instead of one long root with few branches, and thus, when the time comes for transplanting, the young plant is in the most favorable condition. The plants examined were remarkably healthy and in precisely the same stage of growth, the proportion of feeble or late plants being apparently only a fraction of one per cent. The system appeared to be entirely successful, both in a horticultural and commercial sense. No patent will be placed on the system, as the inventor has given it to the public.

New Lime-light.

THE oxyhydrogen light, sometimes known as the lime-light or the Drummond light, is one of the most useful forms of lamp that can be employed wherever a powerful and concentrated light is required, as in lantern projections, lighting large spaces, and in illuminating signs. In a new lamp, recently introduced, the two gases are mixed in the burner by placing one pipe within the other, one jet of gas thus being surrounded by the other, and the two gases burning together at the top of the burner. The lime is cut in the form of a sharp-pointed cone, and is held, point downward, in the gas-flame. By this arrangement the flame heats all sides of the pencil of lime at the same time, and the light is equal on every side. As the lime burns away, it is gradually lowered into the flame till it is all consumed. A curved arm of metal is bent over the lamp to support the cone of lime, and the jets, bracket, and cone are inclosed in a glass globe. By this simple arrangement of the parts this lamp is greatly improved, and its field of usefulness is widely extended. The older form of lamp gives a light in only one direction. In the new lamp the lime is equally exposed to the flame, and the light is as bright on one side as another. This makes it possible to use the light in many places where it has not before been available.

Protecting Iron Surfaces.

A GREAT number of experiments have been made to find a substitute for paints in protecting iron from rust. The most successful process introduced within the last few years employs a skin or film of magnetic oxide, that is formed directly on the surface of the iron. This process is described on page 799, Volume XXII., of this magazine. By a new process, just announced, the surface of the iron is treated with acids, and, after the resulting salts have been removed, the surface of the metal is coated with resin, gutta-percha, pitch, or rubber. The theory of the work is very simple. Cast-iron being composed of iron and graphite, the acid attacks and destroys the iron, leaving the graphite in the form of a honey-combed or sponge-like film on the surface. The pores of this film, after the salts of iron have been removed, may then be filled with resin, pitch, coloring matter, enamels, or other materials. As the graphite is a part of the cast-iron and closely attached to it, it holds the materials injected into the pores firmly, and assists to form a skin or surface over the iron that will resist the action of water and preserve it from rusting. The graphite, when filled with insulating materials, will make cast-iron available as battery-troughs, etc. Treated with enamels, it extends the use of iron in many directions, and makes it a substitute for glass. The process does not appear to be very complicated nor expensive, and will, no doubt, become commercially available very soon.

Improved Forge Furnace.

AMONG the new apparatus having for its aim the convenience and comfort of men working at forges is a new form of circular furnace. This furnace is designed for heating small articles, like bolts or rivets. In place of having a square fire-pot into which the bolts may be thrust for heating, the furnace has a circular fire-box or pot, so arranged that the bolts may be placed in the fire from any or all sides. To accomplish this, the furnace is placed in a room having a low ceiling or beams, or a structure of some kind from which the upper part of the furnace may be supported. The fire-box rests upon an iron ash-pit on the floor. The dome or cover over the fire-box is suspended by chains passed over pulleys, so that, by the aid of counter-weights on the chains, the dome can be raised and lifted off the fire-box. Just above the grate are two rings, placed one over the other, making the circular sides of the furnace. Between these rings are small, semicircular notches, so that, when one ring is placed over the other, there is a series of holes (between the rings) all around the furnace. These rings rest on a revolving table, that can be made to turn around by means of steam-power. The sides of the furnace may thus be turned around at will, the motion being controlled by the workman in charge. There is a door in the dome for getting at the fire, and, when the fire is started, a blast is applied through three openings in the furnace, so as to secure an even fire in all parts of the grate. Surrounding the furnace is a copper water-jacket, suspended by chains from above. Water is caused to flow through this jacket at all times, and when it is lowered over the furnace the workmen are protected from the heat. To get at the fire, it is only necessary to pull the jacket up out of the way. In operating the furnace, the workman stands at one side, and, raising the water-jacket so as to expose the holes in the sides of the furnace, he inserts the bolts to be heated in the holes nearest to him, where they rest on a shelf exposed to the fire. A touch of the foot on a pedal causes the rings to revolve, carrying away the bolts and exposing more holes, ready to receive their charge. In this way, the furnace is filled from one side only, or from any desired position. All the bolts are equally exposed to the heat, and the fire is kept bright and clear around the edges by the motion of the apparatus. By the time the rings have made one revolution the first bolts are ready to come out, and they are withdrawn and a fresh supply put in their place.

Silk Culture.

