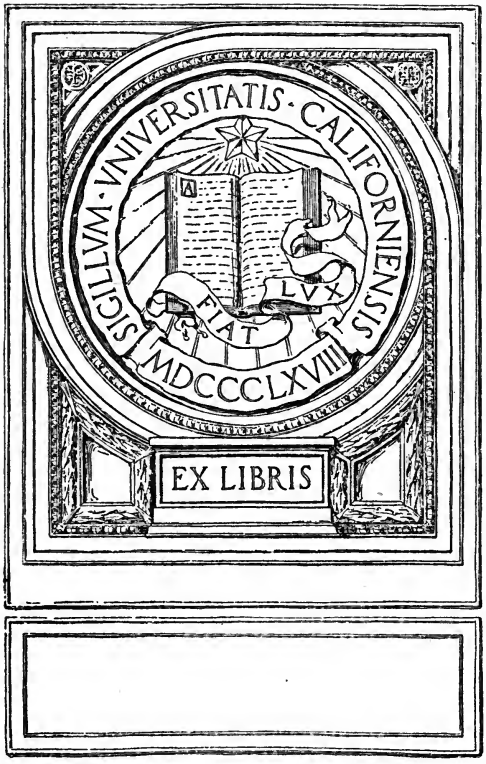
The Lighting Book

F. LAURENT GODINEZ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THE LIGHTING BOOK

Light may be used for decorative, as well as utility, purposes. Here both are combined. If too bright lights are placed within such decorative candle shades as these, the pictorial effect is destroyed and they become annoying.

THE LIGHTING BOOK

A MANUAL FOR THE LAYMAN SETTING FORTH THE PRACTICAL AND ESTHETIC SIDES OF GOOD LIGHTING FOR THE HOME

BY

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NEW YORK
McBRIDE, NAST & COMPANY
1913

Published November, 1913

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THE LIGHTING BOOK

I

LIGHT AND THE EYE

"Oh loss of sight of thee I most complain."

THE human eye must not be regarded as a mere optical device, but as a vital anatomical organ, which is really an extended portion of the brain, affecting in many serious ways every other organ of the body.

Artificial light, as it is used to-day, is more than a serious menace to the eyesight of our nation. Indeed the lighting of our public places and most of our homes is dangerous to health in that its effect upon the eyes is ruinous.

The eye has often been compared with the photographic camera in order to show light is transformed by optical magic into brain pictures. This analogy is appropriate—with certain limitations, that may best be defined by simple analysis. The cap or shutter of the camera admits or excludes light entirely; the eyelid does not. It is so translucent that sleep is not always possible in brightly lighted rooms.

The diaphragm of the camera admits more or less light to the sensitized plate. The iris, or colored portion of the eye, automatically decreases or increases its aperture or dark spot called the pupil. It is nature's automatic protective mechanism. On looking at a bright light or bright surface the pupil contracts, excluding, to a certain degree, excess light. On regarding a darker surface or space the pupilary aperture increases to admit the necessary light for perception. This contraction and expansion of the pupil is not instantaneous—unfortunately. Thus from the sudden explosion of a flashlight, the pupil does not close quickly enough to protect the eye, which is evident by the attendant sensation of benumbed discomfort.

All of our physical sensations are purely relative, and vision—which is a physical sensation produced by light rays received by the retina, and transferred by the brain cells into pictures—is no exception to the rule. On entering a brightly lighted room, after having been for some time in a comparatively dark space, the brightness is exaggerated. Conversely, upon returning to the dark space, it appears absolutely black until the mechanism of the eye slowly adjusts itself to normal perception.

What exactly transpires, when the iris contracts

and expands, changing the size of the pupil, is not exactly determined. It is certain, however, that to subject the eyes to such brightness as to cause prolonged contraction is most disagreeable, and brings attendant dangerous after-effects, particularly when the physical exertion caused by such abuse, is an added burden to an overwrought or ill-nourished system. This is the case of thousands of unfortunates suffering from unphysiologic lighting.

Thus the over-brightly lighted reading page, perused after eating, adds to the continued activity of the digestive organ an extra burden, accounting doubtless for the peculiar sociability of those worthy benedicks who fall asleep over their reading page after dinner.

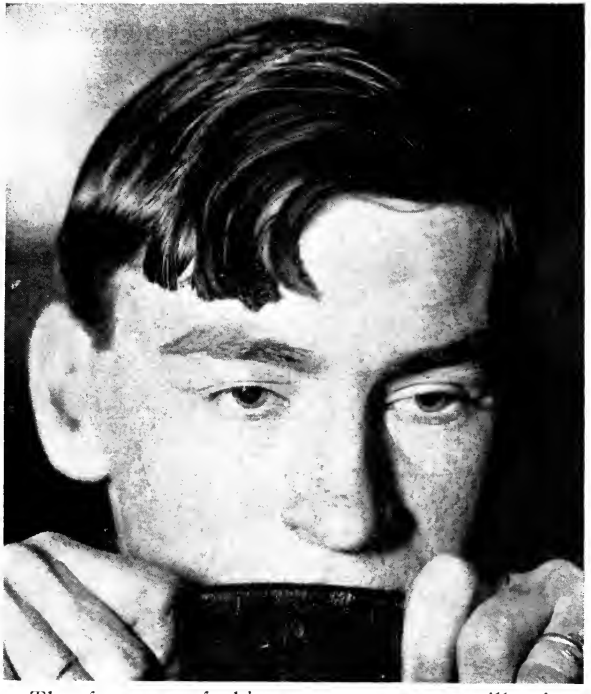
Similarly, those who wander from the subdued lighting of their own fireside to the brilliant glare of the modern drawing-room, or the over-bright screen of the lecture platform or moving-picture show, find an inexplicable feeling of drowsiness stealing over them, due entirely to continued pupilary contraction and its associated exhaustion.

To revert to our analogy, the lens of the camera refracts or bends rays of light (reflected from an object into the lens) so that a sharp, minute in-

verted image of the object is formed on the ground glass observation screen.

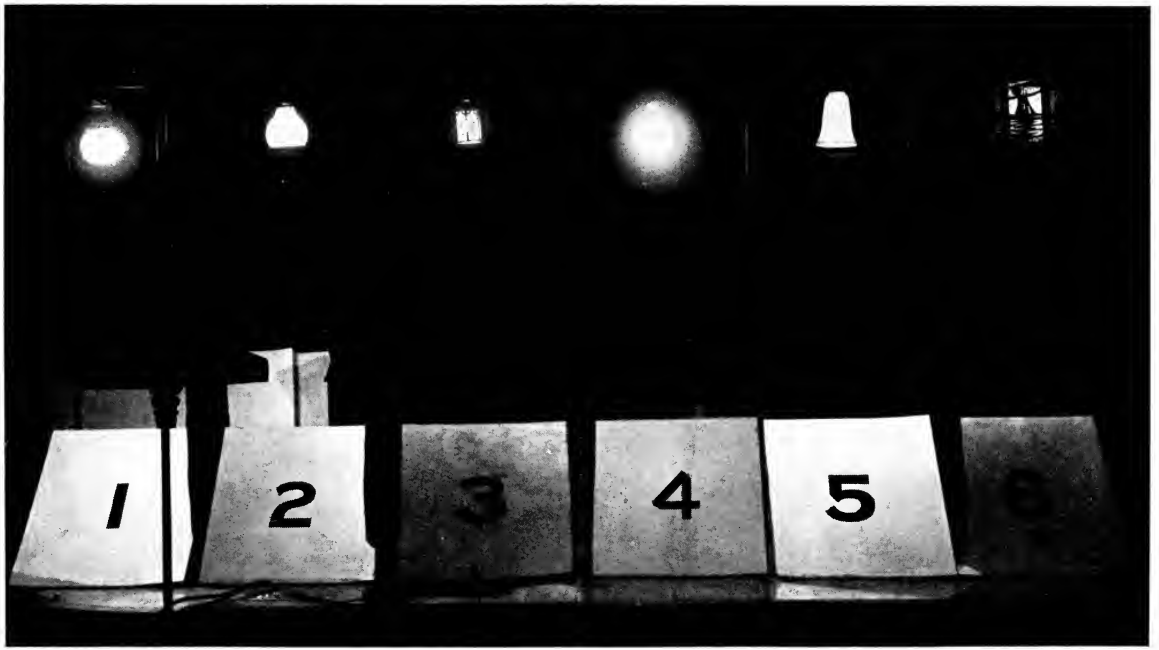
The sharpness or clearness of the image is obtained by "focusing," or regulating the distance between the lens and the plate until a distinct image results. This operation is automatically performed in the eye by the action of the ciliary muscle, which changes the shape of the double-convex crystalline lens, thereby "focusing" light rays by refraction so that they converge on the retina or sensitive inner posterior surface of the eye, which in turn conveys the sensation of vision to the brain by the action of innumerable minute rods and cones, and the optic nerve.

Only in the perfectly normal eye do the rays of light converge properly on the retina. If the eyeball is not perfectly spherical, then astigmatism, near or far sightedness (Myopia or Hyperopia) exists and glasses must be worn to assist the lens of the eye in properly refracting light. Too great care cannot be exercised in the use of glasses. Because a pair of glasses gives very distinct vision is no reason why glasses should be worn. Always consult a reputable oculist or ophthalmologist—the term optician is often used by the jeweler who strives to increase his profits by posing as one qualified to correct eyesight.



The features of this young man were illuminated by a tungsten lamp concealed in a diffusing globe slightly amber in color. Note the wide aperture of the eye pupil and the natural appearance of the features.

A photograph of the same subject taken by the light from a bare tungsten lamp. The pupils of the eye are contracted in lines denoting intensity of expression and innumerable facial blemishes are exposed.



Booths arranged to show the comparative effect of various illuminants and their inclosing globes. 1. Welsbach reflex lamp in opal globe; 2. Tungsten lamp in opal globe; 3. Tungsten lamp in lantern globe; 4. Welsbach in ground glass globe; 5. Dense opal globe; 6. Paper transparency.

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Glasses selected promiscuously, even though giving most distinct vision, often relieve the ciliary muscles of exercise to which they have become accustomed for years in changing the curvature and regulating the accommodation of the crystalline lens. This sudden inactivity often results in cataract or hardening of the lens of the eye until it becomes white and opaque, causing blindness.

The eye is, with the exception of the heart, the most active organ of the human body. Not only are the twelve extra ocular muscles of the eye employed for the purpose of turning the eyeball in its socket, incessantly active, but the ciliary muscle is also continually active in readjusting the crystalline lens for distance accommodation. It loses greatly in efficiency at the average age of forty-five.

Astigmatism is very prevalent. Unquestionably at least 60 per cent. of functional headaches are due to this cause. The correction lies in proper glasses, which will correct—not cure—the evil.

Many a child has been characterized as stupid or backward, whose misshapen eyeballs were alone responsible.

Astigmatism, like every other human affliction, is not without a touch of the grotesque. Sufferers from any form of it do not see vertical and horizontal lines with equal clearness. Thus to one

troubled with "astigmatism in the vertical meridian," the vertical lines of a building are indistinct or blurred, while with "astigmatism in the horizontal meridian," the effect is reversed, and the blurring of the horizontal lines gives an exaggerated appearance of height to a structure, which, conversely, with astigmatism in the vertical meridian, would appear foreshortened. Many sufferers from astigmatism assert positively that they can "see better" at certain hours of the day. The explanation of this delusion is that the hands of the clock when vertical and together—at twelve or 6:30—appear more distinct to a person astigmatic in the horizontal meridian, than when they are in the horizontal position of 9:45 or 3:15.

The photographic plate is not very sensitive to yellow light, unless specially prepared, whereas the eye is more sensitive to yellow than any other color. On the other hand, the camera plate is particularly sensitive to blue and violet, which in the ultra-violet range of the spectrum are not perceived by the eye. The camera plate has often revealed facial eruptions long before there was any visible evidence of the disease. But unless orthochromatic plates are used, the camera will not reproduce objects red in color, and is but slightly sensitive to yellow.

These phenomena will be of assistance in the consideration of the practical problems of lighting which we will take up later in that they exemplify important principles often neglected both by those who have to do with the lighting of public places and those who are responsible for the lighting of the home.

II

THE MISUSE OF LIGHT

"Light seeking light doth light of light beguile."

LIGHT, like life, is as we make it. It may be a thing of parts, a source of comfort, an inspiring influence, an element of the beautiful, or, it may be as it is to-day just a part of things—in the utilitarian sense a "servant in the house"—nothing more.

There is no other product of modern civilization that exercises so great an influence for good or evil. Nerves may be shattered by its violent use, despondency and melancholia brightened by its subtle influence. Eye strain and chronic headache will result from its misuse. Eye comfort and health are the rewards of its intelligent appreciation.

Taken as it is to-day in allopathic doses—as an antidote for darkness—it is over-stimulating and dangerous. Assimilated intelligently in visually palatable homeopathic form, it is a wonderful tonic, almost an elixir—but as commercially pre-

scribed by the incompetent, it is pitifully inadequate, and a deadly menace to the eyesight of our nation.

It is but necessary to revert momentarily to cause and effect to perceive the *raison d'être* of this unfortunate condition.

In the wholesale manufacture and distribution of artificial light, we are confronted with the inevitable triangle of human forces, slightly modified from the conventional triangle of the drama, but a triangle, nevertheless, in the functional sense. In this instance the triumvirate consists of: the manufacturer of energy in luminous form from coal—popularly known as "that gas or electric light company"—operating by franchise as a public service corporation; the manufacturer of energy-transforming devices—lamps which convert gas or electricity (energy) into the visible luminous form of light, and their accessories—lighting glassware and fixtures; and the public, which is theoretically presumed to enjoy, thrive, and prosper by the combination of the first and second forces named.

The word combination, as implied above, must not be interpreted to mean co-operation—at least not on the part of the illuminant, fixture, or glassware manufacturer—since these elements have been

directly responsible for the many unjust and unmerited criticisms of lighting companies by the public. Modern electric illuminants of such dazzling brightness as positively to menace our eyesight, have been widely advertised by their manufacturers without the slightest reference to the dangers attending their misuse, or the least suggestion as to necessary modifications. Affiliated glassware manufacturers have unloaded upon the public a product whose sole attribute has been its property of redirecting light rays. The question of *appearance* has been entirely disregarded, and, as a result, we are surfeited with lighting which is utterly devoid of attraction, without character, commonplace and injurious.

Thus, this misdirected commercialism on the part of the tungsten lamp, glassware, and lighting fixture manufacturers is directly responsible for the critical and unsatisfactory status of artificial lighting of to-day.

While the contractor, and architect's assistant (responsible for detail) are directly blamed for the perfunctory spirit in which they have placed impossible lighting equipment in the home, it must be admitted that they have been utterly dependent upon these makers of lighting glassware and fixtures for working data, which has been quantitive

but inadequate in fulfilling the esthetic and physiologic requirements.

In this regard the manufacturer of illuminants has erred, perhaps as a victim of circumstances, in heeding the unsound advice of affiliated lighting-glassware manufacturers, who have limited their analysis of lighting to extremely narrow, technical considerations, ignorantly inspired by commercial avidity.

An eminent authority on interior decoration states: "The technical man, or engineer, has narrowed his perspective by an exclusive consideration of economic and utilitarian, rather than esthetic, considerations. He has knowledge of lamps and their construction, but smiles indulgently and with smug complacency at the mere idea of estheticism in lighting."

He has no appreciation for environment, knows naught of that consistent relationship between light and color which is the essence of decoration—or atmosphere. Such individuals are responsible for the great unrealized possibilities of artificial light, and their egotism and sublime ignorance of all which represents education in the broadest sense, has prohibited co-operation with those most eminently qualified by nature and experience to help the cause—the decorator and architect.

These criticisms do not apply to the illuminant manufacturer in the sense of belittling his economical achievement in illuminant improvement, for in the tungsten or "Mazda" lamp of to-day, evolved by ceaseless experiments from Mr. Edison's first electric lamp of over thirty years ago we have a luminous medium of singular flexibility and economy.

