reputation as an efficient, progressive business or engineering organization whether customers and salesmen who call at your office leave with a good or bad impression.

Combining the Elements.—We now come to the final element in building up an office organization—that of combining the three elements already discussed into an efficient organization. That is a problem in departmental organization that is different in each case. You must analyze the whole situation and, in some form, have before you a map, plan or schedule of all the different kinds of work to be done, and you must know the capacity of your workers, also the approximate time required to handle each kind of work. Only then can you proceed to assign duties so that they will be promptly and accurately performed.

Draw up a chart that will clearly show the relation of every employee to the organization as a whole, and specify his authority. A chart of this kind, when distributed or placed in a position where everyone can see it, will avoid any amount of friction and misunderstanding.

One way to create a smooth working organization is to have it conducted by a number of committees, which plan can be carried out throughout the entire concern. In an ordinary office there should be an executive committee, a factory committee, an advertising committee, an office committee, an office appliance committee, an office system committee, etc. The executive committee is usually composed of all the active heads; that is, the heads of the five divisions already referred to. The office manager and his chief clerks usually form the office committee, and this committee in turn appoints members to the office appliance committee and to the office system committee. The minor committees decide questions within their scope and suggest improvements to the higher bodies. The office manager should be the final authority on matters pertaining to the office except as they affect the policies of the house. His committee and the minor committees act in an advisory capacity, and this is as it should be, because the office manager is held personally responsible for the success or failure of his organization.

Along these lines a really efficient office organization can be built, but this, however, is only half the problem. There is still the important task of guiding and directing the organization so that it will produce the results required of it, which comes under the head of office management.

A competent supervising organization is worth more to a business than money, equipment, and market, because perfect organization can secure all these.

WATER PURIFICATION WITH BAUXITE.

A FORWARD step in water purification is announced in a paper read at the annual convention a few weeks ago of the American Waterworks Association by Mr. C. P. Hoover, chemist, Columbus waterworks. He describes a new process, perfected there, which is claimed to be an improvement over the present largely used process of coagulating water by applying a solution of ammonium sulphate, previously prepared by dissolving crystal alum in water. In the new process syrup of alum is fed directly into the water supply. The following paragraphs explain the method and compares it with the old.

Lump alum is a combination of bauxite (a clay containing from 58 to 60 per cent. alumina, the aluminum being present as $Al_2O_5H_4$) with sulphuric acid. By mixing the two in lead-lined tanks and boiling for a period of from six to eight hours, the first step in making the alum is taken. The following reaction takes place:

$$Al_2O_5H_4 + 3\ H_2SO_4 = Al_2(SO_4)_3 + 5\ H_2O.$$

The resultant solution is a mixture of aluminum sulphate and silica, and must be filtered to obtain the clear aluminum solution. The filtering process is perhaps the most costly, tedious, and annoying step in the whole procedure of alum making, because the finely divided particles of silica present in crude sulphate solution quickly clog the pores of the filtering medium to such an extent that it is often necessary to force the material through the presses under considerable pressure. After being filtered the alum solution is boiled to expel the excess water. The expense of concentrating the syrup must be taken into consideration, because the density is increased from between 25 and 30° Be. to a density of between 58 and 60° Be. The solution is then discharged into trays, and on cooling crystallizes to the alum cake. Then crushed or pulverized cake is shipped either in bulk, in barrels or in sacks.

In the new process bauxite and sulphuric acid are boiled in lead-lined tanks until a basic solution of aluminum sulphate is obtained. The solution is then diluted with water (usually enough water is added to make 500 gal. of the solution, equivalent to 1 ton of 17 per cent. Al_2O_2 alum), and measured as needed into alum solution tanks, where it is diluted with sufficient water to make a standard solution, which is then applied to the water under treatment. By this process five distinct steps in alum making are eliminated—filtering, concentrating, crystallizing, grinding, and redissolving.

The plant comprises two lead-lined boiling tanks, two alum-measuring tanks, one acid-measuring tank, one sludge tank, one storage tank for sulphuric acid, one crusher and one pulverizer for the bauxite, conveying, elevating and transmission machinery, bauxite storage bins and weighing device, piping, valves and fittings. This plant, some features of which have been made the basis of patent application, has been in continuous operation since the middle of January. The plant was finished and the first alum made on December 25, 1914, but experiments had been carried on for two years.

The requisite installation cost $12,000 and the annual saving to the city has been estimated, conservatively, at $6,000. Between 800 and 1,000 tons of alum will be made at Columbus this year at an approximate cost of $10.50 per ton.

The crude alum solution containing silica or other inert material from the bauxite, probably better defined as chemical mud, is applied to the water under treatment, the chemical mud mixes with the suspended particles present in the water and finally becomes entrained or coagulated by the precipitated aluminum hydrate and settles out in the settling basins. The crude solution, containing the chemical mud in suspension until the metallic sulphate has been converted into hydroxide, has a function not possessed by alum solution prepared by the old process, namely, forming a matrix or nucleus for starting the coagulation. This feature produces not only more efficient results with less coagulant, but also affords the process universal applicability irrespective of any lack of natural turbidity.