is its co-operative stores and bakery, which are available not only for the resident population, but for ordinary dwellers in the locality as well.

Agneta Park owes its establishment to Mr. Van Marken, the managing director of the Netherlands Yeast and Spirit Company, founded by him in 1869. That gentleman has ideas of his own concerning the relations which should exist between employers and employed. He believes that the conditions under which workmen live may have a great effect on their development, both personal and as workmen, and that it is to the direct interest of those who employ them to see that they are provided with "homes" in the truest sense of the word—homes, that is to say, which will not only fulfill every requirement of sanitary laws and convenience, but be positively attractive in themselves.

The matter is thus regarded by him as one of more than mere philanthropy. In fact, in all that he has done for his workpeople, Mr. Van Marken discards any motive of "philanthropy," and seeks to look at everything from a business or a common-sense point of view. "The moral and material improvement of the workingman," he holds, "must increase alike his zeal and his strength, and hence confer a practical benefit on the employer." Having these and a variety of other ideas on the subject of workmen's homes, and finding that the dwellings available in the town of Delft were not what he thought they should be, he bought, in 1884, the site of Agneta Park, and had it laid out and the various buildings erected on it.

But his idea was that the whole should eventually become the property of the community. Hence, having purchased the land, he formed a limited liability company, with a nominal capital of 160,000 florins, and himself bought from the company three hundred and twenty shares for 32,000 florins. He then sold the land to the company for 29,000 florins, the amount he actually paid into the company's exchequer, in addition to transferring to them the site for the Park, being thus 3,000 florins, which formed the working capital. The money for erecting the dwellings, etc., was raised by mortgage on property which, at the time, was really non-existent, so that a certain degree of confidence had to be shown in the matter.

The rents are now paid into a common fund, which is so arranged that, after the deduction of certain proportions for payment of interest and for gradually paying off the mortgages, there is a balance left, which is apportioned among the dwellers in the houses, according to the amount of their rent, and is devoted to buying up the shares in their names. In this way it is calculated that in the course of about thirty years the whole of the original cost will have been cleared off, and the Park, with the dwellings on it, will be held by the community, owing to the gradual transfer of all the shares into their own hands.

When that condition of things arrives, the householders will still pay their rent, as at present, but they will receive it back in the form of dividends on the shares held. This arrangement is thought to be an improvement on the ordinary building society notion of enabling a man to become his own landlord. The possession of a house of one's own may have its attractions, but it is regarded as bringing trouble and inconvenience as well, more especially in the case of a workman who may wish to remove to another town, or of one who dies and leaves, perhaps, his widow to dispose of the house as best she can. In each instance there is involved not only the question of inconvenience, but of the payment of law expenses as well.

By making the Agneta Park houses the property of the community as a whole instead of the workpeople as individuals, these drawbacks are avoided. When a tenant leaves, or dies, his share is disposed of through the directors to some other tenant, and he or his widow will receive the full value of it without any trouble and without any deductions on account of legal expenses. It is, also, to the interest of the community as a whole to see that no particular tenant neglects his property, or becomes a source of annoyance to others, as he might do if the house he lived in were actually his own. Thus it is claimed that under the Agneta Park system there are all the advantages of a workman becoming, in course of time, his own landlord, and none of the disadvantages, either to himself or other people.

CONFECTIONERY RECIPES.

GREENGAGE TABLETS.

Crushed sugar.....	14 lb.
Glucose.....	3 lb.
Tartaric acid.....	1 oz.
Water.....	2 qt.
Green coloring.	
Greengage flavoring.	

Melt the sugar in the water, and bring to a sharp boil. Add the glucose and let the boiling continue up to a strong crack degree. Pour out on an oiled slab and add color to make the batch a pale green tint. Mould in the acid and flavoring, and, when sufficiently cool, pass the batch through the large tablet rollers.

MUSK DROPS.

Crushed sugar.....	14 lb.
Tartaric acid.....	1 oz.
Cream of tartar.....	1 oz.
Water.....	2 qt.
Carmin coloring.	
Musk flavoring.	

Boil the sugar and water, and, after adding the cream of tartar, continue the boiling up to strong crack degree. Pour out the boiling on an oiled slab, and color the whole a pale red. Work in the acid and flavoring, and, when sufficiently cool, pass the batch through the acid drop rollers. After the goods are sifted, work some icing sugar among them.