Similarly the pioneer work of Dr. Carl Auer Von Welsbach has given to the world an incandescent gas mantle, at least equaling the tungsten lamp in quantity and quality of light.

This question of quantity and quality of modern light sources is of grave import. Because he has succeeded in creating an illuminant which approximates daylight, and assists industrial occupations where the matching of color fabrics under artificial light is desirable, the illuminant manufacturer is laboring under the delusion that his tungsten or "Mazda" lamp, with its white light is an universal panacea for all lighting ills, and, from his rather profuse publicity, we are asked to believe that "all these economies make more light, better light, the light universal."

From this we may gather that only the industrial, utilitarian and commercial-economic aspects have received recognition, yet nature provides rest-

fulness which comes with sundown. In the lighting of the home, the glare of continual day perpetuated at night by glaring artificial illuminants is unnatural—diametrically opposed to nature's teachings—entirely lacking in that element of repose which in lighting should delicately emphasize the quiet and peace of eventide in the home.

Let us first consider the physiological aspect of artificial light, and determine briefly just what constitutes hygienic lighting.

Dr. George M. Gould, whose knowledge no physiologist or opthalmologist dares dispute, in Volume I, of his "Biographi-Clinics" in the chapter on the Physiology of Vision, forcibly denounces the prevailing use of high brilliancy illuminants, as follows:

"Another corollary of the law of ocular tire and resensitization may be noticed in passing—a law that is outraged by the lighting of most of our churches and of all of our private houses, theaters, and public halls. *The millions of dollars spent each year in illumination are in great part wasted and misspent, and by the methods used all the harm is done to the eye that is possible. No room should be lit in such a way that the individual lights are visible. Illumination should be by transmitted, dissipated, and reflected light.*"

No matter how beautiful an interior may be, or how harmonious its decorative ensemble, if glaring light sources blind the eyesight, all sense of comfort or repose is lacking, and pictorial value is destroyed. Often one is conscious of a feeling of disquietude or unrest, even in esthetic environment. This is due to the offensive white light and overbrilliancy of modern illuminants. A noted opthalmologist writes:

"American oculists have so many patients who even with the best spectacles, cannot escape suffering whenever they go to the theatre, opera, etc., that the term 'theatre-headache' or 'panorama-headache' has come into general use. As much as to the character of the sermon or of the worshipper, the famous sleepiness of the churchgoer was due to the somnolence caused by ocular fatigue from harsh lights in front. One of the most common symptoms of eyestrain known to all oculists is sleepiness when reading by artificial light. Part of this is certainly due to the unphysiologic systems and qualities of the light used."

One of the necessary requisites for ocular comfort is that the brilliancy of a light source, in the visual field, should be restricted within certain limits. Physiologists agree that light sources having a specific brightness of from 4. to 5. candle-

There is too much light here and it is wrongly placed. The lights hang too low and destroy all possible artistic expression of the picture. The lights against the wall are a source of glare.

A fixture of ground glass or acid etched glass as it appears in daylight.

The same glassware when lighted; all design is obliterated by the glare.

power per square inch, down to 0.2 to 0.1 candlepower per square inch as a minimum, are safe working standards for the eye. While no absolute rule can be laid down, owing to individually different requirements, there is one positive method of determining whether or not the source of light is dangerously bright. If it can be regarded fixedly without ocular discomfort, squinting or annoyance, it is not too brilliant from the physiological viewpoint. Whether it is a source of pleasure, attraction or of delight to the eye, is a psychological, esthetic problem which we will discuss later.

Since the days of the candle the source-brightness of our illuminants has steadily increased. It has passed the danger mark, but the saturation point is not yet in sight. If values of from 0.1 to 5. candlepower per square inch constitute visually the safe range of source-brightness, glance at the following tabulation, and cease to marvel at the optician's prosperity.

Source of Light	(Intrinsic Brilliancy) Candlepower per square inch.
Candle	3– 4
Oil lamp	3– 8
Gas flame	3– 8
Carbon filament electric lamp	375– 400
Welsbach gas mantle	20– 50
Tungsten lamp	1,000–1,500

From an inspection of the foregoing it is apparent that each successive development of electrical illuminants has been attended with an amazing increase in source-brightness, and that where a value of 5. candlepower per square inch is considered the maximum limit of safety, we have exceeded that limit *TWO HUNDRED TIMES!*

Do not confuse this "candlepower of source-brightness" or "intrinsic brilliancy" with the useful light, or "rated" candlepower of the illuminant itself, since the first is purely a measure of source-brilliancy expressed comparatively in terms of candlepower per square inch having nothing to do with the useful light. It is merely for comparative purposes that the reference is here used.

Of course, in many instances, unfortunately not the majority, the eye is protected from the dangerous brilliancy of the tungsten lamp by some sort of glassware in the form of shades which should serve the double function of eye protection, and the re-distribution of light over areas where it is required.

The fact remains unaltered, however, that the lamp manufacturer in his publicity has in no way indicated the necessity for utilizing his product with care, and his undue emphasis on its economy and durability has persuaded its adoption in count-

less instances where it has been ignorantly substituted for older types of less brilliant illuminants, and located directly within the visual field.

A word of warning on each cardboard box in which tungsten lamps are sold would have a far reaching effect. Another word as to the necessity for keeping lamps free from dirt would be equally appropriate but their humanitarian and utilitarian considerations have been stubbornly ignored by the manufacturer. Dr. Ellice Alger, a noted opthalmologist, states:

"The general engineering expression seems to be that the room which is best lighted is most lighted. This is a great mistake. Too intense light decomposes the visual purple in the retina faster than it can be replaced, and leaves a condition of retinal exhaustion. Likewise it compels a constant extreme muscular contraction of the pupil in the effort to exclude the light, which is both fatiguing and painful. Most of our buildings are glaring examples of extravagant and visual inefficient lighting—extravagant because of the waste of light, and inefficient because they are *not even comfortable* to sit in."

Regarding the substitution of older types of less glaring illuminants for those of highest intrinsic brilliancy, for attainment of their unduly adver-

tised feature—"economy" (in abstract), Dr. Alger adds:

"Among the East Side operatives, thousands and thousands of unfortunate men and women spend their lives in making the fractional part of coat, shirt-waist, artificial flowers, and willow plumes, working in close, badly ventilated, badly lighted rooms. Presently the daily headache begins, and a little later their mistakes in the work impose a series of fines. The combination of physical misery and low wages imposed by bad eyes undoubtedly predisposes the men to alcoholism, dishonesty and crime, and makes a life of prostitution seem easy and attractive to the girls."

Whether in the home, the office or the factory, the pernicious, devastating effect of these over-brilliant unmodified light sources is the growing cause of much untold misery and suffering, generally attributed to other innocent causes.

The human eye is but an extended portion of the brain, according to the most eminent anatomists, and as such must be treated not merely as an optical adjunct, but as a vital organ, affecting in some serious manner every other organ through abuse, by light or any other cause.

Thus, the glaring, unprotected light source, whether it be the tungsten lamp of the subway

train, or the unshaded light of the home, is the unsuspected cause of many an acute headache, which with continued exposure will become chronic. Indigestion and nervous despondency have been traced to this cause. The commercial lighting "engineer" or lamp and reflector salesman may sniff contemptuously at this, but the ophthalmologist will nod gravely in acquiescence. Eyeglasses will correct—not cure—astigmatism due to misshapen eyeballs, but they cannot protect the eye from blinding injurious light sources, or glaring prism shades.

The physiological significance of color, or quality of light in the home, brings us to the reading page. A great deal of humanity's ocular discomfort has come from endeavoring to decipher small black characters against a white page.

In the days of earlier illuminants the page was, perhaps, insufficiently lighted, and eyesight was impaired through strained perception. Then came the oil lamp with its soft mellow radiance, which has yet many admirers in the student world. We "see" the small print on our reading page by contrast—the contrast of the black type against the white background—but the total area occupied by the blank white paper is far greater than the total area occupied by the black type. In other words,

the white paper area, which serves to reflect light (if glazed) or diffuse light (if rough) from a lamp into the eye, reflects or diffuses more than is necessary to perceive the small black printed matter by contrast. With earlier forms of electric illuminants the white page was modified and softened by the amber color of the light source itself, and against this soft, mellow background the contrast of the small black characters was less abrupt, more readily perceptible, and less tiring. With the tungsten or "Mazda" lamp, the reading page is glaring white, reflecting so much light into the eye that comfortable perception in continued reading is impossible.

Assuredly we desire to enjoy the economic advantages of modern illuminants, but by all means let us temper this economy with respect to our eyesight. With the same required quantity of amber and white light on two reading pages, any person will be able to read longer and with much greater comfort with the amber light.

This is an absolute statement of fact and will be contested only by those who fear the effect of such knowledge in directing the public mind along lines of investigation, resulting in legal measures regulating the publicity and sale of illuminants.

Since the illuminant manufacturer and his sales-

man the "illuminating engineer," will not recognize the obvious physiological requirements of artificial light, let every person interested in conservation of vision and the avoidance of eye strain prescribe his own remedy—for the procedure is simplicity personified.

Granting that the requirements of the individual differ, then let the individual recognize his requirements.

There is, to-day, a material termed "gelatine film" which is manufactured in sheets about two feet square. It is a thin, transparent medium employed in the theater for the protection of colored lights and the attainment of realism in scenic effects. It is available in many colors, including *amber,* and is fire resisting. It may be cylindrically shaped to conform with the various sizes of modern light sources, and held in place by ordinary paper clips, such as are used in attaching office correspondence. It may be obtained from the electrician of any theater for a few cents.

Just one experiment will convincingly demonstrate its ability to transform harsh, white light into the soft, agreeable soothing radiance of the oil lamp.

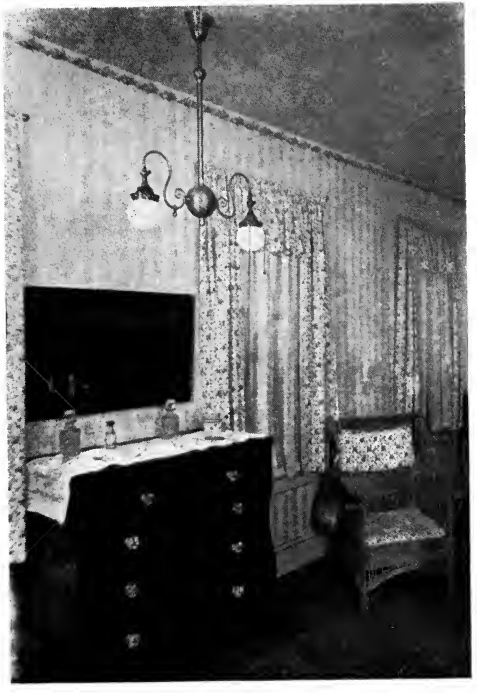
Hundreds of letters have been received from those who found a wonderful relief by thus modify-

ing the white, glaring light of the tungsten or "Mazda" lamp.

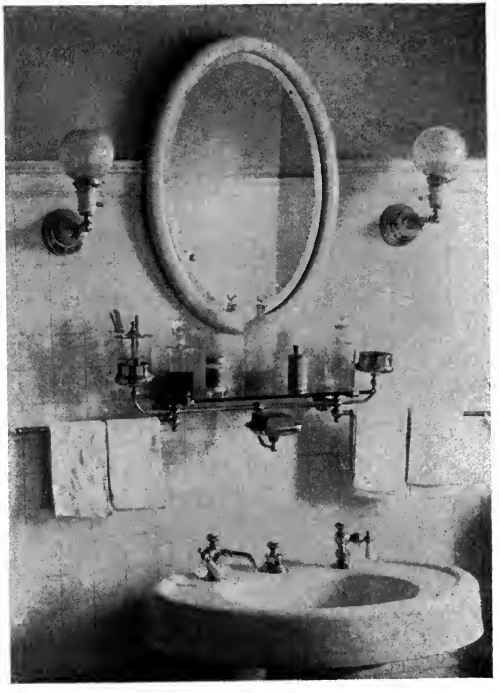
While a fluid preparation, known as "lamp coloring" has been available for staining lamp bulbs, its application has been limited to exterior sign effects. Moreover, it is impossible to obtain permanency of color or variation of color density with its use, and the operation of "dipping" lamps in coloring solutions is fraught with many uncertainties.

The standard makers of incandescent gas mantles, recognizing sometime ago that a white light mantle was unsuited for home lighting, devised what is termed an "amber light mantle," which is most pleasing and restful to the eye. Unfortunately, the manufacturers of tungsten lights have ignored this matter.

Too much emphasis canot be laid on this question of light modification. Great physical discomfort has resulted from the substitution of high intrinsic brilliancy of light sources for older types of illuminants to which their visual functions had become accommodated. Overstimulation of the retina decomposes the visual purple much more rapidly than it can be restored, and the result is retinal exhaustion followed by its attendant depression of other organic functions.



With the inverted mantle the major part of the light is downward, illuminating the features before the mirror.



Here tungsten lamps are used in proper position—their greatest candle power is along the horizontal.

An inclosing globe of decorative opal used for hall lighting with gas, since much light is not required.

III

LIGHT AND THE MIND-PSYCHOLOGY

"There's nothing good or bad but thinking makes it so."

ASIDE from physiological considerations there are other reasons why too much light is undesirable in the home, and these involve psychology. Subconsciously and unconsciously we experience many sensations which are directly due to psychological precedent. Unexpected contact with a subtle perfume, a certain quaver in a musical theme, and instantly our mind reverts to some incident or personality of long ago, revivifying the past with startling realism. Through the interminable space of centuries humanity has been trained through hereditary psychological precedent to regard light as a symbol of warmth, comfort and repose. For ages the comfort of the open fire has impressed on the subconscious mind the invariable association of that physical comfort and sense of warmth with the amber coloring of the dancing flames. Recall the pictorial beauty of the setting sun, transfiguring everything with its

golden radiance and know why nature's teaching has endeared to humanity that soft mellow amber quality of light which imbues even the environment of the home with an atmosphere rich in tone, feeling and expression.

No woman can appear to advantage beneath the cold, harsh, white light of modern illuminants which cruelly reveal every wrinkle and emphasize every facial blemish. Even the bloom of youth pales under the brutal glare of the tungsten lamp.

The photographs facing page 4 show this. Try the experiment yourself. Holding a mirror before the face, illuminated by a bare tungsten lamp, observe the uncomplimentary effect. Then place a piece of amber film, amber tissue paper, or an amber globe over the lamp and note the transformation. Wrinkles and facial blemishes fade away like magic. In interiors lighted with a prevalence of amber light all is soft and reposeful and each and every one looks her best.

Schopenhauer and Herbert Spencer devoted most exhaustive research to determine the effect of music on the nerves; yet the influence of color, particularly on the overwrought nervous system, is even more definitely marked. The great student of chromotherapy, Van Bliervliet, maintains that those senses which are most sensitive to color ap-

preciation, directly stimulate intellectuality, indicating that those individuals possessing superior intelligence are particularly susceptible to the suggestion of color or music.

Nervous prostration, lack of literary inspiration, and insomnia may be relieved, restored, and cured by the proper treatment of light and color.

To-day the lighting of the office is harsh, white and cold. Why let the light of the home suggest to the mind of the tired business man working conditions?

This subject of psychology is irrevocably linked with artificial light, particularly in the home—which is the theatre of life. Once a dramatist, more daring than his fellows, staged a play. It dealt with the psychology of light. The critics read the manuscript and predicted failure. As usual the public decided. It was a wonderful success. Night after night thousands sat spellbound under the psychological influence of light.

The following abstract from one of the scenes will interest all in whom the sense of imagination and power to appreciate logic still holds sway.

Vavin, a scientist, is discovered with Halcomb and Dora—the lovers of the play. Before leaving them alone in the moonlight, he administers gratuitously a psychological benediction:

Vavin—Do you know the effect of color?

Halcomb—Color?

Vavin—You have heard of Nancy—in France—the town?

Halcomb—Yes.

Vavin—And Dr. Charcot?

