

DEFINITION OF AIR CONDITIONING

It would seem, therefore, that a logical definition for air conditioning from this standpoint, to act as a foundation for further enlargement on the subject, would be as follows: *The obtaining of pre-determined effects upon material, persons or air in an enclosure, by treating them with atmospheric air whose temperature, moisture content, relative humidity or purity, singly or in any combination, are under control.*

An analysis of this definition may indicate the real importance of this science. Prior definitions and, it may be said, the term "air conditioning" itself, deem to have circumscribed and clouded it. It has always been the tendency of lay engineers to assume, partially due to the name with which the science has been christened, that the ultimate object was to control the heat and moisture of air, as much for its own sake as for any other. It seems, today, that only the expert industrial conditioning engineer visualizes the subject in its broadest sense and sees the treatment of the air as only the means to an end; he, only, realizes it to be a necessary step in a process whose object is not the functioning of a scientific toy, but a real industrial triumph measurable in dollars and cents. The manufacturer and his advisory engineers, educated as they have been on the basis of the narrower definition, for considering air conditioning, cannot be blamed when proposing it for the factory, as a luxury. Presented to them as a means of obtaining a new or a more perfect product, or of eliminating a stumbling block in the way of progress, the reaction is dramatically opposite, and the proposal is considered in the light of offering a necessity.

How are these valuable reactions in "persons, materials and air" to be obtained? As concerns materials, and by that is meant all solids (and, in special cases, also liquids and gases) which are raw, partially finished or finished materials in industrial manufacture—consider this fact; with few exceptions they all, depending upon the physical characteristics of the surrounding air, vary in moisture content. Furthermore, this variation and moisture content has a specific effect upon the appearance, weight, texture, conductivity, strength and workability of the material. Taking these two facts together then, it is evident that one who knows their interrelation as applying to each specific material, can, by a change in the atmosphere, mold and shape the physical character of the material at will. Such a phenomenon can be understood when a comprehension of the basic principle of the industrial phase of air conditioning is obtained. The law is, that the moisture in the air, varying with its concentration (practically independently of its temperature) exerts a definite pressure; also, that the moisture content in a material exerts a measurable pressure, varying with its concentration and the temperature of the material. When a material is fully immersed in air, there is an immediate tendency for the vapor pressure to equalize; if that of the material is lower, moisture will flow into it—if higher, moisture will flow out of it, until, if time is given, a balance is arrived at. Now, therefore, if the surrounding air is held at a given vapor pressure and temperature, a predetermined moisture content of the material is the inevitable result. The time element enters into this as into all processes, also an unbelievably great background of experimentation; but the basic principle remains simple

and understandable. *Relative humidity*, that one term besides *temperature* which is known to the reading public, is the only measurable condition of the atmosphere, which, being controlled, in turns governs both essentials—absolute moisture and temperature. The fact that there are several different ways of controlling this relative humidity, while interesting to the specialist, is not essential information as far as this exposition is concerned.

In general, as regards people, the phenomena of heating, cooling, high or low relative humidity and purity of air in which they live, have been thoroughly investigated and the results to date cataloged.

The increase in efficiency of workers in an atmosphere of moderate temperature and humidity, over that in extreme heat, cold and moisture,

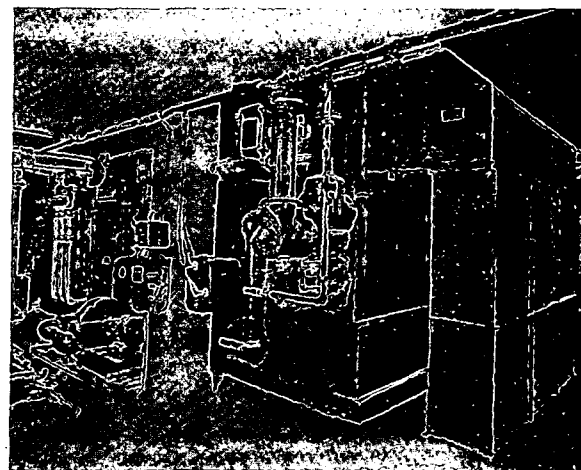


FIG. 64. AIR CONDITIONING PLANT IN CALIFORNIA THEATER

the decrease in sickness and absenteeism, when the workroom atmosphere is pure and fresh, are too well known to require more than mention here. Every one has, on himself, noted the effects of the extremes of the seasons and needs no more than a reminder to recall them. A committee of this Society, and several distinguished members, have presented reports and papers on the subject—figures are available for proof that comfort of workers is a practical consideration in industry, showing monetary dividends, whether the conditioning is primarily for the workers' benefit or has these advantages to add as a by-product to those arising from an installation made for other purposes.

The effect on air, other than that which has undergone specific treatment, may be taken to be the third important function of air conditioning, either when considered alone or in combination with the hydro-metric treatment of materials. Any drying system in which the drying air is recirculated and mixed continuously with air pretreated for the