EVERTON TOFFEE.

Crushed sugar.....	10 lb.
Brown sugar.....	4 lb.
Glucose.....	3 lb.
Butter.....	2 lb.
Water.....	2 qt.
Lemon flavoring.	

Dissolve the sugars in the water, bring the sirup to a sharp boil, stir in the glucose and continue the boiling

up to strong crack degree. Break the butter to small pieces, drop them into the boiling sugar, add the flavoring, and pour out on an oiled slab, arranging the slab irons so as to make a level sheet half an inch thick. When partly set, mark the sheet deeply into bars or squares.

SWEET FLAG CANDY.

Crushed sugar.....	7 lb.
Cream of tartar.....	1/4 oz.
Sweet flag infusion.....	1 pt.
Water.....	1 pt.

Wash and slice four ounces of sweet flag root, simmer it down to a pint, strain and add to the sugar. Add the water, melt the sugar, bring the whole to a sharp boil, then add the cream of tartar, and continue the boiling to soft ball; then remove the pan from the fire, rub portions of the sugar against the side of the pan until of a cloudy appearance; stir well, pour into buttered shallow tins and let cool, when remove the candy from the tins. In America this is a favorite remedy for dyspepsia and indigestion.

RUBY ROCK.

Crushed sugar.....	14 lb.
Glucose.....	3 lb.
Tartaric acid.....	2 oz.
Water.....	2 qt.
Cochineal coloring.	
Rose flavoring.	

After melting the sugar in the water, bring them to a rapid boil, then stir in the glucose. Continue the boiling up to a strong crack degree, and pour out on an oiled slab. Color half of the batch of bright red, work the acid, flavoring and a touch of blue into the remainder, and pull over the hook until of a glossy whiteness. Remove it from the hook, and pull it out to a sheet of irregular thickness, then roughly case the red with it. Pull out to long bars an inch thick, keep them in motion until cold, when chop into pieces of about an inch in length.—Confectioners' Union, London.

FURNACE FOR BURNING REFUSE MATERIAL.

By J. B. ALLIOTT and J. McC. C. PATON, Nottingham.

THE figure shows a sectional elevation of this destructor furnace in which 1 is the main combustion chamber, 2 the firegrate, the lower end of which is carried on a hollow bearer 2a, through which water is circulated to keep it cool. The lower grate 6 is of suf-

FURNACE FOR BURNING REFUSE MATERIAL.

ficient length to prevent clinker, etc., which fall on to it from the upper grate, from falling over its front end. The clinker, etc., remain on this lower grate until more completely burnt and partially cooled, when it is raked off over the front end. 7, 7a, and 7b are tuyeres through which air, in addition to that entering through the firebars, is forced; 7 and 7b, on either side of 7a, are not visible in cut; 8 is a drying-hearth on to which the refuse to be burnt is fed through the aperture 9. The stoking hole 10 permits the introduction of an iron bar for keeping the grate and back wall 5, from getting clinkered up. The products of combustion are drawn through the openings 11, 11, which are at the hottest part of the fire, into the main flue 12, through an intermediate chamber 13, fitted with a damper 14. Three modified forms of the destructor are also described. The claims made in a furnace of this kind are for the combustion chamber, having a hearth so inclined that refuse and clinker thereon will move downward automatically or with little help; for the fire grate, similarly inclined, and through which air is admitted to the combustion chamber; and for the back wall with inlet or inlets to admit air, to aid that admitted through the inclined grate; also an opening or space behind the back wall and the adjacent end of the inclined grate. Provisions for feeding refuse on to the upper grate, and for introducing air into the combustion chamber opposite to the feed end, as well as provision for the escape of products of combustion from the hottest part of the furnace, are further claimed. Finally, the intermediate chamber 13, as arranged, is claimed.

PHOTO-MECHANICAL PRINTING PROCESSES.*

By WALTER E. WOODBURY, Editor the Photographic Times

THE term "photo-mechanical" is applied to all processes in which, by the combined action of light and chemical substances, printing surfaces are prepared from which a number of impressions can be taken by purely mechanical means.