Halcomb—Yes.

Vavin—He was my friend. We made together many experiments of the effect of color upon many persons under hypnotic influence. Invariably under yellow, or amber, the subject laughs; under green he is content; under red he is stimulated; if it is brown he is in fear; if violet he weeps; under blue he is—what you call it—*distrait?*

Dora—Perplexed?

Vavin—Perplexed!

Halcomb—Don't you think, Monsieur, so much attention to the light is a bit theatrical?

Vavin—Theatrical?

Halcomb—Not true to life.

Vavin—Life? Do you know, Monsieur, that sixty per cent. of the causes of falling in love are in the moonlight—in life?—Do you know the harvest moon?

Halcomb—You mean the full moon that comes at harvest time?

Vavin (nodding)—Do you know its peculiarity? Generally the full moon rises nearly an hour later each night.

Halcomb—Well?

Vavin—The harvest moon at the full comes up three nights almost at the same time. Did you ever think of that?—and why is it, do you suppose?

Halcomb—Why?

Vavin—That harvesters, men and women, shall fall in love with each other! Oh, it is a droll God, Monsieur, that plays that trick for one hour on His children. Think of it, Monsieur, a harvest moon for one hour! Is that of the theatre? No; it is a droll God. Now, I cannot show you; I have no arrangement to get the blue light, which is mystery, and the green light, which is content, and which

> together make a moonlight—when two people come together, mystified and happy, and say "Ah, this is Fate—we were for each other since the beginning."

Do not laugh, gentle reader, for it is tragedy—not comedy. Here in our midst, at our very door, yes, even within our home is a marvelous omnipotent agent, willing to aid us, yet fettered by man's stupidity and the unyielding shackles of a sordid, misdirected commercialism.

And so it is that the color of an interior, as manifested in its wall tints, influences to an unrealized extent the minds of those who dwell therein—through the medium of reflected light and the eye.

Just as misshapen eyeballs produce astigmatism, or indistinct vision, so the retina of the eye varies as to color perception.

To the lighting engineer color in decoration is of interest only because of its light absorbing or reflecting qualities. "Dark colors with black as a limit, absorb more, and reflect less light than lighter colors, approaching white as an extreme."

But this sordid economic dogma of the lighting engineer represents the least important phase of the subject. The color and influence of this reflected light from colored surfaces on human beings is infinitely of greater import.

About one out of every seventeen males is *color blind,* and at least one out of every twelve *color ignorant.*

The color of an object depends on its absorption of certain light rays and its reflection or diffusion of others. If light rays are absorbed or reflected by a surface, the surface is *colored* and *opaque.* If some light is transmitted through the surface it is colored but transparent.

Surfaces which transmit or reflect all colors are white, while those which transmit or reflect no color are black.

The innumerable tints in natures vast color equipment are due to the greater or less reflection or transmission of certain light rays. Plants, trees and flowers really have no color of their own, the impression on the retina being merely a case of cause and effect, resulting in our attributing colors to natural objects which are not existent, being simply the result of changes in the cerebral cortex.

To the man who wears dark green glasses all apparent red objects appear black since all the red rays reflected from them are absorbed by the green glasses. In the same way the blue green light of the mercury tube commonly seen in most photographer's windows, causes all apparent *red*

objects to appear black to the eye, since the red surface can only reflect, or transmit red rays, absorbing the blue and green. Hence the ghastly appearance of those who appear beneath such lights since every vestige of color (red) in the features is obliterated, giving place to dark shadows. The cheek with the bloom of youth becomes sunken, and ruby lips turn black. Conversely red or pink lights are an aid to beauty. Globes of old rose tints over offending white lights counterfeit natural complexion tints to a miraculous degree.

To the color blind, and their name is legion, black appears sometimes green, sometimes crimson, light blue appearing as dark blue, crimson or black, while green is confused with black or brown, and crimson with blue. They see no difference between a laurel leaf and a stick of red sealing-wax, and of all the glorious tints of the rainbow they see but the red and blue. An amusing anecdote is related of a Quaker who was color blind and attended a Quaker meeting clad in conventional drab clothes, but with brilliant red stockings!

The apparent changes which light rays cause when reflected from various colored surfaces is naturally of interest and not alone from a psychological viewpoint, since decoration is naught but a

consistent relationship betwixt light and color at its best.

The modifications which black designs undergo on various colored backgrounds are in many instances startling, and these are a few which may be easily verified by any one gifted with normal vision.

Color of Background	Color Change in Black Design	Color of Background	Color Change in Black Design
Red	Dark Green	Green	Reddish Gray
Orange	Bluish Black	Blue	Orange-Gray
Yellow	Black	Violet	Greenish Yellow-Gray

The modifications produced by colored lights on colored fabrics is even more marked, showing how really necessary it is to consider light as a part of decoration, in preconceived decorative schemes.

Color of Ray	Initial Appearance of Fabric	Change in Appearance of Fabric
Red	Black	Purple-Black
Red	White	Red
Red	Red	Redder
Red	Orange	Redder
Red	Yellow	Orange
Red	Deep Green	Red-Black
Red	Light Blue	Violet
Red	Violet	Purple
Orange	Black	Maroon or Carmelite Brown
Orange	White	Orange
Orange	Orange	More Vivid
Orange	Red	Scarlet
Orange	Yellow	Yellow-Orange
Orange	Light Green	Yellow-Green
Orange	Deep Green	Rusty Green
Orange	Deep Green	Yellow-Green

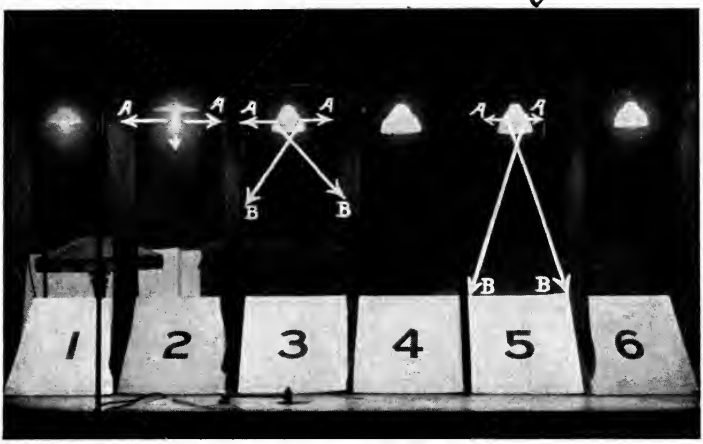
Color of Ray	Initial Appearance of Fabric	Change in Appearance of Fabric
Orange	Light Blue	Orange-Gray
Orange	Deep Blue	Gray-Slightly Orange-Gray
Orange	Indigo Blue	Orange-Maroon
Orange	Violet	Red-Maroon
Yellow	Black	Yellow-Olive
Yellow	White	Light Yellow
Yellow	Yellow	Orange-Yellow
Yellow	Red	Orange
Yellow	Orange	Yellower
Yellow	Green	Greenish Yellow
Yellow	Light Blue	Yellow-Green
Yellow	Deep Blue	Green-Slate
Yellow	Indigo	Orange-Yellow
Yellow	Violet	Yellow-Maroon
Green	Black	Greenish Brown
Green	White	Green
Green	Red	Brown
Green	Orange	Faint Yellow-Slight Green
Green	Green	Deeper Green
Green	Indigo	Dull Green
Green	Violet	Bluish Green-Brown
Blue	Black	Blue-Black
Blue	White	Blue
Blue	Blue	More Vivid
Blue	Red	Violet
Blue	Orange	Brown-Pale Tint of Violet
Blue	Yellow	Green
Blue	Green	Indigo
Blue	Indigo	Dark Blue-Indigo
Blue	Violet	Dark Blue-Violet
Violet	Black	Faint Violet-Black
Violet	White	Violet
Violet	Violet	Deeper Violet
Violet	Red	Red-Violet-Purple
Violet	Orange	Light Red
Violet	Yellow	Brown-Slight Red
Violet	Green	Light Purple
Violet	Blue	Fine Blue-Violet
Violet	Indigo	Deep Blue-Violet

IV

THE MODIFICATION OF LIGHT

"The moon is up, and yet it is not night—"

THE modification of light sources for the attainment of eye-comfort, atmosphere and repose in the home involves among other considerations an analysis of the glassware used in lighting. Whether in the home or abroad, the over brilliancy of modern illuminants should legally necessitate their concealment within shades for the purpose of eye protection and, where necessary, for the redistribution of light over working areas. Since our visual impressions are invariably acquired from surface indications, it is evident that the effects and influence of artificial light are very largely dependent on its shade or covering. Therefore the source of light should invariably be concealed in appropriate glassware, which when it becomes a secondary source, shall exercise its functions of eliminating glare, giving a useful distribution of light, and in appearance becoming literally a part of its decorative environment.



Comparison booths showing the action of shades which do not entirely inclose lamps. 1 and 2. Ordinary white opal glass; 3. Glass which transmits and reflects; 4 and 6. Sheffield design; 5. Dense opal of proper shape.

See page 47

The various types of inclosing shades contrasted. 1. Welsbach reflex in ground glass; 2. Dense opal globe; 3. Common prismatic glass shade; 4. Reflex lamp opal shade; 5. Same type glass as one over tungsten lamp; 6. Undesirable ground glass shade.

See page 53

The old iron fixtures of German Gothic design are properly matched with the lantern shade: how unsatisfactory is the cheap, inefficient, modern shade in contrast.

Never introduce in the environment of the home those shades or globes which suggest the ugly, commonplace, ribbed affairs of the shop interior. Remember, the eye cannot refrain from straying toward a source of light and let that source be mellow, subdued, and artistic.

Several years ago, when electric illuminants were less economical than now, the glassware manufacturer did his best to make shades which would reflect, re-direct, and concentrate every ray of light over a working area, unknowingly sacrificing every consideration of appearance, beauty, or effect, for economic efficiency. To-day, however, owing to the wonderful economy of illuminants and to the increased use of gas and electric light in thousands of homes, the progressive glass maker must shape his product for grace as well as utility. Artificial light is now so cheap in cost that the great problem of the hour is to prevent its becoming cheap in appearance—and to this end the makers of lighting glassware must come to the rescue. Some of them have, but others still continue to unload an ugly product which has become commonplace and undesirable, ignoring all the wonderful possibilities of the chemistry of glass for the time-worn, futile argument of economy.

The more progressive glassmakers who have

done things worth while, have erred, perhaps, in that their product is not always so attractive when illuminated as it is by daylight. This is because certain forms of glassware for lighting are adapted to modern illuminants, and others are not.

While "transparency" is the most common attribute of glass, there are kinds which are but slightly transparent, even opaque.

After the fire-clay pots, in which a mixture of sand, carbonate of soda, carbonate of calcium, and red oxide of lead have been heated and maintained at a melting temperature, the furnace is cooled, and the glass, at various stages of cooling, may be blown, cast, pressed, rolled, drawn, cut, drilled, ground, and shaped in many forms. Acid etchings, and blasting and grinding, have various effects in bringing out the body color and lending texture or softness of tone, and these various applications modify the appearance of glassware, and have much to do with its artistic effect, and its transparency, which should be carefully considered—and avoided.

In many interiors with average ceiling heights, lighting fixtures are hung so that the pendant, or upright shades are continually within the visual field. In such cases glassware must be selected to perform several functions. Ocular comfort de-

mands that these globes shall be restful and uninjurious to the eye, since the brilliancy of the light source within them must be subdued by their diffusive action.

Globes of harmonious contour and with that proportion of line, expressive of period and fixture design, should be selected. It matters not how beautiful a globe may be, when not illuminated, if when lighted an ugly, glaring splotch of light reveals the location of the source, and destroys its pictorial value.

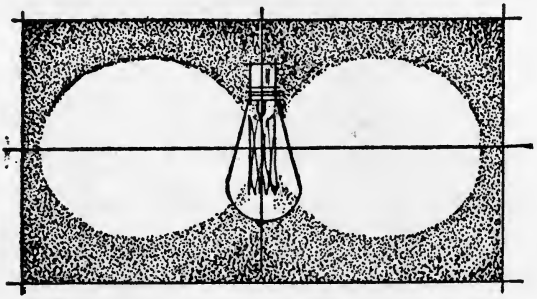
Globes and shades may be of totally enclosing or semi-enclosing form. The former entirely enclose a light source, or else expose but a small portion of the lamp tip. In globes of such form, light from the illuminant within is transmitted through the structure of the glass, and the pleasing appearance of such globes and their diffusive properties is entirely dependent upon the nature of the glass and its surface treatment.

In a totally enclosing globe of ordinary clear glass, the outer surface of which has been ground or etched with acid, there is apparent a brilliant spot of light in the midst of an illuminated area of less intensity.

The microscope and camera combined were utilized by the writer in studying the phenomenon

of light transmission in various media and with ground glass it was noticed that the effect produced was to allow light rays to pass through the glass without changing their direction.

It is well in this connection to realize that with either an electric bulb or incandescent gas mantle, the greatest candle power is obtained from the

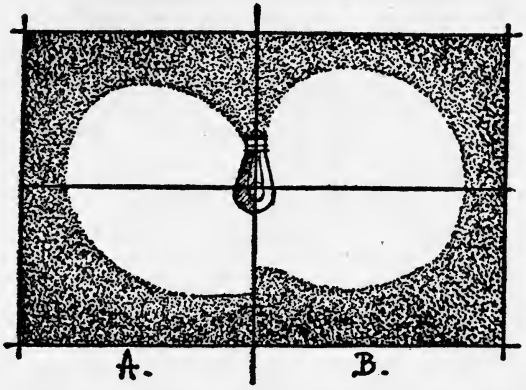


THE LIGHT FROM A TUNGSTEN OR LAMP IS MAINLY DISTRIBUTED ALONG THE HORIZONTAL

side of the lamp, the greatest radiating surface being there. Naturally from the tip or base, where the radiating surface is less and there is much impediment to light rays in the form of metal sockets or burners, the light is weakened. Gas or electric lights are therefore rated by their horizontal, or side candle power. Hence the electric lamp which gives sixteen candle power on the horizontal, is rated as a sixteen candle power lamp, despite the fact that the candle power from the

tip downward (when the lamp is in a pendant position) is but 6.6. The bright spot light, tells us beyond dispute that the greatest candle power is on the horizontal and nowhere else.

The diagram below (marked B) shows the distribution of light about a bare sixteen candlepower

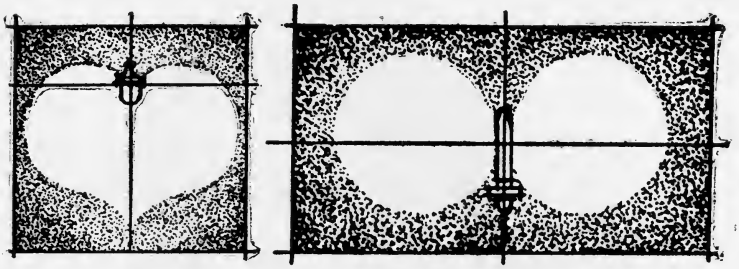


THE MODIFICATION IN THE DIRECTION OF LIGHT MADE BY FROSTING THE BULB. B, CLEAR GLASS; A, GROUND GLASS

lamp. The effect of "frosting" or roughening the outer surface of the glass bulb is indicated by A, the effect of this treatment being to give more light in directions where there was less before. Thus, where the greatest light obtained from the bare bulb is on the horizontal, the effect of "frosting" is to decrease the light in that direction. But, on the other hand, where previously there was *less* light—from the tip of the lamp *below,* and the

socket *above*—"frosting" increases quite appreciably the useful light in these directions.

In the same manner, the diagram (page 36) illustrates the distribution of light about a tungsten or "mazda" lamp. With gas lamps there is a greater amount of light directly below the lamp,



THE LIGHT DISTRIBUTION FROM AN UPRIGHT GAS MANTLE CLOSELY RESEMBLES THAT OF THE TUNGSTEN LAMP. THE INVERTED MANTLE BESIDE THROWS MOST OF THE LIGHT BELOW

owing to the greater light-radiating surface there. Thus, in the diagram above the characteristic distribution of light about a bare Welsbach inverted incandescent gas mantle is shown. The figure beside it shows the striking similarity in distribution between an upright Welsbach gas mantle and that of the tungsten lamp.