AN effort was made in the United States some years ago to introduce the culture of silk, but, owing to the unbusiness-like way in which the matter was brought forward, it was a failure. The subject has lately received renewed attention, and from an examination of some of the results already obtained, it appears to be evident that silk can be raised to advantage throughout the greater part of the country. The chief difficulty that has hitherto stood in the way of this industry in this country has been the cost and labor of unwinding the silk filament from the cocoons. Hand reeling machines have long been in use, but they are all too slow and too imperfect to be of any value. A reeling machine, intended to be used by either hand or steam power, has been recently introduced that appears to do the work quickly and thoroughly. It consists of an iron table, supporting a shallow iron boiler open at the top. This boiler is to be filled with water, and kept at a low boiling point by a gas-stove under the table. On the top of the table, which forms a zinc-lined tray or shelf around the boiler, is placed a wooden frame or bridge. This supports four glass rings or guides, directly over the water. Back of the table, and joined to it by an iron frame-work, is a simple form of reeling apparatus. This consists essentially of a horizontal reel and four sliding guides for guiding the filaments upon the reel. At the machine examined, a young girl was employed to turn the reel, but attachments are provided for employing electricity as a motive power if wanted. In using the machine, the reeler sits before the table with a basket of cocoons at her side, and a dish of cold water on the table. A quantity of the cocoons are then placed in the boiling water, and beaten up with a small stiff broom, till the gum on the cocoons is melted, and the ends of the filaments are loosened. These filaments are gathered as fast as they appear, and are held in the left hand, with the cocoons floating on the water. With the right hand one of the threads is passed through the glass guides, or eyes, over the water, and then a second thread is passed through the next eye. The two threads are then twisted loosely together, and each is carried through one of the sliding guides to the reel. When four threads from four cocoons are thus arranged in pairs, twisted together, and caught over the reel, the machine is set in motion. The revolution of the reel draws the threads from the cocoons, and they roll over and over in the water, unwinding by their own gravity. As fast as the silk is removed from one cocoon, a thread from another is joined to it by merely pressing one filament against the other. They quickly stick together, and thus one filament is joined to another to make a continuous thread. The length of this thread is regulated by the number of cocoons on hand, or the amount of silk required in a skein. The machine examined appeared to be well designed, and admirably adapted to the work. With hand-power it could be made to move at the rate of two or three hundred revolutions a minute while winding four skeins. The labor of attending the apparatus is light, and not particularly taxing to the attention. New cocoons must be added to the reel at the rate of about one in three or four minutes, and many hundred can be unreeled without stopping the machine. The cold water is used to cool the right hand, that must be often thrust into the hot water to remove the empty cocoons as fast as they are unwound. It would seem desirable to use some kind of glove that would resist the heat when the hand is thrust into the hot water. The apparatus is regarded by competent authorities as well adapted to the work, and larger machines, to be used with steam-power, will, no doubt, prove of value.

The culture of the silk-worm appears, from the experience of those who have practically tried it on a commercial scale, to be very simple. All the work can be performed by women and children, and it can be safely recommended as a new employment for persons living in the country who are able to control about six weeks of their time during the early summer. The capital required is quite small, and the plant needed for a moderate number of workers can be established in any dwelling-house or temporary wooden building. The culture consists essentially in the rearing of a number of silk-worm eggs from birth to full maturity—a period of about thirty-five days—and the subsequent care and sale of the cocoons. Unless fresh eggs are bought, there will also be the labor of caring for and rearing the moths for the purpose of securing a fresh supply of eggs for another season. The food of the worms must also be bought or raised, and this is simply a matter of so much farm-work spent on an orchard of mulberry-trees. An agency has already been established in this country for the sale of eggs and the purchase of cocoons and reeled silk. There is also a literature of the subject that can be readily consulted.

BRIC-À-BRAC.

The Yearn of the Romantic.

EDITOR OF THE CENTURY.

SIR: Finding a lamentable tendency, of late, toward the modern inanities of Æsthetics, I have prepared the following, in the endeavor to restore a healthy taste for the Mediæval and the Strong; to induce others to return, with me, to the chivalric pages of Scott, of Bulwer, and of G. P. R. James; and to lead them to sigh, as I do, for a revival of feeling for the stalwart old days of Knighthood and of the Troubadour.

I am, my dear sir, with sentiments of the highest consideration,

ONE OF THE OLD ROMANTIC SCHOOL.

WHEN aweary of this living, with its gaining and its giving,
And its toiling, and its traffic, and its tame pursuit of gold;
I recall at what a high rate lived the Poet, Knight, and Pirate,
As they fought and sung and swaggered, in the bloody days of old!

I.

THE KNIGHT ERRANT.

WITH a chivalry romantic, and with love and honor frantic,
With a cross upon his armor, and a spur upon his heel,
He would bind him in indentures to impossible adventures,
And to rid the world of evil—or to never take a meal!

Then, to slay the dark deceiver, or the wicked unbeliever,
He would swim the foaming river, and would sleep upon the sward;
To subdue a horrid schism, he would risk the rheumatism—
All to prove his high devotion to his Lady and his Lord.

Then, it was not looked absurd on, if he wore a lady's guerdon,
Whom he loved with desperation—but he didn't know by sight—
When he rode a distant journey to indulge in joust or tourney,
To maintain her matchless beauty over any caitiff Knight.