About the year 1813 Nicéphore Niepce commenced a series of experiments which resulted in the discovery, some fourteen years later, that bitumen, under certain conditions, becomes insoluble when exposed to

the action of light. He coated metal plates with a solution of this substance and exposed them to the image in the camera or beneath a drawing on translucent paper. Those portions acted upon by light became insoluble, while the remaining parts were dissolved away with oil of lavender. By this means a reversed picture in bitumen was obtained on the metal plates. By next applying an etching acid the parts of the metal unprotected by the bitumen image were corroded into the surface, and after clearing away the image a printing plate was obtained.

In 1838 Mungo Ponton discovered that gelatine and other organic substances, if treated with dichromate, became sensitive to light, becoming insoluble in those parts exposed, in the same manner as the bitumen. Later on (1853) Fox Talbot discovered another important property possessed by gelatine. If a dichromated film of this substance be dried at a moderate temperature and exposed to light beneath a negative, it could, when washed and dried, be treated in the same manner as a lithographic stone; that is to say, it would absorb water and refuse greasy ink in some parts, while in others it would refuse water and take up the ink.

It may be said that upon these three important discoveries all photo-mechanical printing processes are based. We can arrange them into two distinct classes:

A. Those in which the picture is moulded in pigmented gelatine.

B. Those in which the picture is printed in ordinary printing ink.

To the first class belong but three processes, which, except in a few minor details, are practically the same. They are the inventions of the late Walter B. Woodbury, and termed Woodburytype, Woodburygravure, Stannotype.

The second class contains a large variety of processes, including those printed from gelatine surfaces, from stone, from intaglio metal plates, and from metal plates in relief.

We will give an outline sketch of the various photo-mechanical processes as now worked.

Woodburytype was the invention of the late W. B. Woodbury. In this a glass plate is coated with collodion and then with dichromated gelatine. This is exposed under a negative and afterward washed in warm water, which removes the soluble parts, leaving the image in relief. When the gelatine relief is dry it is exceedingly hard, and is stripped from the glass support and pressed into a sheet of lead by hydraulic pressure. By this means an intaglio mould is formed. This is placed in a specially constructed press having a heavy and perfectly true lid. A little warm gelatine solution containing any desired pigment is poured on to the intaglio mould previously greased; a piece of prepared paper laid on the top and the heavy lid brought down and clamped firmly. This squeezes out the excess of colored gelatine, only allowing that to remain which lies in the depressions of the mould, which sets and at the same time adheres to the paper support. The paper when removed has in this manner a gelatine image attached to it, which is dried and hardened with chrome alum. If glass be employed instead of paper, very beautiful transparencies or lantern slides can be made.

It will thus be seen that the resulting picture consists of varying thicknesses of pigmented gelatine, the tone or gradation depending upon the thickness.

The Stannotype Process is a modification of the Woodburytype by the same inventor. A negative relief is made, or the reverse of that used in the latter process, and developed upon a glass plate. When dry it is coated with a thin solution of India rubber and a piece of tin foil laid over it. The whole is passed through rubber-coated rollers, which presses the thin sheet of tin well into the relief, where it firmly adheres, owing to the India rubber solution.

Here we have to all intents and purposes a printing mould the same as obtained by pressing a positive relief into a lead plate, and the printing is done in the same manner. The object of the process was to reduce the cost of the necessary materials for the Woodburytype by dispensing with the hydraulic press.

Woodburygravure.—For some time the chief drawback to the use of Woodburytype prints for book illustrations was the necessity for trimming and mounting each picture. By a process discovered quite recently, it was found possible to mask the unsightly outside edge of each print and transfer the picture image from one support to another. It will be noticed in the Woodburygravure print that the surface is of a duller nature, more like a photogravure. This is due to the fact that the surface we see was previously the under part in contact with the first paper support.

The Photo Filigrane Process consisted in passing through a rolling press a gelatine relief and a sheet of heavy opaque white paper. Certain portions of the paper are, by the pressure, rendered more transparent than others, and a photographic image resembling a watermark can thus be obtained in the body of the paper.

Collotype or Albertype Process.—This process was devised by J. Albert, of Munich, in 1869, and is worked under a variety of fancy names.