The photograph facing page 5 shows an arrangement of a series of compartments for comparing various illuminants and their accessories. The intensity of light beneath each lamp is revealed by the brightness of the cards, num-

bered respectively and consecutively from 1 to 6 for purposes of identification and comparative reference.

No. 1 of this photograph is a Welsbach reflex lamp. Over the inverted mantle is a globe of Verre Krasna glass, the very finest form of imported opal, manufactured in Austria. The perfect diffusion of this glassware is apparent. No. 4 is another Welsbach reflex lamp within a globe of ground glass. This glaring effect, and the higher intensity of light on card No. 1 is well marked. No. 2 is a 40 watt tungsten lamp within an opal globe similar to No. 1. No. 3 is a 40 watt tungsten lamp within a globe formed to represent an old Gothic lantern with imitation leaded glass panels. Unfortunately the glass used is surfaced roughed—as is manifest by the characteristic glare and non-modification of light direction. The fact that ground glass does not appreciably change the distribution of light about a lamp is forcibly demonstrated by comparing No. 3 and No. 6 where lamps of the same size are placed respectively in ground glass and behind a paper transparency. Card No. 3 is little brighter than card No. 6. No. 5 illustrates how dense opal glassware assists in reducing glare and expressing admirably the character of the globe. Beautiful

designs in *bas relief* are wonderfully effective in such glass when not over lighted.

One need have no fear as to the placement of such globes or their effect on visual functions. Even on lighting fixtures hung so low that their globes are constantly in the visual field—dense opal glassware will work wonders in correcting such injurious conditions.

Nor do not feel that light is wasted in using dense globes which decrease source brilliancy and modify it as to color. The *one* thing which the illuminant manufacturer has done satisfactorily, is the production of illuminants which are *economical,* but it remains for the user to make them visually safe and adaptable to æsthetic and individual requirements.

It is interesting to note that the globe which really meets æsthetic requirements—can never be productive of glare, since the glaring splotch of light so offensively distortive of detail is a vulgarity irrevocably opposed to artistic expression in any form. Judge globes, therefore, relatively, as a part of your decorative ensemble, and you will find the globe which satisfies the æsthetic is quite likely to meet physiological requirements.

The higher the pedestal the wider the area of useful reading light with a portable lamp. The art glass shade, however, must be low enough to leave the eyes in shadow.

An illustration of the eyebrow's function in protecting the eye. A higher pedestal would greatly improve this lamp.

The results of gas and electricity in relation to their fixtures contrasted. E. A tungsten lamp; G. A Welsbach reflex. The arrows denote the direction resultant with these shades.

See page 60

V

SEEING BY LIGHT TRANSMITTED

"He that is stricken blind cannot forget,
The precious treasure of his eyesight lost."

IN rooms with very high ceilings, glowing lights are not so annoying, being generally so high that they are not directly before the eyes.

This condition offers no excuse for the use of ground glass, since the angle at which large pictures hang from a wall is such that the side light from bare lamps or lamps enclosed in ground glass globes strikes these picture surfaces and is reflected downward and across the room, generally at such angles (in wide rooms) as to cause intense ocular discomfort to those seated facing such pictures. This physiologically bad effect is even more objectionable from an æsthetic viewpoint, assuming that the artist's work to be appreciated and give pleasure, must be seen.

A case of too much light in the wrong place is shown facing page 14. Even with the light so high as to be out of the visual field of those seated, its

influence reaches the eye by reflected light. Beneath the shelf is seen a row of four globes. These were not lighted when the photograph was taken for the excellent reason that their glare would have obscured everything else on the plate. Later we will discuss the desirability of the side wall as a *locale* for lights but in passing let me emphasize the importance of keeping them subdued—their function being purely as an aid to decorative and architectural expression—not a hindrance. With Mazda-tungsten lamps and ground glass the side wall light becomes an absolute annoyance to the eye. Dense opal globes will correct this, and if carefully selected will harmonize perfectly with decorative environment. Let me repeat that globes of ground glass or acid etched glass are never attractive when lighted. Since a source of light, fundamentally, must be soft, restful, and agreeable to the eye, there is no excuse for wasting money in purchasing globes which if attractive by day, become glaring splotches of light at night with all their beautiful designs obliterated in a vulgar splotch of brightness. Opposite page 15 is shown the daytime appearance of one of these ground glass globes with a cut glass design—which becomes obliterated at night.

Dense, opal globes (enclosing) can be used to

better advantage with inverted gas mantles than with ordinary tungsten lamps. This is because the reflex inverted gas lamps give much more light downward from the mantle tip than is obtained from the tip of the small sized tungsten lamp which could be compared with the inverted gas mantle on an economic basis.

A word as to the possible applications of these enclosing globes of opal glass in the home. In living-rooms where one center ceiling fixture is supposed to give general illumination, dense opal globes of suitable design are appropriate—particularly in instances where fixture changes are inconvenient. Doing away with all fixtures and placing unsightly prismatic glassware close to the ceiling is well enough for the barroom but not in the home where environment means so much, and exerts so great an influence by the psychological force of associated ideas on the morals of the young.

Irrespective of their shape, enclosing globes illuminate by *transmitted* light. In choosing them, remember that with round opal globes the diffusive action of the suspended particles of opal within the structure of the glass causes an even spherical-like distribution of light with about as much light transmitted above, toward the ceiling, as below in the lower part of the room. With

fixtures hung low this transmitted light above the globe is of little value unless ceilings are absolutely dead white, and even then there is not enough of it left to be of appreciable value after at least three reflections which must take place from ceiling and side walls before reaching the lower part of the room.

With fixtures close to the ceiling, the use of enclosing opal glassware, while meeting physiological requirements, gives an effect of a bright circle of light on the ceiling directly above the fixture, less noticeable with darker tinted ceilings.

In the majority of instances where lighting reforms are needed, low hung fixtures are the rule not the exception. Such cases may be satisfactorily corrected by using opal glass, which gives excellent effect for general illumination if dense amber globes are used.

Bathrooms are usually decorated in light tones, affording a good opportunity for the application of enclosed globes on either side of mirrors.

The illustration shows a case where dense white opal globes on either side of a mirror will reveal with brutal frankness things as they are—not as they seem. Here is an instance where the penetrating qualities of white light serve admirably in the various operations of preparing the toilette and

in degree of efficiency which is not possible with light from one side only (facing page 22).

The position of the lamps beside the bathroom mirror would be suitable with inverted or upright tungsten lamps, or upright Welsbach gas mantles, because they give the greatest light sideways. The position of the fixtures would not be desirable for inverted Welsbach gas lamps, because of the greater amount of light directly below the mantle tip—which would be for the most part wasted in this instance.

The other photograph facing page 22 shows this point; the fixture is placed so that the downward candlepower of the inverted reflex mantle, which is greater than the downward candlepower of the tungsten lamp, brightly illuminates the features of a person standing before the mirror, and at the same time gives an agreeable general illumination sufficient for the purpose of the interior—a bedroom. With remote control—a pneumatic button placed conveniently near the bed—this fixture would answer quite acceptably all utilitarian requirements.

In halls where a tremendous burst of light is undesirable, enclosing globes may be used effectively. Opposite page 23 is such an arrangement. Here again the question of light utilization must

be considered. With a tungsten lamp the greatest light would be transmitted through the globe sideways with comparatively little useful light directly below. In other words, other than enclosed glassware as shown here gives better results with inverted gas mantles than with upright gas or electric lamps.

Little difficulty will be experienced in determining where enclosed globes should be used if the distribution of light about the lamp in question receives due consideration. Study the effect of the interior, and note if the horizontal light from the side of the lamps causes objectionable glare, or gives an uneven distributive effect. Always remember that when lamps are hung low, directly within the visual field, dense opal enclosing glassware must be used unless the entire lighting system is to be changed. A source of light should be a source of pleasure and comfort to the eye.

The white table cloth acts as a reflector for light from an overhead dome. This accounts for the brightness of the upper wall. Such globes as this may be lighted by gas and it is possible to have them controlled by a pneumatic button on the wall.

Comparison of various reflectors with tungsten lamps of the same size. 1. Opal shade; 2. Smooth aluminum reflector; 3. Reflector of pure silver; 4. Cone of blotting paper; 5. Bare lamp; 6. Flat mirror plate above lamp.

See page 65

Comparison of their reflecting surfaces with tungsten and Welsbach lamps. 1. Welsbach inverted mantle opal shade; 2. Blotting paper; 3. Tungsten lamp in pure silver reflector; 4. Aluminum reflector over inverted gas mantle; 5. Ordinary newspaper; 6. A mirror plate.

See page 67

VI

SHADING AND REDIRECTING LIGHT

"He saw;—but blasted with excessive light,
Closed his eyes in endless night."

UP to the present we have restricted our consideration to *totally* enclosing globes, which modify by reducing source brilliancy, and through the diffusive action of the glass itself in transmitting light. In the upper illustration facing page 32 comparison booths are shown with tungsten lamps all of the same size with various shades which do not entirely enclose the lamp, but are cone shaped. Card No. 2 is receiving less light than the others due to the flat shade which does not intercept and redirect the greatest light from the bare lamp which is in the direction A-A. Card No. 1 is brighter than No. 2—since the shade of No. 1 hangs lower on the lamp thereby intercepting and redirecting more light below. These shades in No. 1 and No. 2 are of the ordinary commercial type—white opal glass. They are used here, because many glassmakers ignorantly advocate flat

shades for use in the home, where their use should be prohibited by law because they accentuate the glare of tungsten lamps. Furthermore it is evident from a glance at No. 1 and No. 2 that these flat shades are not even utilitarian—in that they fail to redistribute light where it is required.

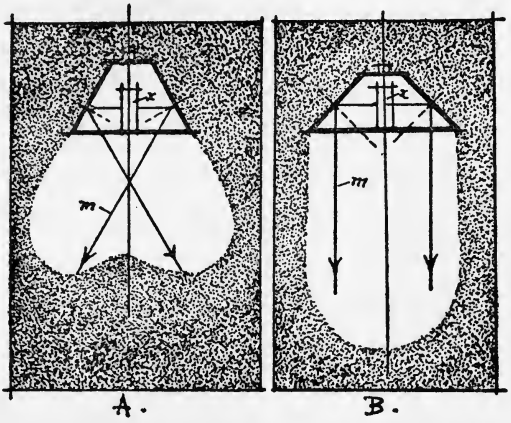
No. 3 shows how a shade transmits as well as reflects light. The greatest light from the lamp is in the direction A-A and strikes the inside surface of the shades. Two things happen: first some of the light is *transmitted* through—its quantity depending on the thickness of the glass and its absorption; second, some of the light is redirected downward by the inner surface.

When light rays strike the surface of a reflector or anything else, their direction is changed depending upon the angle at which they impinge upon such surface. If the surface is polished they will be sharply reflected, with glare. The effect of the interior of polished surface shades is as bad for the eye as the glare of an automobile headlight. Of course shades are not hung so their inner surfaces are staring one in the face, but nevertheless the polished surfaces of tables, and papers reveal their obnoxious images with mirror-like fidelity.

Now when light strikes a rough or depolished

surface it is diffused, the rays being broken up or scattered, and there is no glare—*Whenever shades are open, exposing the lamp tip—the inner shade-surface must be depolished, and a frosted tip lamp used.*

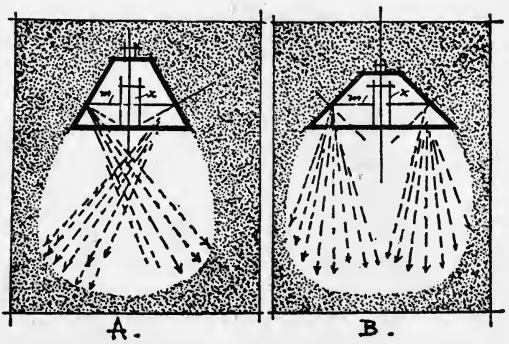
All glass makers can furnish shades with de-



CHANGE IN THE DISTRIBUTION OF LIGHT EFFECTED BY THE USE OF DIFFERENT REFLECTORS WITH POLISHED INNER SURFACES WHICH PRODUCE GLARE

polished inner surfaces, and every purchaser who has the least respect for his eyesight will insist upon it. We have noted the necessity for placing the light source well within the redirecting surface of the shade, both for physiological and utilitarian reasons, now let us study the change in distribution of light effected by changing the shape of the redirecting surface.

The diagram on page 49 shows two shades with inner polished surfaces over a light source (X)—the action of these polished surfaces in redirecting light by reflection is shown by the dotted lines (M) representing any ray of light emitted by the square X. With shades having sides more nearly



CHANGE IN THE DISTRIBUTION OF LIGHT EFFECTED BY DEPOLISHING THE INNER SURFACES OF THE REFLECTORS SHOWN. THE RESULT IS DIFFUSED LIGHT WITHOUT GLARE

parallel (A) the light rays cross, giving a wider distribution than in (B) owing to the greater inclination of the shade's sides which redirect the light in a concentrating manner directly below the shade. The change in distribution of light caused by depolishing the inner surfaces of these shades is shown on this page. The amount of light which a shade should transmit above, toward the ceil-

ing, and diffuse below toward the floor, depends upon the conditions under which it is used.

No. 3, already referred to (page 32), a shade of an opal glass, characterized by innumerable spots, flakes and blotches within the structure of the glass —transmits almost as much light above as it reflects below. With such an equal utilization of light above and below the horizontal there is little to recommend such a shade in preference to an enclosing globe or ball of opal which gives the same equal distribution above and below, with the advantage over the cone shaped shade of hiding the glaring tungsten lamp entirely from view. In No. 5, the bright card tells a different story. This shade is made of dense opal glass which transmits only 20 per cent. of the lamp's light, above. A dead white, shell-like inner surface diffuses 80 per cent. of the total light of the lamp below the shade. Glassware of this type can be obtained in soft amber tones when lighted, and a grayish white by day. This is desirable since the shade takes on, by the diffusive properties of daylight, a modified color effect dependent upon and harmonious with the color motif of the wall decoration. Nos. 4 and 6 illustrate commercial shades of white opal glassware done in the conventional tedious "Sheffield"

design which has in a measure become as undesirable through common use as the ugly ribbed prism shades which are so commonplace and suggestive of the shop.

Opal glass, unlike prismatic, has no stereotyped malformations on its outer surface, and an infinite variety of designs may be executed thereon in decisive *bas relief* effects which give character and expression to an interior.

As a race we Americans are if anything progressive, and progressiveness and originality should go hand in hand. We do not ape our neighbors in the decorating of our homes, striving instead for something different—something expressive of character and refinement. We would never introduce the vulgar and typical ornamentation of the barroom in our homes, yet unthinkingly we use ugly glassware which is just as typical of such undesirable environment. Hence, aside from the vital question of glare, the first fundamental esthetic consideration is to select glassware which is not like the prismatic shades of the store, office and shop window. Look about you, and when you have noted the type of glassware which is most commonplace in your locality, insist upon having something absolutely different for your home. The chances are one hundred to one in favor of your getting some-

Along the ceiling of this bay window lights were placed in silvered reflectors. They shine through a lattice skylight of diffusing glass panels. With properly colored glass when viewed from within the effect is of sunset glow. This picture is taken from the veranda outside.

A veranda lighted with the usual porch lantern and containing a 40 watt tungsten lamp. There is a glare about the lamp and the porch is in darkness.

The same veranda illuminated with indirect lighting equipment using a 40 watt tungsten lamp. Note the increased brightness on walls and floor.

thing really artistic if you but follow this simple rule.

