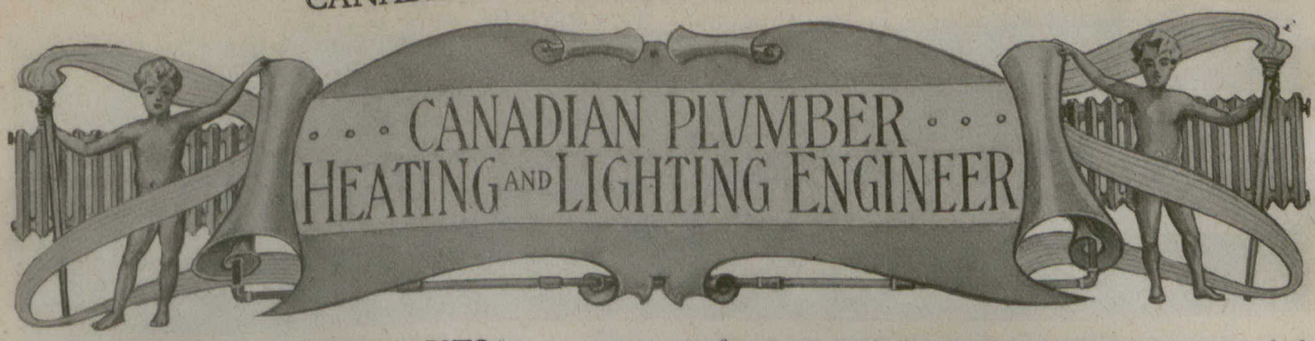

INDOOR ILLUMINANTS.*

BY JAMES SWINBURNE, F.R.S., M.I.C.E.

It is quite worth the while of the man who has to look after the lighting of a big building to become a specialist to some extent in illumination. The only difficulty is that an engineer-in-charge has to be a specialist in so many branches of engineering that he has not very much time available. Some day we may have illuminating engineers who are not supply electricians or gas engineers, but concern themselves with the application of electrical power, gas, petroleum, and acetylene to lighting, dealing with each on its merits without partiality. At present the question is left generally to architects, house decorators, and chance has far the most to say in the matter.

Before going further I may as well say at once that I have no claim to be called an illuminating engineer, and I am not going to try to lay down the law in any way; all I want to do is to bring various points forward that seem most interesting and important, and to start a discussion in which we may all compare experiences. The first point to consider is what we want to produce and what the real goal of our labor is. If, instead of beginning at the manufacturing end of the matter, we go to the other extremity, we find that what we want to do is to affect the retina of the eye. The object of all lighting is to get the maximum of light on the part of the retina desired, at a given cost. People use artificial light for reading, writing, and seeing one another, and for finding their way about. Women also use it for sewing.

In all cases the important point is that the eye should receive plenty of diffused light from the objects that are to be observed, and as little light as possible from any other surface. The last part of this is most frequently overlooked in lighting a building. Most people photograph in our days, and no one dreams of making an exposure with the sun shining into the lens, that is to say, the camera is always arranged so that, treating it as an eye, it does not see the sun. The eye is something like a camera provided with a portrait lens with a very large circle of illumination. That is to say, the lens of the eye gives very fine definitions over a very small area and gives very little definition over a very large area; in fact, if you are looking straight in front, the eye can notice the movement of a piece of paper, not only at one side, but even a little behind, so that it corresponds to a lens taking in more than 200 deg. It is, therefore, sometimes difficult to arrange lights so that they do not shine into the eye. The eye is shaded above by the eyebrows, however, and this makes the problem easier to solve.

If the sun is allowed to shine into a camera, light gets reflected from the brasswork of the lens mount, or from some of the surfaces of the elements of the lens, and makes marks on the plate, or it illuminates the bellows so strongly inside that the plate receives a lot of light which is not meant for it. In the case of the human eye this does not happen so much. What happens in the case of the eye is that it finds it is getting more light than it likes, so that it automatically closes its iris diaphragm. This is one effect which is probably produced by strong lights, even if the eye is not looking directly at them; but a much more serious matter is that if a strong light comes into the eye at all the eye is automatically turned to look at it, so that the image is formed on the most sensitive part of the retina. This produces two results: the iris is automatically closed and the retina becomes fatigued, or the eye is dazzled, and the sensitiveness is lost until the eye gradually recovers it. It is, therefore, most important that the eye should not be exposed to bright lights. It would be almost impossible to light a public or any other building economically entirely by diffused light with all the lamps out of sight; but the evil of direct lighting can be very much reduced by arranging lamps so that they are high enough not to shine directly into the eye, except from a good distance, and so that they are small as to candle-power, and large in area, and give diffused light. From a physiological point of view, therefore, the sources of light should not be intense, but should be small and numerous. or should be out of sight.—

*Abstract of a paper read before the Association of Engineers-in-Charge, November 14th, 1906.

FLANGED JOINT WORK.

Carelessness in bolting up flanged joints frequently leads to disastrous results. It often happens that when joints do not come squarely together, the workmen, instead of seeing that the line is made square so that the joints will come together properly, will undertake to spring a very rigid piece of work in the bolting, the result being that if something does not give way under this strain on the bolts, it very likely will do so when the pipe is subjected to expansion and contraction.

Another blunder frequently made by workmen is in not taking pains to tighen the bolts evenly so that they will all be brought up together to the same tension. They will start in and tighten up one side, hard, and then when they come to tighten the opposite side, it throws a very severe strain on the side first tightened. If the flange is not broken by this strain, there is the same danger we have mentioned above, that is, that it will break under the strain of expansion and contraction.

It also frequently happens that when leaks occur after steam is turned on they are not promptly and properly attended to. This, of course, is very bad practice, for every engineer knows that if a leak is allowed to run for any length of time it will injure the material, either the metal or packing of both. Furthermore, it will then be impossible to tighten it by screwing up the bolts.