

These companies are equal to the average in this country as to buildings and equipment. The tempo has been slow, however, and they have therefore been unable to do as much as they should with the available money.

In addition to the Gantt methods of planning and scheduling, costkeeping, storeskeeping, the Gantt charts, and the Gilbreth process charts for continuous processes, we have developed methods for executive direction and for the determination of the major policies of the company or groups of industries.

We often go so far as to schedule on Gantt charts our own work of installation; for instance, at the beginning of last year, after we had spent six months with a client, we signed a new contract and at the same time drew up a schedule of our visits throughout the year. The dates for the beginning and completion of each installation in the various shops were set down. Copies were given to the Directors and each week the lines moved across the charts in accordance with the progress made. At the beginning of this year we went over the previous year's charts with the Directors, drew up a new schedule for this year and signed another contract. We find these charts extremely valuable in securing the prompt co-operation of executives in issuing orders and in getting things done quickly.

Of course we have schedules showing where every member of the staff is to spend his weeks, for it is difficult to have their visits properly timed. Each visit to a plant consists of five days, Monday to Friday, during which time we go over the things we have asked to have finished before our arrival and see that they have been properly done. We then introduce the new features, explain them thoroughly and actually begin their use. By the end of the week we have written a report which we discuss with the executives on Friday afternoon. In this we frankly state the situation in each part of our installation, give detailed instructions covering the new methods introduced, together with the reasons why they were needed, and finally, write down the things we expect them to do before our next visit. This report must necessarily be condensed and clear. We find it of great value in securing action on our recommendations.

During the early part of a contract we visit a plant every second week, later every third week,

and when things are moving faster, our visits are four weeks apart. A member of the staff usually visits a plant once or twice between my visits.

The staff engineers are native to the countries in which they work and bring to their work a knowledge of the psychology, customs and laws of the country which is valuable in supplementing the methods which we teach them. These men speak English and act as interpreters in the shops and at conferences. A secretary-interpreter also helps in conferences with the executives and writes and translates the weekly reports, which are always presented in two languages.

Apropos of this, I am often asked if I do not find it a handicap not to speak Polish or other languages where I am working. On the contrary, I find that when things have to be translated, only the essential things are said. This eliminates a great waste of talk and time.

Saturdays we spend in our offices in Warsaw, Paris or Prague. This traveling is hard work but interesting. In the large cities the hotels are of course very comfortable but in the smaller towns they are not quite so good. We often joke about the thoroughly standardized luncheons at Armentieres. Those of you who were raised on "The Three Musketeers" will remember the villainess who caused all the trouble and that d'Artagnan and his three friends finally caught her as she was escaping across the river Lys at Armentieres. This river is scarcely as wide as Fifth Avenue.

At Billancourt we eat lunch in the window of a restaurant looking across the street at a handsome butcher shop which hangs out in front of its doors the best quality of horse meat. We always order lamb or chicken.

At Bethune our rooms in the hotel look out on the public square. The facade on the opposite side has been rebuilt since the war and is remarkably beautiful. In the center of the square is the old belfry dating back many centuries. Some organization has been kind enough to present to the city a wonderful set of chimes with a big bell which can be heard for twenty kilometers. These chimes play eight times during every hour, throughout the day and night. On my last visit, the square was filled with a street carnival which drowned out the loud chiming of the clock.

Many of the large plants in Poland are away from the cities and therefore from hotels. These

plants have guest houses which are usually quite comfortable. In Starachowice we stay in what was once a typical country house with a large veranda, well kept flower gardens and tennis court. The last time I was there we arrived in a two-horse sleigh, with straw under our feet and big blankets wrapped around us.

In Pabianice we live in a wing of the plant manager's house. There are always three of us on these trips—a staff engineer, a secretary and myself—and we are quite comfortable in three rooms and two baths. We usually arrive about midnight Sunday and in the summer we are invariably welcomed by a nightingale in the gardens. During the season we usually get up in time to go out in the garden and pick enough strawberries or currants for our breakfast, which is served on the piazza.

In Switzerland our hotel and the windows of the office in which we work, look out across the lake to Mont Blanc and the whole southern range. Unusual surroundings, of course, add zest to any type of work.

The owner of the alarm clock business, before building his plant, sent two of his engineers to America. They brought back with them all the moving belts, carriers and other handling devices imaginable. But they lacked the ability to make all this equipment work together. In six months we brought about a 40 per cent increase in production of clocks with no expense for additional machines and a less than 10 per cent increase in labor. In spite of the fact that his men had been admitted freely to shops in America, this owner does not pass on such a privilege to others. No one is allowed to visit his plant; we have to have cards to pass us inside the gates.

In a textile mill the problem was to secure an even flow of material from one operation to another. It was not possible to reduce the kinds of product in order to allow machines to run continually on one kind. Careful planning as to the time in the week when each machine would change, increased the production of the plant by 12 per cent.

In a plant which made plated silverware, some of the buildings were over one hundred years old. In tracing the movement of one of the products, a silver candlestick, we found that in the course of manufacture the material moved four kilometers.

By rearranging the equipment and opening a few doors, but without changing any walls in the old buildings, this distance of four kilometers was reduced to 875 meters, which is 22 per cent of the original distance. By way of local color I might add that this candlestick is made in a building which originally was the home of a lovely lady who was the friend of one of the marshals of cavalry under Napoleon.

The rearrangement of plants is, of course, incidental to the more important features of a reorganization.

In a street railway company the operations of stripping or disassembling the car and then rebuilding it were studied. Parts were prepared outside of the car and each operation scheduled. This has resulted in a monthly production of three times as many cars with a reduction of 10 per cent in workmen. Wages have been raised and the workmen have gladly accepted the new methods. The inventories of raw materials and parts have been reduced by 45 per cent. We are now studying the handling of passengers and introducing the service idea into traffic departments.

In a tool-making department, employing about 350 men, the introduction of methods of planning and recording production in comparison with standards resulted in an increase in total production of a little more than 40 per cent.

In a plant which builds railway cars, for the first group of five cars completed after our work was begun the average erecting time was 180 days. On each succeeding lot this time was reduced, because of the introduction of planning methods, until at the end of the first nine months the time had dropped to 110 days. Now, after a year and a half, it has come down to 65 days—a little more than a third of the former erecting time. Reductions in cost of production have also been large, but there is no accurate measure of these savings because the new costs are on a different basis from the old methods. There are, however, records which indicate the savings occasioned by improvements in the erecting operations. Three-quarters of the carpenters' operations have been studied and the average reduction in time has been 25 per cent. In varnishing operations the reduction has averaged 13 per cent. The earnings of skilled workers have been increased through providing them with better tools, teaching them improved methods and