Once more, we have a new array of shades in our comparison booth awaiting our inspection. First let us compare No. 1 and No. 3 in the lower illustration facing page 32. No. 1 is a ground glass globe over a Welsbach reflex inverted gas mantle. I have mentioned before the fact that an inverted gas mantle gives more light downward from the mantle tip than a tungsten lamp and this we see is true in comparing No. 1 with No. 3—an ordinary prismatic shade over a 60 watt tungsten lamp. Prism glass allows at least 30 per cent. of the useful light to pass through the glass upwards—when clean—and reflects about 70 per cent. below from its polished inner surface. The prisms on the outer surface of the glass assist in this reflection to some extent—when clean— but not to the degree claimed by manufacturers. As a matter of fact the polished inner surface of the glass itself reflects at least 30 per cent. of the light which never enters the prisms.

Prismatic reflectors should never be placed within the visual field, unless interiorly depolished by acid treatment. In emphasizing this statement Dr. Percy W. Cobb, physiologist for a group of local tungsten lamp makers, states: "In

the case of prismatic reflectors it is only when they are so far away that the eye is unable to distinguish their individual surfaces, and the media of the eye can themselves perform the necessary diffusion, that there is any reduction in intrinsic brilliancy significant for the protection of the eye."

Owing to the ugliness of prism glassware, and the fact that it has become commonplace it should never be used in any home where motives of refinement hold sway. Realizing in a measure how obnoxious a set product can become through vulgar usage, manufacturers of this glass have attempted to overcome these objections by changing the shape and form of prisms and globes. These efforts have been unsuccessful for the very good reason that the prisms are so regular, unvarying and monotonous in appearance that they mar the surface of glassware just as smallpox pittings ruin the fairest complexion. If shades are to have any exterior markings these must be in the form of greatly varied ornamentation, not an unvarying series of bumps and hollows.

In the comparison booth just referred to, No. 2 is a fairly dense opal globe which compares equally with the prism shade in No. 3 so far as distribution of light is concerned. The difference in downward light between inverted gas mantles and tungsten

lamps is seen by comparing No. 1 and No. 5 where glass of the same type as No. 1 is placed over a 60 watt tungsten lamp—the difference on the cards being well marked. No. 6 is merely a "shade" in name only, being an ordinary piece of ground glass having absolutely no inner surface light redirecting properties. Let me place myself on record here and now in stating that I believe shades of the type described in this chapter have outlived as it were their usefulness. Even with depolished inner surfaces the tremendous brilliancy of the tungsten lamps, and the increase in brilliancy which must inevitably attend further illuminant improvements, will necessitate the use of totally enclosing glassware of an attractive character such as to differentiate and give dignity. Lamps will be placed within soft toned beautiful glassware eliminating glare, and every useful ray of light will be utilized by enclosed lamps in opaque reflectors which will redirect every ray of light in a manner suitable from physiological, utilitarian, and æsthetic requirements.

VII

LIGHT ON THE PATH

"Shine by the side of every path we tread,
With such a lustre he who runs may read."

THOSE partially enclosing shades, of the commonplace, ugly commercial type—the kind which must never be placed where they can be seen in the home—have certain useful applications where their ugliness is concealed from view.

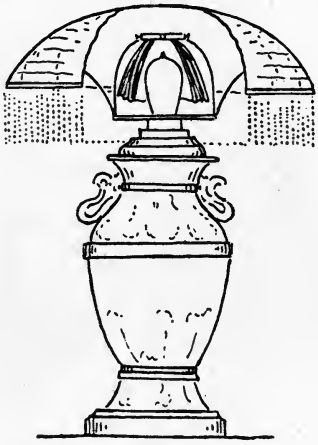
In order to appreciate just how incongruous shades of commonplace design are amid decorative environment, consider the interior rich in the period of medieval German Gothic architecture opposite page 33. These old iron fixtures thoroughly in harmony with their surroundings, and of individual pictorial value, are marred by the crude commercial glassware, which is almost as commonplace and obnoxious as prismatic glass. This shade, though it directs some useful light downward, allows enough transmitted light upward *through* the shade to give a requisite degree of shadow contrast in revealing the admirable

grotesque above. The desirability, therefore, is apparent of relating these qualities beneath a more attractive exterior, and this was accomplished by placing the form of a Gothic lantern over a smaller shade of opal glass snugly ensconced within, attaining thereby an economic utilization of light together with a perfect realization of esthetic requirements.

There are other applications where unattractive commonplace shades may be concealed, and similarly utilized with excellent results.

Portable reading lamps as they are usually manufactured and sold, while offering a wide variety of pleasing pedestal designs and beautiful effects in leaded art glass, have a most inefficient arrangement of lamps whereby a great amount of useful light is wantonly wasted—light which costs money and which is recorded on the meter whether or not it is utilized efficiently. The inner surfaces of these art glass domes generally consist of the unfinished side of the glass particles forming the design or pattern, and of too dark and non-uniform a nature to serve as a good reflecting surface. Hence, only the light from the side of the lamp exposed to the table top is effective, all the light from the upper side, within the art shade, serving merely to illuminate the art glass without contrib-

uting one bit of light on the reading page. Portable lamps with clusters of three or five lamps, throw a spot of light directly below the lamps, not covering a sufficiently wide area to meet the reading requirements of several persons seated around the table.



A Scheme to Make the Portable Lamp Give Better Light

The accompanying diagram shows how to make your portable give better light at a lower cost. Have a pull chain socket placed in an upright position as indicated. If the art glass dome is supported by a center rod, a simple wire shade holder, similar to those used on oil lamps, *concealed* within the dome, will permit a dense opal shade depolished inside, to be placed atop the lamp, as indicated. It is unnecessary to have this

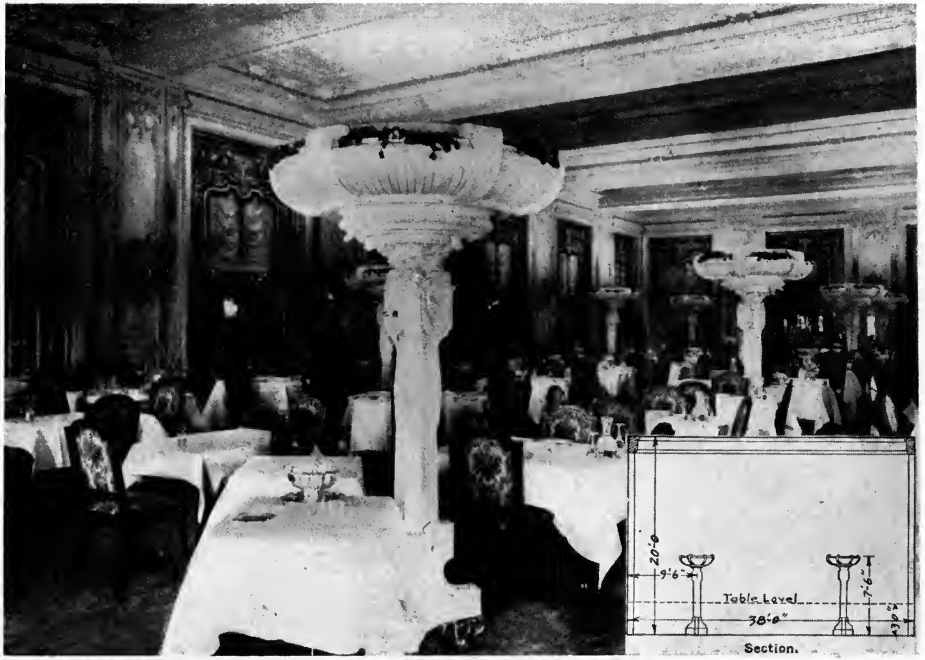
small shade supported, and it may rest on top of the lamp tip. The shade must be deep enough to come down and cover the light-giving wires, or filament of the lamp, else it cannot perform its function of redirecting light. The lamp and its shade must be well covered by the art glass dome. There have been some lamps like this offered for sale, but the mistake was made of using an inner shade of prismatic glass, producing glare and causing intense ocular discomfort to those seated within range. In selecting shades for such applications insist upon having amber opal, *depolished* on the inside.

In buying portable reading lamps always remember that the higher the pedestal is, the wider will be the area of useful reading light. A short squatty lamp, even with a shade applied as described, will necessarily have its redirected light confined within a narrow circular area below the lamp—not wide enough in range to enable more than one to read with comfort at a table so lighted. A cut shows how the rim of the art glass dome cuts the redirected light so as to leave the face of the reader in shadow, directing the light where it is most needed—on the reading page not on the eye. (Upper picture facing page 40.)

In earlier chapters I have spoken of the func-

tions of the eyebrow in protecting the eye. An excellent illustration of this is seen facing page 40 and it also shows a lamp which would be greatly improved by a higher pedestal.

Oftentimes a shade which is purely a shade, in the implied sense of *shading,* or protecting the eye, can be a re-director of light as well, if properly modified. For example, the glassware shown facing page 41 can be obtained in two forms, one rough and untreated on the inside, the other with an inner layer of white opal glass. The former has no re-directive power owing to the negligible quality of its dark, non uniform inner surface, while the latter with its dead white inner surface, redirects a higher percentage of the light which strikes it. Here again we have a striking comparison between modern gas and electric illuminants. Assuming that both globes are without white inner surfaces, and that the one on the left "E" is a tungsten lamp, and the one on the right "G" an inverted Welsbach reflex lamp. The tungsten lamp would be at a disadvantage since the greatest light (on the side) would pass through the glass in the direction "S" without being re-directed. The light from the tip "D" is of no greater value than if the lamp was without a shade. But with the inverted gas mantle "G" a much



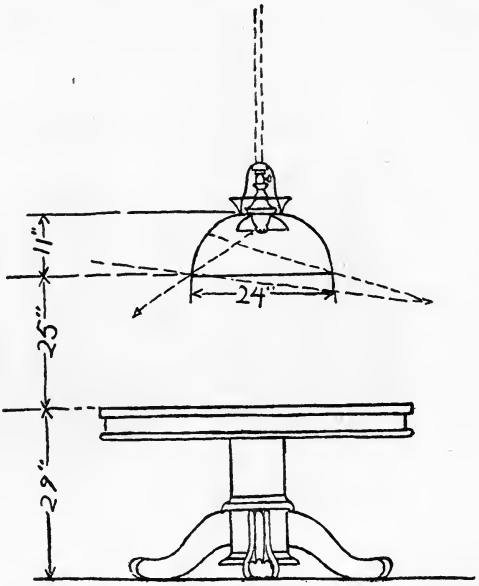
Dining-room in the Congress Hotel showing an example of original and artistic lighting. The pedestal contains powerful reflectors directing light to a white ceiling. The light is toned down with pink colored gelatine, giving a warm, rose-colored glow to the room.

Examples of the best types of modern glassware. Designs such as this are worked in amber colored glass, and appear in a variety of designs, some worked in the glass and some in *bas relief*.

greater light is given from the tip downward (D) with proportionately less passing through the glass in the horizontal direction G.S. With a white opal inner surface the side light from the tungsten would be redirected as indicated by the broken line "S"2, and would then be more nearly comparable to the Welsbach lamp from an economic viewpoint. On the other hand, the inverted glass mantle within a white opal interior would also have its useful downward light greatly augmented —the difference still being in its favor over the tungsten.

There is one other use to which these shades may be put, general enough to deserve special mention. Decorators will tell you that the dining-room dome is atrocious, that it should never be used. Nevertheless, this is more a question of individual taste than dogmatic prejudice. Thousands who live in apartments must meet existing conditions, and I am willing to predict that it will be many years before the dome becomes extinct as a light giving source above the dining table. Those who have them, naturally, would like to know how to make the best of them. The diagram shows a dome placed at the correct height above the table. The average dome, like the average portable lamp, is fitted with a junk-like

cluster of lamps most inefficient and un-economical. An opal shade—depolished inside—placed well up within the neck of the dome gives the best redirection of light and conceals the mechanism



See that the Dining Room Dome Light is Placed at a Proper Height. The Lamps Should be Out of the Line of Vision

of the thing entirely from view. Many a case of indigestion has resulted from constant nightly exposure of overstrained eyes and nerves to the insidious glare of exposed lights above the dining table.

The effect of such an arrangement, which is

decidedly effective, appears opposite page 46. This particular dome is lighted with gas, the chain being hollow. From a point near the door a pneumatic button enables one to turn the light on and off with equal facility. The brightness of the ceiling is caused chiefly by the light diffused upwards from the white table cloth. To find to one's own satisfaction how much light is really redirected in this manner, place the table cloth over the table and seat yourself facing some one opposite; at a given word whip the cloth from the table watching the features of your "vis-a-vis" intently the while. You will think momentarily that the lights were lowered almost to the point of extinction.

VIII

MAKING THE MOST OF LIGHT

"Walk while ye have the light lest darkness come upon you."

WE have considered the action of enclosing, and partially enclosing globes in modifying the effect of light sources. Perhaps it has occurred to the reader that in *general effect* these various types of globes and shades, all more or less resemble the same thing—a spot light dangling from or supported upon those obstructions to our view, which in moments of pleasantry we term "lighting fixtures." The lighting of the future will be distinctive if anything, and to-day those who have any other interest in lighting, save the sale of stale and inadequate equipment, are striving to indicate ways and means of expressing character, individuality, and attraction in lighting, with a reasonable and sane degree of economy.

It is quite natural and desirable that the light emitted by our modern illuminants should be utilized economically, but this must be accomplished with due regard for the effect and appear-

ance of such utilization. One of the most humorous incidents in the chain of grotesque accidents, which have marred rather than marked the path of lighting progress, was the extravagant claim of prism shade makers that their different shaped shades (withal so much alike that Milton's lines: "that other shape, if shape it might be called that shape had none" best describes the result) were an infallible panacea for all lighting ills.

When lights are absolutely concealed from view, in creating most beautiful and individual effects, differing entirely from each other, under these conditions of concealment the appearance of the light redirecting accessory is not important, because it is hidden from view. What we are most concerned with then, is its ability to redirect every ray of light from a lamp, so that the desired effect will be obtained in a manner both economical and efficient. Redirecting surfaces which accomplish this purpose are called reflectors and do not *transmit* light, being *opaque*—their inner surfaces reflecting light in proportion to their reflecting power. By turning to page 47 (upper picture) we will find our familiar comparison booths replenished with a new assortment of glassware—not shades or globes this time, but *reflectors,* awaiting our inspection.

No. 5, is a bare 100 watt tungsten lamp. The brightness on the upper part of the curtains shows clearly that the greatest light is in that direction and not *downward* from the tip of the lamp, as is proved by the dark card. In No. 6, a flat mirror plate is placed over the lamp, which accomplishes nothing whatever in redirecting the horizontal light downward, which is plainly evidenced by the fact that card No. 6 is as dark as card No. 5. This rudely shatters the delusion so fondly cherished by merchants who cover the ceilings of their show windows with mirrors, in the belief that great light is thereby reflected downwards. Card No. 4 shows the result of placing a cone shaped reflector of ordinary blotting paper over a lamp of the same size as that in No. 5 and No. 6. In No. 3 is a reflector formed by depositing a layer of pure metallic silver over a thin form of glass. Silver is the best reflecting surface known, and even while the light has to pass through the glass before touching the silver, and then back again through the glass, with two resultant absorptions the effect of this wonderful redirective surface is forcibly indicated by the brightness on card No. 3. Reflectors of this type—pure metallic silver on the back of glass—must not be confounded with the cheap inferior "quicksilver" reflectors, which are

A corner of a room where standard indirect equipment is used. The reflectors throw the light upon the ceiling from whence it is diffused evenly about the whole room.

This appropriate fixture is spoiled by ground glass and the ugly dangling lamp below it. Concealed reflectors would have rendered it beautiful.

In a small unpretentious hall general lighting is not necessary. This lamp provides sufficient illumination. The gas is controlled by a wall socket designated by the arrow.

being promoted by unscrupulous manufacturers. These consist of an ordinary quicksilver "backing" covered with a coat of enamel. The heat of the lamp, expansion of the glass, and its contraction, disintegrate the quicksilver and crack its enamel backing—which cannot be baked on. Pure metallic silver on the back of glass is elastic and does not crack, expanding and contracting pliantly with the variations of the glass itself. Owing to the series of bright streaks, or lines of light in the light-giving element of the tungsten lamp, bright reflecting surfaces multiply images of these lines, mirror like, and project them downward upon working surfaces where (if the reflector is not perfectly stationary above) a series of fluctuations most conducive to eye strain occur.