A sheet of thick plate glass ground perfectly true is first coated with a film of albumen and gelatine to which a dichromate has been added. This is then laid on a piece of black cloth and exposed to light, washed and dried. The plate is again coated with a dichromatized gelatine, or isinglass, and dried in a chamber heated to about 120° F. It is then exposed under a reversed negative, soaked in water to remove all chromium salt, hardened with alum and finally dried. By this means a scarcely visible image in gelatine is the result, those parts which have been exposed to the light being insoluble and repellent for water, the remainder retaining their absorbent properties. The plate is fastened with plaster to the bed of an ordinary lithographic press, the printing being very similar. A wet sponge soaked in glycerine and water is used to moisten the absorbing parts of the gelatine (the whites of the picture) and an ink roller inks the image part. A paper mask is fitted over and a sheet of paper laid on it, and after pressure is applied, the ink is transferred to the paper. Prints may also be made upon cotton and silk fabrics.

Artotype Process is but a modification (by Obernetter) of Albert's process. Instead of first coating

* From the catalogue of the recent exhibition, New York, of the Society of Amateur Photographers.

with a chromated gelatine substratum and rendering insoluble to light, as a foundation, he uses a mixture of silicate of soda and albumen or stale beer. By this means metal may be used in the place of glass as the support.

Heliochrome is another modification of the callotype process by Ernest Edwards, the principal feature being that the gelatine film is hardened with chrome alum and afterward detached from the support upon which it is first prepared. It thus forms a tough and flexible skin which can be used at any time for printing from by attaching to a zinc plate or to a cylinder.

Indotint Process.—Still another modification of the callotype process (by J. C. Roche). In this a copper plate is roughened by means of a sandblast, which causes the sensitive film to adhere closely. This is employed in place of the glass plate.

Collotype enamel prints, which have a very close resemblance to an ordinary silver print, are produced by employing a photo-brown ink, printing upon a tinted enamel paper, and afterward varnishing with a shellac water varnish.

Chromo-collotypes are produced with a number of collotype plates, using different colored inks, as in chromo-lithography. The negative having been made, it is blocked with opaque varnish in all parts, except those required to be reproduced in a certain color. From this a collotype plate is produced to be used with that colored ink. The varnish is then removed, and the negative blocked for another color, and so on. In printing, the paper is passed through with the different plates until all the colors have been printed on it, forming a complete colored image.

Instead of blocking out the negative, there are at present many processes of photographing the object, with specially prepared plates, through color screens which have the effect of shutting off or absorbing some colors while allowing others to pass through to the sensitive photographic film. This is more clearly explained in the three-color processes described later on.

Hydrotype is a kind of reversed collotype invented by M. Cros. A plate coated with dichromated gelatine is exposed under a positive transparency; the plate is washed and immersed in an aqueous dye. This is absorbed by the parts unaffected by light, and will yield a contact print by transference of the dye to a sheet of dampened paper.

Leimtype.—A process devised by Husnik, of Prague, in which gelatine images in high relief are used for direct printing in the ordinary printing press.

A thick plate of chromated gelatine is exposed under a negative. This is then attached by means of gutta percha to zinc or wood. The surface is next developed by means of a solvent, usually an alkaline dichromate, which not only dissolves the parts unacted upon by light, but serves to strengthen the relief. This is not carried too far at first; the lights are then covered with an opaque ink, and the plate exposed a second time to harden and strengthen.

Photo-lithography.—The term includes a variety of processes in which the artist's drawing on the stone is replaced by a photographic image. In direct photo-lithography the polished stone is spread over with a solution of gum arabic and potassium dichromate. It is then dried and exposed under a negative. After this the stone is well washed and rolled in with ink.

The process which is almost universally employed is known as the "Transfer method." In this a sheet of paper* is coated with albumen or gelatine containing dichromate, which when dry is exposed under a negative and afterward coated over with a greasy lithographic transfer ink. The inked paper is floated face upward on boiling water, which coagulates the albumen. It is then washed with warm water, which removes the ink from the parts not acted upon by light. Where the light has rendered the colloid substance insoluble it retains its hold of the ink. The image in printer's ink is now termed a photo lithographic transfer, which is laid on the stone, and, when the two are passed through a press, the fatty ink image is transferred from the paper to the stone.

Photo-caustics.—This term is applied to certain photo-lithographic processes where the half tones are obtained by photographing the object or picture to be reproduced, through a ruled screen, as in the half tone process.