Reverting to the illustrated booths, page 47, No. 2 is an aluminum reflector, giving a streaked effect owing to its perfectly smooth inner surface. No. 1 is an opal shade such as previously described. It is shown here to illustrate the fallacy of using glassware which allows light to pass through and above in applications which require all the light below.

Now glance at page 47 (lower cut) and behold our comparison booth re-equipped for the last time. No. 6 shows the mirror plate again, with

its non-redirective effect as evidenced by the dark card below.

No. 5 is an ordinary newspaper hanging about the lamp, and redirecting some light below on the card—at the same time protecting the eye. No. 4 is the aluminum reflector over a Welsbach reflex inverted gas mantle, compared with a 100 watt Mazda tungsten lamp No. 3—in a pure silver reflector. Compare No. 4 with No. 2 (Fig. 1) and note the absence of streaks. This is due to the uniform luminosity of the gas mantle, which is free from the bright lines of intrinsic brilliancy characteristic of the Mazda tungsten lamp. No. 2 (Fig. 2) is the same blotting paper shade (No. 4, Fig. 1) and No. 1 is a Welsbach reflex inverted gas mantle within a thin globe of imported Austrian opal glass. The relatively greater downward light from the gas mantle over the tungsten lamp is particularly emphasized here, since even with the powerful silver reflecting surfaces over the latter there is not the tremendous difference which one might expect, and with the aluminium reflector No. 4 over the inverted mantle the contribution of its side light to that of the downward (mantle tip) light at least equals the effect in No. 3.

We have now reached a stage when it is possible to apply these elementary (but comparatively

unknown) facts to applications where the *cause* being known the *effect* can be more readily appreciated.

IX

INDIRECT LIGHTING

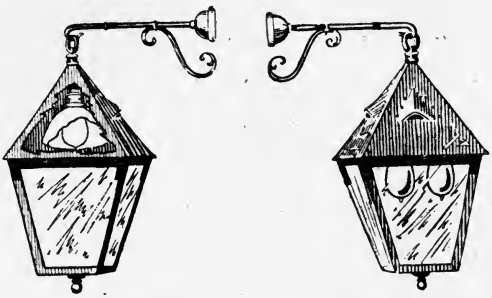
"In Nature's way, the Moon, at night,
Shines, indirect by borrowed light."

OPAQUE reflectors which utilize by reflection all the useful light generated by a gas or electric lamp, were, up to a few years ago, used mostly for display windows and industrial lighting—in those rare instances when anything but bare lamps was deemed necessary for protecting the eye, or utilizing light.

With the efficiency of modern gas and electric illuminants they afford a means of improving many lighting conditions which through the fixture manufacturers' ignorance, or neglect of modern requirements, are most unsatisfactory.

Every one has noticed lighting fixtures with bare lamps placed therein, causing glare and ruining the pictorial effect. Many a hall lantern is so glaring that one turns away with eyes painfully smarting. This represents money wasted, and cannot be termed artistic in any sense of the word.

The diagrams show how lamps are usually placed in lantern fixtures, and illustrate the remedy, consisting of an efficient opaque reflector placed high up within the lantern, and covering the lamp so that all its useful light strikes the reflecting surface and is redirected downward through the glass



THE PROPER POSITION OF LAMPS IN LANTERN FIXTURES IS IN THE UPPER PART OUT OF SIGHT. AVOID SUCH ARRANGEMENTS AS THE RIGHT HAND ONE

panels. This is an instance where ground glass might properly be used for lantern panels, since the lamp is far enough distant to avoid the suggestion of any bright spot, and the redirection of light downward by the reflectors' surface would be unchanged in passing through the ground glass, for reasons which have been explained.

There is a growing sentiment on the part of discriminating persons to obtain individuality in their lighting, and this can only be accomplished

by reconciling both decorative and lighting arrangements.

Shown opposite page 52 is such an effort on the part of one who would rather lead than follow stupidly in the beaten path. The result was obtained by placing opaque silver reflectors above a daylight skylight fitted with diffusing glass panels, spacing the reflectors uniformly so as to obtain a uniform luminosity of skylight surface, and hanging them high enough to avoid any suggestion of bright spots from below.

With the economy of modern illuminants there is no limit to the novel and pleasing effects in lighting which may be cheaply installed and economically maintained. By dropping white canvas curtains before windows, and reflecting light against the diffusing white surface of the cloth, an interior may be most agreeably lighted.

In the case of bay windows the curtain must be arranged in semi-cylindrical form, at least three feet distant from the glass. This requires a projecting and protecting ledge, which ofttimes may be perfectly concealed beneath architectural formations. The system is particularly applicable to bungalows with continuous veranda formations, the veranda roof affording an excellent position for the concealment of the lamps and re-

The table portable produces a homelike effect by leaving the walls in part shadow. This is an example of a good type of lamp, high pedestal and simple glassware.

The objection to the opaque bodies often used in indirect lighting is overcome here. This is an indirect unit with a small additional light used simply to illuminate the art glass bowl.

flectors. By covering the reflectors with gelatine film beautiful effects may be obtained. In this way a room may be suffused with the mellow radiance of sunset, or the soft glow of twilight by the turn of a switch. It is effects like these which make of artificial light something more than a necessary evil, something which contributes generously to the comfort and happiness of those whose desire for better working and living conditions, inspiring them to work out their own individual requirements on a broad progressive basis.

Several years ago, an enterprising individual, in fact a pioneer in the lighting field, conceived the idea of concealing the source of light from view, and by the use of enclosing reflectors, to redirect every ray of light from the source against the ceiling, thereby obtaining a secondary redirecting surface of wide expanse, obviously much greater than the comparatively small area of a reflector, which barely encloses a source of light.

Without going into the uninteresting and tedious technicalities it is a positive fact that so far as quality of light is concerned, indirect lighting is just as economical as direct. It has been urged by nervous competitors—manufacturers of stereotyped direct lighting equipment—that "regardless of their high efficiency in reflecting light, these

pure silver-coated reflectors gather dirt, being in an inverted position." With proper maintenance —easily and quickly given—this criticism is specious. Thousands of dollars are spent annually in washing windows to let natural light *in* but a very small amount is expended in cleansing globes and shades to let artificial light *out*.

Globes and shades are never cleaned, because lamp manufacturers have never been considerate enough of the consumer's satisfaction to print a simple inscription on their lamps' cartons explaining that dirty lamps give at least 20 per cent. less light. Indirect lighting reflectors give good satisfaction, if only cleaned once a month and then a dry rag will do the trick. The necessary thing is to have reflecting surfaces which will not depreciate from the heat of lamps, and crack or grow discolored, as quicksilver backed reflectors invariably do after a comparatively short use.

For the lighting of the home, single reflectors with 100 watt tungsten lamps, or upright Welsbach gas mantles give pleasing effects in interiors of average size. In larger rooms reflectors are grouped in clusters and concealed within artistic exterior molds, harmonizing with the decorative treatment.

To my mind the best feature about this new

method of utilizing artificial light, aside from the blessed relief from eye strain which it gives, is its versatility of expression. It matters not that the reflectors which direct the light against the ceiling are ugly, since they are concealed from view, and in effecting this concealment, any exterior form may be used. Hence, one is not limited in choice to a few varied designs in glassware, which, viewed from a distance, look more or less alike.

The florist may utilize his floral baskets to house his lighting equipment, the wine merchant his casks (iron bound) hanging from chains and the druggist his symbolic urns, or mortar and pestle. There is absolutely no limit to the expression of originality in designing lighting of this type, except the artistic perception and originality of the designer. Diagrams show how these reflectors of pure silver are grouped and placed within bowls of a composite material, called "compone" which can be finished to resemble exactly any metal fixture finish—old brass, brushed brass, ivory, verde antique, Pompeiian bronze, etc. (Page 83.)

In rebuttal of the assertion that indirect lighting equipment is too greatly influenced by deposition of dirt to be practical, the photographs opposite page 53 illustrate indirect lighting on verandas as contrasted with the ordinary fixtures

used. The same size lamp was common to both fixtures—namely, one 40 watt tungsten, and the difference depicted by the camera is no greater than actually appears to the eye.

This particular installation, one of several in the locality, receives a casual dusting with a dry cloth about every three months.

Of course, in lighting a room generally, as indirect lighting does, there is not the high bright light which obtains directly below a single direct light. On the other hand, where with such low general illumination beneath the shade but few persons could read comfortably, the general lighting enables one to read in any part of the room indirectly lighted. Let every one try this experiment on fixtures with upright or pendant gas or electric lamps. Shape a piece of white cardboard funnel like, and place it under the lamp (if pendant) or over it (if upright) so that the useful horizontal light from the filament, or gas mantle, is redirected upwards on the ceiling. The immediate relief to the eye and the pleasing aspect of the room with its wonderful increase of useful light will seem like a magical transformation, and in the majority of cases it is a matter of simplicity and inexpense to make the effect permanent.

X

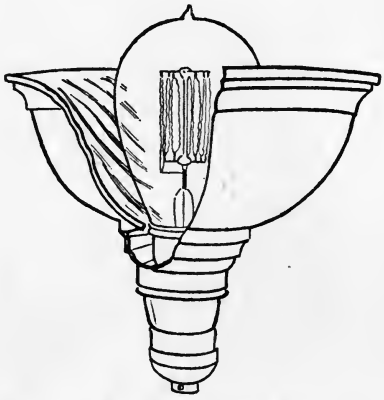
INDIVIDUALITY IN LIGHTING

"For the apparel oft proclaims the man."

WE have alluded to the possibilities afforded by indirect lighting for distinctive artistic effects, but this does not imply that fixtures must necessarily be purchased in their attainment.

Perhaps the lighting fixtures under consideration are so ugly that their removal would be desirable, and in that event it is not necessary to replace them by others, particularly where a low ceiling would be greatly improved by eliminating dangling impediments of brass and iron which serve to exaggerate the lowness of a room. An interior may be lighted by indirect lighting, the reflectors being concealed above and below the mantle top. Two 60 watt tungstens in pure silver coated reflectors shaped so as to redirect the light well toward the center of the ceiling, and not on the adjacent wall, are used, the control being in the form of a pull chain socket concealed at the mantle side next the wall. In this way, when pianos are

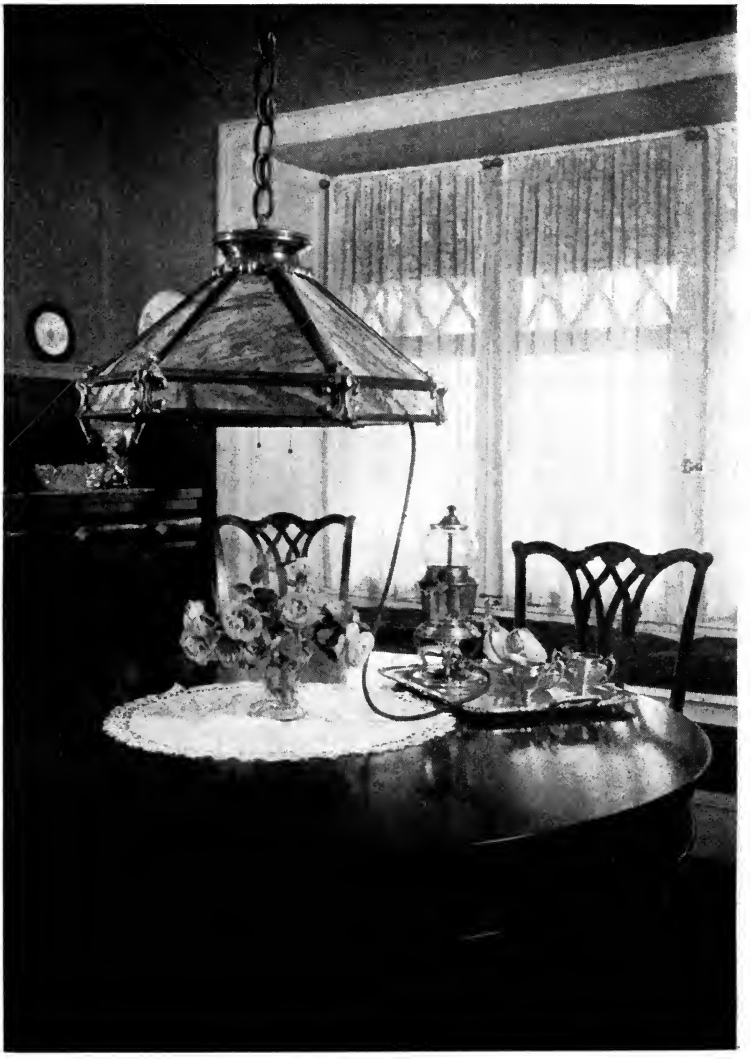
placed cornerwise, one lamp and reflector concealed behind will beautifully illuminate an interior. Very often there are urns and pedestals in the home which can be converted into pleasing indirect lighting units, simply by placing reflectors and lamps within them, and without changing



A Form of Indirect Lighting Unit Available for Home Lighting Effects

in the least their original exterior appearance. There are thousands of designs which are applicable to such usage, and which may be obtained in various material ranging from ordinary plaster and terra cotta to wonderful hand work rendered in wood and marble. The reflector in the diagram is represented in part section to show the proper position of the lamp filament with reference to the redirecting surface. In the same way

Indirect lighting is applicable to portable lamps. The powerful reflector throws the light upward to the ceiling whence it is diffused. Here the light is directed against the glass bowl which is used as a secondary source of distribution.



Users of gas should be aware that drop cords may be used from plugs in the floor. There also is an improved device by which a hanging table light can be utilized for gas much as it is for electricity

the top of a gas mantle should not project above the top of the reflector.

The Congress Hotel dining-room shows an interior which is an excellent example of original artistic treatment of light as a part of decoration. When one enters this interior, the first sensation is one of surprise—where is the light coming from? An involuntary glance at the ceiling follows, but fails to reveal aught resembling those ornate masses of gold and bronze which for want of a better name some unknown humorist has christened "fixtures." This then is the secret of attraction in lighting, as in all things: have something different. But here the difference is not alone due to the fact that for the tiresomely conventional ceiling fixtures have been substituted beautiful pedestal urns with reflectors concealed within, for there is something else more subtle than any material thing which holds one spellbound by its mystery and charm—and that is color —the psychology of light. For, in this beautiful interior there prevails a warm, soft rosy glow, emanating apparently from nowhere, yet, which lends to the complexion of the fair sex the delicate flush of a full blown rose. (Opposite page 60.)