Chromo-Photo-Lithography.—Processes in which pictures are printed in two or more colors from different stones, the negatives being prepared as described in notes on chromo-collotypes and three-color printing.

Photo-Electrotypes.—A very large number of processes come under this heading. They all consist, practically, in first exposing a sheet of chromated gelatine under a negative. If half tone effects are to be produced, grained or lined negatives must be employed. The effect of the light shining through the negative is to render certain parts of the gelatine film insoluble and incapable of absorbing water. After exposure, the gelatine is either soaked in water to swell the remaining soluble parts, or it is treated with a warm water bath, or acetic acid to wash them right away, leaving the insoluble parts to form an image or relief.

From these, moulds in wax or plaster are made, from which a copper relief block for typographic printing is made by the electrotype process. To obtain half tones by grain from an ordinary negative, Waterhouse's method is as follows:

A Woodbury relief is first developed on a silvered copper plate, washed, immersed in a solution of dichromate, drained, and dusted over with very fine waxed sand. When dry this is brushed off, and it will be found to have granulated or pitted the gelatine image, the pits being deepest in the thicker parts. From this an electrotype is made which forms the printing plate.

Photo-Zincography.—Processes similar to those described under photo-lithography, but the image, instead of being transferred or printed direct upon the stone, is transferred or printed upon a zinc plate, which is then treated with an acid to engrave the lights and give a slight relief to the remaining parts.

Photo-Engraving.—Although the term practically includes many of the processes already described and many others, yet it is now generally applied to what is also termed the half tone process, by means of which

a metal relief block for typographic printing is made from a photograph, drawing, or direct from the object itself.

A collodion negative is first made. In front of the sensitized plate a glass screen is fitted, having on it a number of fine black lines ruled both ways. These lines are made by mechanically ruling the glass with a diamond and filling in the cuts with a black substance. They are ruled from eighty to two hundred lines to the inch, and form a fine network through which the image must pass before it reaches the plate. The result is that half tones are broken up into a series of dots ranging in size according to the amount of light passing through. A copper or zinc plate is polished and immersed in a weak solution of nitric acid to give a biting surface. It is afterward coated with albumen containing a dichromate and dried. Exposure under the negative is the next operation, after which the whole surface is inked all over with an even film of transfer ink. The plate is then immersed in a dish of clear cold water, and gently wiped with a piece of soft substance, which removes the albumen and ink from the unexposed parts. When dry again, the plate is dusted with finely powdered bitumen, and held over a stove until the powder just softens sufficiently to adhere. In this manner we have a bitumen image on the plate capable of resisting the acid, which is next applied to eat the copper from the bare portions. A process that is now being employed very largely by photo-engravers in this country is known as the enamel process. In this a mixture of fish glue, albumen and dichromate is used to coat the plate. After exposure and development it is heated over a stove until the color turns to a deep brown. When cool it is ready for etching.

Typogravure.—A process invented by Major De la Noe. A prepared plate is coated with a film of sensitive bitumen, exposed, and developed as usual. The plate is then etched with diluted nitric acid until the depth of about $\frac{1}{16}$ of an inch is reached. It is then dried and again coated with bitumen. The ground is next polished off with a stick of charcoal, leaving the bitumen on the lines, after which the plate is gummed and printed from as in photo-zincography.

Photo-gravure.—The idea of making copper intaglio

the final result a fac-simile of the original colored object. That is, theoretically they should do so, but the theory breaks down in practice, principally owing to the want of printing inks answering the necessary requirements of color and transparency. The subject has, however, already become a most fascinating study, and results have been obtained which are equal to pictures printed in a much larger number of colors.

The above sketch of photo-mechanical printing methods, written at a few hours' notice, is necessarily very incomplete. To include the whole number would have required a book of several hundred pages; but if it enables the reader to better understand the various specimens exhibited upon the walls of this exhibition, its purpose is served. There are already a number of well written works upon the subject to which the student seeking further information is referred.

A HORSE KILLED BY ELECTRICITY.

REFERRING to the recent electric explosion in Cannon Street, London, Alderman Bell, chairman of the City Sewers Committee, at the meeting of the City Corporation, stated that the accident was caused by the confusion of two high pressure cables at Bankside, in consequence of which a current was unintentionally put on to a cable which was touching the ground, and which caused the cable to break down, the resulting sparks igniting the gas which leaked in the boxes. The shock which killed a horse would not harm a human being.

The diagram we publish serves to explain the cause of the accident. The cables used are high tension at 2,000 volts. There had been a slight leak of gas into the tube which carries the wire and, as explained by Alderman Bell, the electric current had at the same time been accidentally put on to a cable which was touching the ground. The horse, stepping on the iron box, which is used to examine and repair the wires, with its fore legs, made a circuit with the ground, through which the wire at once discharged its electricity. The result was fatal to the horse. Not only that, but when the horse completed the circuit "sparkling" took place inside the box and set fire to the insu-

A HORSE KILLED BY ELECTRICITY.

plates by means of photography was first worked out by Niepce. Many other processes have followed.

About 1870 to 1871 Woodbury suggested to Goupil & Co. a method of photo-gravure, which was taken up by that firm and worked with considerable success. A gelatine relief was made in the same manner as for the Woodburytype process, except that a finegritty powder was added to the gelatine to give the necessary grain. From this relief a mould and electrotype are made.

The process that is generally employed may be described as follows:

From the negative to be reproduced a positive transparency is produced. From this a carbon print is made, which will of course be a negative one. This is transferred and developed upon a copper plate (to which a fine grain has been given by dusting over with fine bitumen powder and heating), and forms the resist in the etching bath. After treating with the etching fluid (perchloride of iron) the carbon image is removed and the plate cleaned. It can then be printed from in the same manner as a copper-plate etching or mezzo-tint engraving.

Goupil-gravure is a method of making fac-similes of water-color drawings. The plate is carefully inked in by hand with the different colored printing inks, and the picture printed by one impression. The method is, of course, very costly, as skilled artists have to be employed for coloring the plates.

Three-color Printing.—This is a process still in its infancy, although very important results have been obtained during the last year or two. The aim of the process is to obtain by three printings a perfect fac-simile of a colored picture or object. Three negatives are made, the plates being color-sensitized by means of three different dyes, each of which will absorb one-third of the spectrum, and reflect the other two-thirds. The effect is further assisted by the interposition of different color screens, which absorb certain rays, and allow others to pass through to the plate. From these negatives three printing plates are made by the collotype or half-tone engraving process. One is printed from with a yellow ink, the other with a red, and the third with a blue. The superimposition of these colors and their combinations should give in

lation composition on the wires. This in turn fired the gas which had accumulated in the "wire tube," and the result was the explosion, which knocked down two men.—The Daily Graphic, London.

ICE FROM NATURAL GAS.

IT is probable that, before the natural gas supply of certain parts of the United States is exhausted, this gift of nature will be better utilized than has hitherto been the case. Indeed, it would not be surprising if the advantages of the natural gas supply were only to become fully appreciated just before it ceases forever. It appears from a recent contribution to an Indianapolis newspaper, that a local firm have constructed a refrigerator for making ice by means of the cold produced by the expansion of natural gas to atmospheric pressure. This is the principle of all artificial ice machines; yet it seems to have only just occurred to some American engineers that natural gas as it issues from the wells at pressures amounting in some instances to 20 atmospheres, and at a temperature of 42° Fah., presents the sole physical condition necessary for the production of cold by gaseous expansion. Assuming the density of the gas to be only half that of the surrounding air, 1,000 cubic feet of it will weigh 38.5 pounds.

According to Pictet's formula, by expanding a gas from a pressure of 20 atmospheres to that of 1 atmosphere, its temperature would be reduced 318° Fah. below freezing; and by expanding 1,000 cubic feet of gas per minute, there would be a cooling effect of 318° × 38.5 pounds, which would make 72 pounds of ice per minute from water at 62° Fah. Hence a very ordinary gas well, supplying 1½ million cubic feet per diem, is theoretically capable of producing 51 tons of ice daily at a cost of not more than 50 cents per ton; and, after all, if delivered in its expanded state to furnaces, etc., the gas would produce, on burning, as much heat as if it were delivered for fuel direct from the well. Hence, by proper management, the natural gas supply of Indiana and Ohio should supply all the ice wanted by these States during the hot season, as it actually furnishes most of the heat required all the year round.—Journal of Gas Lighting.

* In order to avoid distortion by expansion or contraction of the paper supporting the transfer, tinfoil is now used by many workers.