This question of color is important in applications of indirect light—the more so because it has

been entirely ignored—that is, from all save the viewpoint of the Illuminating Engineer, who, knowing that white ceilings reflect more light than dark, and knowing little else, has unfailingly prescribed *white* as the only color for indirect lighting, because it is "economical" and "efficient" from the "utilitarian" viewpoint. By all means let us have lighting that is within the means of our purse, but why ignore forever those vital considerations of *"effect"* which means so much in differentiating the atmosphere of the home from the crude, ugly lighting of the store and office. I have repeatedly explained and demonstrated to manufacturers of lighting equipment, and their salesmen the desirability of amber light in the home. Within these pages I have logically proved the necessity for such color modifications. I have never yet heard of any one who made the experiment of modifying white light, who was not delighted beyond measure with the amber effect, both from the esthetic and physiological viewpoint. Decorators and architects unanimously agree with me on this point, yet, those others professing, or posing as competent to advise impartially on lighting matters, stubbornly exhibit a preference for the glaring white light of the tungsten lamp. The gas industry has intelligently rec-

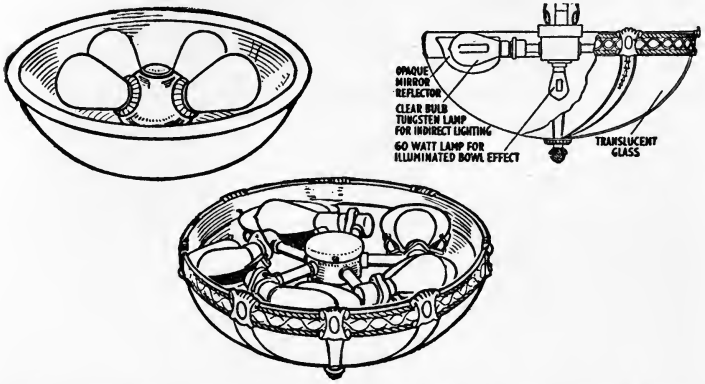
ognized modern requirements in supplying the amber light incandescent gas mantle. We must conclude therefore that those interested selfishly in the sale of electric illuminants fear to face issues which tend to awaken the mind of the public along lines of investigation opposed to the indiscriminate purchasing of inadequate equipment. Again, let the individual decide. Place over the top of your indirect lighting reflector a strip of amber gelatine film, previously described, and note the transformation in the room. It is not the true color values of material which we desire, but atmosphere, pictorial value, tone, feeling and expression of repose, which only amber light can give to the home at night. We have discussed in a general way the question of dirt deposition on these inverted reflectors for indirect lighting. Color modification assists greatly in this relation for if a strip of gelatine film be placed in a flat circular metal frame (formed by two flat circular strips of galvanized iron riveted together) it is a much simpler operation to dust off the surface of this than to delve down between the narrow confines of lamp and inner reflector surface. The Illuminating Engineer exclaims in horror: "But the absorption of light?" What of it? We have reached a stage of economy with modern illum-

inants when it is no longer necessary to turn every atom of light to brilliance alone in an insane misdirected, fanatical pursuit of "economy" and "efficiency." Let our lighting be a treat not a threat to our eyes.

And now there arises a question which has proved a bone of contention for wrangling manufacturers —principally because each one wanted the bone— and that is whether the entire concealment of a light source is desirable. Unquestionably, humanity has for centuries been accustomed to "seeing" a source of light at night. Unquestionably, hereditary precedent has perpetuated psychologically an influence on the subconscious mind that a light source to be appreciated at night must be seen. It has been urged that no matter how decorative the opaque exterior of an indirect lighting fixture may be that it appears to the eye as a dark unattractive suspended mass. This would be true if side walls and floors were black, but it must be borne in mind that the light diffused downward from the ceiling is in turn re-diffused by the walls and floor, sidewise and upwards respectively. Consequently with side walls and floors of moderate lightness in color, a sufficient amount of light reaches the lower part of the fixture to relieve any suggestion of darkness. It is readily understand-

able why manufacturers interested in the sale of glassware alone, who for years had things their own way, owing to public ignorance, should encourage such beliefs, but this effrontery in itself is no proof of the truth of such assertions.

From the lessons taught by our comparison



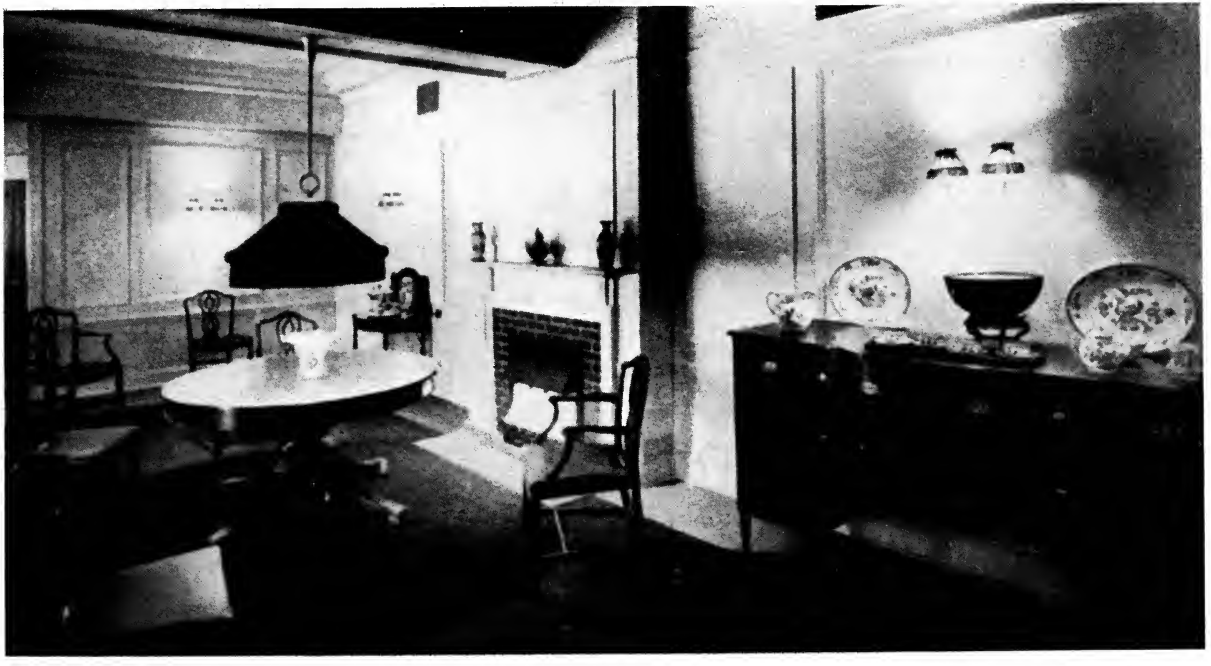
VARIOUS FORMS OF BOWLS USED FOR FIXTURES. AT THE LEFT A SEMI-INDIRECT TYPE. THE RIGHT HAND FIGURE SHOWS MEANS OF ILLUMINATING THE BOWL WITH INDIRECT LIGHTING EQUIPMENT; THE CENTER DIAGRAM IS UPPER VIEW OF THIS FIXTURE SHOWING REFLECTORS

booths we have well in hand the importance of light utilization, that is, directing light where it is required for specific usages—not where it will be wasted. Accompanying diagrams show this.

The figure at the left represents what glass makers have been pleased to term "semi-indirect lighting," meaning, presumably, lighting which is neither direct nor indirect, in which case the

designation is quite appropriate. If indirect lighting is to be of the slightest value, that is, if we are to obtain any benefit from the ceiling as a secondary diffusing and redirecting surface, it is imperative to direct every ray of light from the lamp upon its surface, or what is returned below will be of no value.

The glass maker has produced many attractive bowls and urns in opal glass, which are grateful and pleasing to the eye when not over-lighted, but when lamps are arranged in cluster form, as shown, the pictorial value and beauty of the glassware is not only destroyed, but the amount of light directed upwards on the ceiling is in most cases not enough to be of even utilitarian value. Such glassware, with lights so arranged, usually allows about as much light to pass downward through the glass (transmitted) as is reflected or diffused upwards, and almost invariably interiors mislighted in this way are recognizable by bright spots of light directly above the fixture on the ceiling, with intermediate dark spaces giving a spotty and unattractive effect. I have never yet encountered one of these arrangements where any difference in the amount of light in the lower part of the room could be detected after the fixtures were covered by strips of cardboard, absolutely prevent-



Side lights should be carefully arranged to avoid the spotty effect which is so noticeable here. By covering the tops of the shades and placing paper screens on the inside half sections of the shade, this ugly glare may be corrected. Side-lights, unless numerous, are more for decoration than use.

Indirect lighting is suitable for bedrooms since when it is efficient the light is usable in every corner of the room. Here, though the portable bedside light is very desirable, the side wall lights might really be dispensed with.

ing any light from reaching the ceiling by any redirective action of the inner surface of the glass bowl. This proves conclusively that quantitatively the light directed upwards by such bowls is of negligible value, not only from a utilitarian viewpoint but also from an æsthetic one since a spotty uneven lighted ceiling can never be described as meeting decorative or architectural requirements. Furthermore, to reiterate, in most instances the light wasted between the bare bulbs, with that transmitted through the glass downward, obliterates all design.

The diagram at the right shows how a very small lamp can be placed below silver reflectors arranged to direct all the useful light of the lamps upwards without waste. The center diagram, shown illustrates the appearance of such a fixture from above. Suitable glassware of a type which, like the alabaster stone, lends itself gracefully to indirect lighting fixtures is shown in the photograph (page 61). A wide variety of designs may be obtained from various glassmakers, so at present it is possible for one to select almost an exclusive design. The requirements of the future as regards individuality of expression will force glassmakers to cast sectional pieces of glassware, conforming with the fixture designs of lighting

specialists, and decorators, who must take lighting in their own hands if they would have it aid, not hinder, the expression of their work.

When one lamp is sufficient, silver reflectors may be so applied as to adopt the principles already elaborated. An attached opal cup diffuses sufficient light properly to illuminate the enclosing glass bowl.

Samples of the glassmaker's art in treating opal glass with designs in bas relief, are represented on page 61. This glassware is known as "Beaux Arts glass" and incorporates within its structure the property of transforming harsh white light into mellow amber radiance. The photograph facing page 66 shows an interior lighted by a standard indirect lighting equipment, consisting of small tungsten lamps within opaque silvered reflectors within an opaque composite bowl. The side walls and floor are very dark, yet, to the eye the design of the bowl is very pleasingly revealed.

XI

LIGHT IN THE HOME

"Where glowing embers in the room
Teach light to counterfeit a gloom."

LET us go through the home together applying our knowledge of lighting technique wherever it can serve us best in creating an atmosphere of attraction and repose. In lighting any interior, or exterior, we must first consider its objects and then arrange our lighting to best satisfy these requirements.

Beginning at the beginning we are now prepared to enter by the front door,—and for convenience we will hastily assume that the street lighting is all that it should be, that there are no unsightly poles directly before the house, and that no dazzling arc light, like a rising sun, peers offensively through our front windows, turning night into an unnatural day. Being on the veranda we are naturally interested in its lighting, of greater or less importance, depending on its size. On large verandas, in homes where social

functions are the rule and not the exception, the veranda light becomes an important consideration. I have explained the possibilities of indirect lighting for such applications, and will add that aside from its superiority over older systems from the utilitarian view point, it appeals to me particularly on account of the varied and graceful manner in which it may be applied: perchance in a floral basket, behind an ornamental cornice, within an urn, or in the form of a simple, yet, distinctive fixture, as previously illustrated. There is no more thoughtful way of speeding the parting guest than in lighting the path, so he will not break his neck in stumbling down dark steps. Of course, the control for veranda lighting must be placed inside, near the door, and in popular neighborhoods it is not amiss, oftentimes, to take the precaution of using lock sockets—a device which discourages free trade in lamps. With gas, remote pneumatic control, or an electric magnetic valve, can be cheaply installed, owing to the short distance for piping, and the very small tubes or wires can be "fished" through and above the veranda's ceiling without removing a plank or defacing woodwork. Electricians and contractors are not unwilling to work along progressive lines, but the stereotyped, narrow training which they have received from

the manufacturer of globes, shades, and fixtures, has given them the impression that all homes should be wired and lighted alike, with as similar equipment as possible, thereby enabling them to obtain the manufacturer's greatest discounts for "quantity lots." Hence the commonplace monotonous lighting of the present day, a natural result when lighting equipment is sold like sausages, by the yard.

Having lingered unduly on the veranda, let us proceed within, pausing for a moment in the vestibule. Here sometimes letter boxes are to be found, and there are keyholes to be discovered on dark nights. When architectural, or decorative expression is of a nature to justify, fixtures in the form of lanterns can be used, but unless exceptionally well designed it is questionable whether they add anything to the character of an entrance. With indirect porch lighting, one of its peculiarities is that one indirect fixture placed before a vestibule will direct sufficient light within for all requirements.

We are now in the reception hall, or just plain hall whichever extreme you prefer. The picture opposite page 67 represents an entrance where the lighting fixture is perfectly in accord with its surroundings esthetically, but so bad from a utili-

tarian point of view that a make-shift arrangement consisting of a ball above and an ugly dangling lamp below had to be added. Of course, the ball was of ground glass, as evidenced by its reflection from the painting at the head of the stairs. Here is a case where reflectors could easily be concealed within the top of the fixture and the whole entrance beautifully lighted by the soft diffused light from the marble ceiling above. The photograph beside it, shows a hall on a less pretentious scale. If the hall is to be used for no other purpose than a depository for coats, hats, and umbrellas, the lighting may be localized in preference to general illumination. General lighting always reveals. If there is nothing in our hall that would reflect admiration, the sensible thing to have is lighting which conceals and beautifies,—always with due regard for the necessities. Hence, if a hall mirror is frequently used, the features of persons using it must be sufficiently lighted. In such cases side wall brackets, such as described for bathroom lighting, only of more attractive design, can be used. When there is no porch light, the light of the hall must be so general and far reaching as to reveal the features of visitors. This can be accomplished more easily with gas than with electricity, by turning the light up and down. The fixture

shown in this case is an attractive opal globe, placed over a Welsbach reflex light. The remote pneumatic control, which I have previously mentioned, is conveniently placed near the door, and is designated by an arrow.

Passing on, we enter the living-room. Here is an interior, which under average conditions must serve several purposes, and each of these require special lighting. First we must consider occasions when a subdued light would be agreeable, and these are numerous. All during the day the woman in the home sees the same walls, the same decorations, the same pictures. Daylight, no matter how well modulated, reveals all these things. Hence at night, if artificial light can lend an air of mystery to the surroundings by subduing the light on the side walls, there is an added charm to such lighting which comes as a welcome change each night. This effect is obtained by the portable reading lamp, which has been previously discussed, and the effect of an interior so lighted appears facing page 72. When general lighting in such room is extinguished and the portable lighted the brightness of the side wall fades, and is replaced by a mysterious veil of shadow beneath which the walls recede, giving to the illusion a semblance of perspective which

is decidedly attractive. Old familiar objects are not quite so recognizable; their subdued aspect adds a new charm, and everything in the room is conducive to repose—if the light is right.

The table lamp shown is one of many types. By virtue of its high pedestal it distributes the light over a wide area. If a longer exposure had been made, the floor would appear as bright as the table top, even to the doorway, and in choosing table lamps it is well to remember this point—the higher the pedestal the wider the area of distributed light.

Some portable lamps are so faulty in construction that the lamps themselves are a constant factor of annoyance to those seated about the table. In such cases it is best to cover the bottom of the large art glass shade with fine linen, stretched by lacing on a wire hoop, which in turn is secured within the shade rim by small wires placed at infrequent intervals. This diffusing screen entirely hides the ugly unfinished mechanism of the lamp and enables a layer of amber film to be placed atop it, obtaining thereby the visual comfort of the oil lamp. Perhaps it may then be necessary to use larger bulbs, consuming a bit more energy, but in such extreme cases it is generally found more economical to pay the difference to the lighting

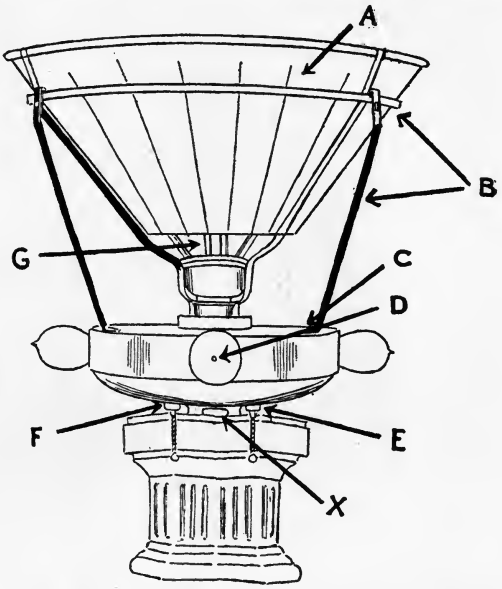
company than to the oculist. And the cost of the extra light is not apt to be great.

Opposite page 73 is the effect of the same interior revealed by indirect lighting with gas. The hollow chains conduct the gas to a Welsbach mantle within a silver reflector fitted with a small diffusing opal cap (previously illustrated) which illumines the enclosing bowl of Beaux Arts glass, just sufficiently to bring out its beauty. This general lighting of a living-room is required when company is present, and when one desires to attract attention to fine furniture and book cases filled with handsomely bound volumes of those books one is supposed to read. No matter how unprepossessing our ceiling fixtures may be, it is possible to modify its light as to color, and in eliminating glare, so these two systems of local and general lighting, both so necessary in living-rooms, can be enjoyed by almost every one. The center table is the best place for the portable lamp, because it gives a wide range of useful light, and that tables can be placed centrally without giving an overcrowded effect.

Both local and general illumination can be combined in one portable lamp, thanks to the ingenuity of makers of standard indirect lighting equipment.

So it is possible, without changing ceiling fixtures, to obtain both effects from one source.

The mechanism of such a lamp is very simple. (See diagram.) The tungsten lamp "G" is placed



THE MECHANISM OF AN INDIRECT LIGHTING EQUIPMENT FOR PORTABLE LAMPS WITH PROVISION FOR PRODUCING THE EFFECT OF LOCAL LIGHTING

within a silver covered reflector "A," supported by the holder "B." Light escaping from the lower exposed portion of the lamp strikes the flat white surface "C" and is diffused upwards against the *outside* of the reflector, which is finished in silver, and redirects the light against the exterior

silk shade, giving just the right effect. The small lamps "D" are lighted when a subdued effect is desired in the room: both large and small lamps are controlled by the pull chain switches "E" and "F." The illustration opposite page 78 shows an interior lighted generally by one of these lamps, the light being directed against the glass bowl above, which serves as a redirecting surface in conjunction with the ceiling by directing rays of light about the room.

A word as to drop cords hanging from fixtures to table lamps. These should be avoided when possible since their use detracts greatly from the general ensemble. Outlets can be located beneath tables without trouble or expense. For gas table lamps, there is a new floor baseboard connection which deserves mention, and is constructed so that the gas cannot be turned on accidentally. It may also be applied within dining-room domes, affording great convenience in connecting gas chafing dishes, percolators, toasters, etc., as shown opposite page 79.

Passing now from the living-room, we may skip the library, where the relations existing between a local and general lighting together with decorative restrictions are such that the indirect method best meets average conditions.

Now as to our dining-room, lighting here is greatly a matter of individual taste. Some like the conventional dome, others detest it and prefer candelabra on the table. Obviously no hard and fast rules regarding decoration can be laid down. Neither can lighting be universally prescribed so far as fixture design is concerned. If domes are used, by all means utilize your light so that none is wasted, as I have explained. Sometimes the side wall is selected as a desirable location for lamps, but unless they are very much subdued the effect is invariably bad. The photograph facing page 84 shows this point. The lights above the buffet produce a spotty effect against the side wall, which is neither decorative or useful. By covering the tops of the shades, and placing paper screens on the inside half-sections of shade next the wall, this condition can be corrected. Never expect lights so placed to do more than harmonize and assist in decorative expression.

Bedroom lighting also involves local and general systems. So far as the dresser is concerned, general lighting obviates the necessity for the local wall lights. (Op. page 85.) The small portable lamp is decidedly a convenience.

In the bedroom facing page 90 the illumination is not general enough to meet local requirements.

A modern type of gas fixture is shown, but the glassware represented is of the kind to be avoided, resembling too closely the commercial types of white opal, which have become almost as commonplace and obnoxious as prismatic glass.

Before ending our impromptu visit, let us speak of the kitchen light. The arrangement opposite page 91 is to be avoided. The single light casts shadows, and prevents those standing before the range and sink from getting sufficient light on their work. It is desirable to have one light source meet all the requirements of general and local working conditions, but this can only be accomplished by indirect lighting. When the entire ceiling of the kitchen becomes a redirecting surface, it is possible for a person standing opposite the gas range to see inside ovens with glass doors to the very back of the oven.

XII

LIGHT AND DECORATION

"Come forth into the light of things
Let Nature be your teacher."

AND now to turn from things utilitarian, let us consider the possibilities of light—reconciled with decoration in making the home attractive. It is not enough that light should serve only as a means of lighting our difficulties—solving the problem of more or less light here and there. General light and local lighting, however gracefully executed, still have something to be desired, something which even the most unpretentious home connot afford to be without. Because beautiful Italian alabaster bowls, and urns, and pedestals, rendered in hand-carved woods, and exquisite marbles are expensive, one should not feel that the pleasure of expressing individuality in lighting is denied him. These effects can all be approximated with cheap, good looking substitutes—graceful sconces and wall brackets in plaster, pedestals and urns in composition, or ordi-

nary plaster (treated), glassware in the form of bowls and vases made in this country, which almost defy detection when compared with the genuine hand carved alabaster. Those who have the natural artistic perception of the decorator—a quality which might be natural but can never be gracefully acquired or cultivated by the unimaginative, though women possess this gift to a degree superlative—can put together a conglomerate mass of miscellaneous material and express something which is really attractive, artistic and beautiful. All lighting, whether decorative or utilitarian, must meet physiological requirements. The lighting fixture which is glaring and hurts the eye can never be termed artistic, or even useful. On the contrary, light and decoration properly combined always satisfy the physiological necessities of eye comfort if not eye utility.

Let us see how light can be used to appeal to the imagination and create an atmosphere replete with charm and mystery.

The photograph facing page 96 shows a reconciliation of light and decoration. It is to be regretted that the camera does not reveal in this case the color contrasts, which are a veritable treat to the eye. The small art lamp beside the piano consists of a plaster column and capital

worth 50 cents. Through a centrally drilled hole wires lead from the base to an electric socket atop the column and within the glass dome, which is of mottled glass, old rose in tone, with suggestions of lighter and darker color modulations, all blending charmingly. Such a shade may be obtained for less than one dollar, with its holder, which fits over the socket, within which is an attachment for obtaining various degrees of light.

The small round bulb tungsten lamp is so high up within the shade that it is invisible to persons seated in the room or at the piano. A piece of amber gelatine film held together in cylindrical form by two ordinary wire paper fasteners, completes the color modification, and the lamp is supported by a plaster capital finished in water colors to harmonize unobtrusively with the dark green wall. Against this practically neutral background (at night) this graceful lamp with its shade of old rose is just bright enough to emphasize its value as a decorative symbol. A touch of a switch and the music page becomes bright without spoiling the effect. The features of a soloist standing by the accompanist, facing the occupants of the room, are suffused with a rosy and becoming flush, relieving even an unnatural pallor. Another decorative treatment of piano lights (frontispiece)

is the use of candlesticks with appropriate silk shades. These must not be over lighted. Too bright lights in decorative shades destroy their pictorial effect, and annoy the eye.

Within the shade of the side lamp—again on page 96—an opaque screen of asbestos placed close to the lamp prevents the splotch of wall light (as typically shown facing page 84). The small picture artistically placed below the lamp is lighted with a dull red glow, produced by a small "V" shaped section of red gelatine film placed within the shade directly above. Thus the "Fall of Babylon" suggests to the mind, by the psychological influence of red light, that vibrant sense of impending disaster which is the predominant theme in this wonderful painting. Above this small picture is a water color reproduction of Burne-Jones' famous work "The Awakening of Galatea," and, suspended from the jaws of a gargoyle by antique chains hangs a plaster replica of an old Egyptian urn. Within, a lamp placed in a small silver coated reflector covered with scarlet gelatine film casts a rosy glow upwards, which in turn is rediffused downwards by the ceiling, conveying with just sufficient emphasis the flesh tints betokening the awakened life of the beautiful Galatea. The lower portion of the body receives just a touch of

white light from a slit in the side of the urn, enough to mark the gradation twixt marble and flesh. Below, the figure of the sculptor Pygmalion, kneeling reverently at the base of his masterpiece, is barely revealed beneath impressive shadows. Thus, the interpretation of the artist is enhanced and the theme of this legend of ancient Greece embellished by light and decoration combined. From any viewpoint in the room the effect is equally perfect, there being no glaring reflection from the picture-glass, so characteristic of all our art gallery lighting.

Above the piano is a small cabinet, serving to support a transparency invisible by day but at night revealing two little owls upon a tree branch sharply silhouetted against the full moon. These transparencies are called Spookie Shades and may be obtained in a wide variety of designs—they are most inexpensive. The player at the piano by the touch of a switch may diminish or increase the quantity of light on his music without destroying the pictorial effect by a burst of light—the music page alone being brightened. In other parts of the room light has been directed upon a picture or even shines through the canvas of a work in oils by small lamps placed against white asbestos grounds, or in small home made reflectors of as-

A reconciliation of light and decoration. Here touches of light are used artistically in co-operation with the fixed articles of decoration. Even the spirit of the pictures is interpreted by light.

An ingenious treatment of a narrow hall to overcome the usual cañon-like effect. The walls are subdued and a pale green-blue light cast through lattice counterfeits moonlight.

bestos concealed beneath architectural projections. Thus where an object is to be emphasized or its effect heightened—light may be used to bring out its beauty.

In these decorative touches of light, the small electric lamps offer a ready means of attaining many pleasing effects. Perhaps the best way is to use what is known as a transformer, which cuts down the regular commercial voltage supplied at one hundred and ten volts to six or eight volts. This voltage involves no fire risk, consequently small silk-covered wires of the same color as the wall paper can be readily concealed and distributed without difficulty or expense. When the main switch is open, no electricity can pass through the transformer, and the lighting of the small lamps, of course, denotes that the switch is closed—hence they constitute their own danger signal. In concealing these small bulbs within vases, to give life to a sprig of blossoms therein, small reflectors of white asbestos, funnel-shaped, may be easily made.

Be sure that the light radiating portion of the lamp lies well within the reflector, else its redirecting powers will be nil. A touch of light on the dial of an old clock, the beautifying of a picture, as described in previous pictures—the glow of an open hearth, and other and innumerable touches

of light—used as an artist would apply his brush to a painting—are only limited by the imagination and artistic perception of the individual, which is measured, incidentally, by the finished appearance of his work.

It is to be regretted that electric illuminants may not be so conveniently regulated as gas. The satisfaction of turning a lamp up, or down, gradually, in perfect harmony with one's various wishes, is very great. True, there is an electrical attachment on the market which accomplishes this in a way, but the various gradations are too abruptly marked, and its application is limited. To those who appreciate the ability to control electric light in the home with the same facility as gas, the use of "dimmers" such as are used in producing theatrical effects, are recommended. These are obtainable in various sizes, and may be placed on the wall near the point of control or switch. Very often they may be concealed at the side of a piano or behind a large picture frame. They consist of a resistance wire imbedded in fire-proof material and contact with the wall is prevented by projecting arms, which serve to hold them in place. Any intelligent electrician will know how to install them in accordance with the regulations of the Board of Fire Underwriters.

On a bookcase (page 97) a simple candlestick with its shade of pink silk delicately illumines the face of an old French clock, and brings out the rich brown tints of the old wood, while at its base the lines of a bronze are suggestively relieved by silhouette.

Oftentimes the pink silk candle shade which one buys (under daylight conditions) because of its desirable color for a certain contrast background, when placed in position over its miniature lamp, and viewed by *transmitted* rays of artificial light, with chameleon-like perversity turns white!

Hence this little silk shade, which by day blends so charmingly and inauspiciously by contrast with its decorative surroundings, by night becomes offensively predominant, detracting from the beauty of the ensemble.

The use of this gelatine film, available in all colors, enables one to obtain as agreeable an effect at night as by day—without impairing the appearance of the shade so treated under daylight conditions.

Another wonderful effect is inexpensively produced by diffusing a soft light through a panel-skylight of stained glass set in the ceiling of a bay-window embrasure. The light shining down upon a fern is like the glow of sunset (page

52). This involves a simple wood framework with panels of diffusing glass. Two 40 watt tungsten lamps attached to the ceiling in silver covered reflectors direct light downward through the glass —a pull socket with the pendant chain concealed behind the portières affords a reliable means of control. The front of this skylight may be masked by a false wall or border, extending above the molding line. This may be formed of tarred paper, painted over, and can be used as an effective situation for art plaster relief work in flat panel format (facing page 97). Behind in a lamp box, a transparency depicting an impressionistic scene, gives the suggestion of an extensive perspective through the Moorish arches—a touch of realism in light and decoration made possible by the economy and durability of small tungsten lamps.

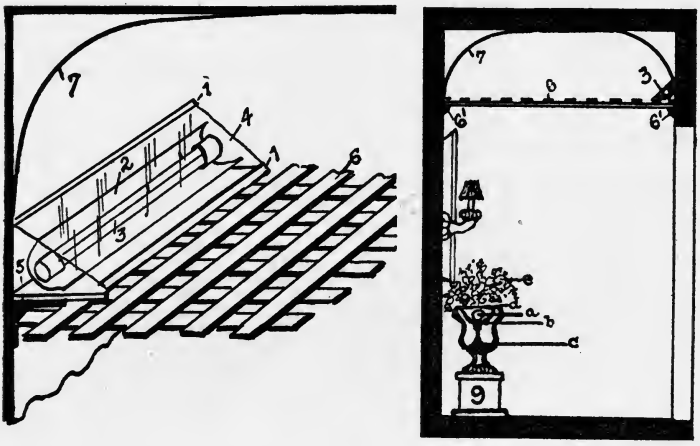
Opposite page 102 is pictured light used as an artist does his brush in delicately emphasizing details. Below a landscape in water color a candlestick with a pink silk shade softly reveals the picture, the pink flowers in the foreground seeming to be a part of the shade. This same floral motive is further emphasized by a sprig of blossoms in a tall urn at the right, within which just enough light escapes upwards to give a touch of life here and there to the drooping branches with their

pretty blossoms. To the left, seated upon an antique jar, a Billiken is revealed in a ruddy glow, warming his toes and grinning amiably the while. The strong directional light from below gives the requisite degree of shadow contrast necessary to properly convey his grotesque expression. The silk shade allows enough light to pass below barely to reveal a delicate bronze and an exquisite sample of cloisonné ware. Beneath the shelf on which these rest, is a color reproduction of Maxfield Parrish's "Old King Cole and his Court." Directly below the enthroned figure of the merry monarch, a light concealed in a small trophy cup illumines the king's countenance and the expression of rather forced gaiety of his court jesters—perpetually obligated to laugh at the king's jokes. At either side inexpensive urns of Parian marble, lighted by miniature lamps, cast a soft glow over the scene. Here is light used so that the eye is attracted and pleased. One never tires of looking at this picture painted with light, because it has not violated in the slightest any physiological and æsthetic commandments.

These effects, though shown in juxtaposition, are of course merely suggestive, their application suiting various situations not in combination. They are easily obtained, if one will only take the

trouble to try a few experiments, to be judged by the eye alone.

The hall, too, can be relieved of its cañon-like narrowness and height, so common to some houses. Opposite page 103 is an arrangement where the



A Plan for the Treatment of a Narrow Hallway: 1, Narrow Molding; 2, Blue Gelatine Film; 3, Tubular Lamp; 4, Curved Reflector; 5, Supporting Moldings; 9, Urn and Pedestal with Light to Shine on Flowers (e); (a) Lamp; (b) Reflector; (c) Support

usual, tiresomely conventional hat-rack and umbrella-stand are absent. From above a latticed ceiling streams a light like that of the moon, making it seem like a loggia open to the sky. The light brings out softly the outlines of an Italian urn, while above the entrance arch a globe of soft

golden hue is contrasted with what appears to be the blue sky overhead.

The drawing on page 108 is a self-explanatory diagram showing how to obtain this effect, which may be infinitely varied to conform with local conditions and individual preferences.

The improved economic state of modern illuminants has made possible these new uses of light. Unquestionably there will be still further improvement along economic lines. If these suggestions shall be the means of bringing home to any one a greater appreciation for those comforts and pleasures which artificial light has to bestow, and with such lavish prodigality, then has the mission of this book been accomplished.

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