

# AN IDEAL FACTORY FOR SMALL MOTORS

## A FRIENDLY RELATIONSHIP EXISTS BETWEEN EMPLOYER AND EMPLOYEE

DECATUR PEOPLE WILL WORK FOR AN INSTITUTION THAT HAS THEIR VERY INTERESTS IN MIND, FIRST, LAST AND ALL THE TIME, SAYS SUPERINTENDENT BARNES.

As I prepare to write a few words descriptive of the General Electric company's policy with regard to its employees, the findings of President Wilson's second Industrial Commission have been released and are being discussed in the press. It is interesting, therefore, to compare these recommendations with the conditions that have existed in our plant for some years; namely, the recognition of the advantage of a friendly relationship existing between employer and employee which can best be promoted by a deliberate, although not aggressive organization in the plant itself to bring about this friendly spirit of cooperation; the object being to utilize the common interests centered in our work and diminish the area of activity. In other words, bringing about on a large scale the human relationship that existed between the employer and the employees when industries were much smaller and the employees were necessarily closer in touch with the aims and the ambitions of the employer, and vice versa. As executives we should know the peculiarities and feelings of our employees just as intimately as we know the advantage of employing one kind of material or metal for a specific purpose in producing the output which we manufacture. In this I do not mean that we should think of our employees in terms of raw material, but in the past there has been a tendency

### Medical Care.

Under this heading we have two dispensaries fully equipped, in charge of trained nurses. We have an industrial nurse to investigate sickness of our employees on the outside, and among our employees there are a number of men and women who are able in case of emergencies to give their services and assist the medical department. We also have a physician on the premises at all times who has authority to call into consultation the best surgeons in the city. This work, as far as first aid and visiting nurse is concerned, is absolutely free to our employees.

### Employment Department.

Our employment department has a very important function to perform; namely, the selection of work in the shop of people who need work, and who will develop into faithful and proficient employees. We look up the record of prospective employees so far as possible to find out just who they are and what their previous experience has been, and then start them out in the plant with some assurance of success.

### Personnel Workers.

Just after the signing of the armistice it was found that a great many of our women employees (we had over 1400 of them), were leaving, and that the new girls employed to take their place did not stay with us, but left after a few days. It was discovered in many instances they left because they felt lonesome and strange in their new surroundings. To overcome this difficulty we picked out from a number of volunteers, 12 young women who had been with us for some years, and delegated one to each department where girls are at work to take care of the new girls from the time they were employed until such times as they became fully acquainted with their duties. At all times these personnel workers are smoothing out trivial disagreements and questions that come up, which, if not taken care of promptly, might lead to serious misunderstandings. We have found that this service is a very valuable one and we are entirely satisfied with the results obtained.

### Industrial Service.

Under the general heading of industrial service we have male and female investigators who help in the matter of advertising, arranging for club outings, sports, pastimes and similar functions. These investigators work through the organization, and keep in touch with the suggestions and recommendations of our club members, safety committees and others who may have something which they wish to suggest.

We have schools for the training of machinists, pattern makers, foundry workers, draftsmen and specialists. These young men, who are selected because of their promise, are given a regular course in these crafts, at the same time they get one hour and a quarter a day in mathematics, drawing and other educational subjects that go "hand in glove" with their mechanical training. We have a department in the works where our employees can get an upgrading or intensive training in machine shop practice. Many a young man who has toiled faithfully without much apparent prospect of advancement has taken advancement in this training class and is now earning good wages, and has in his possession skill and ability to do things that were heretofore virtually denied him.

Compensation and factory laws are taken care of by the industrial service department. Cases are investigated, and in every instance the interest of the employee is given first consideration. As stated before, it is one of the fundamental principles of our organization to foster and promote confidence and contentment among our employees, and to encourage

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## DECATUR G. E. PLANT IS A REALIZATION OF THIS IDEA---LOCAL FACTORY THE MOST MODERN OWNED BY GENERAL ELECTRIC

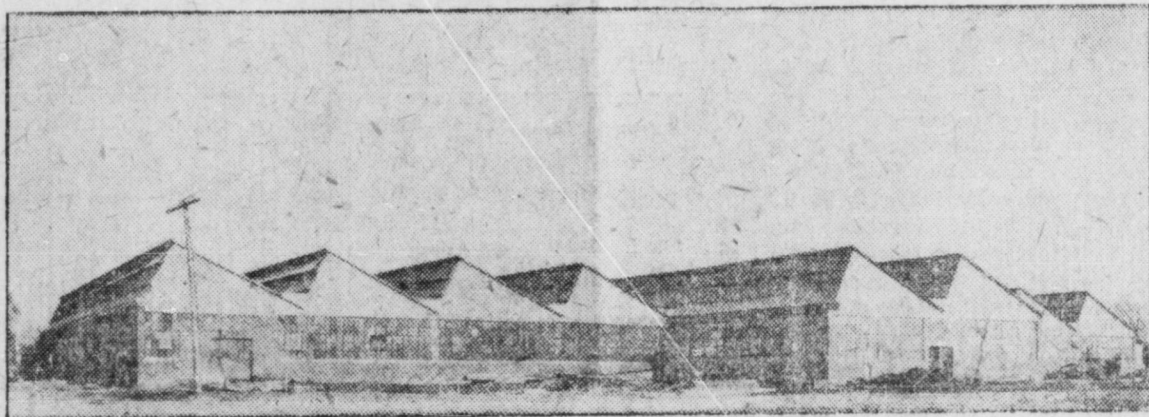
For a number of years there existed in the minds of all of our engineers and officials a mental picture of an ideal factory for the production of small motors; a plant wherein a given production would be produced with a minimum amount of labor; where the facilities and the arrangement of these facilities would be such that the material would progress from one end of the plant, from operation to operation, and the result would be a finished product ready for shipment to the consumer, at the other end of the plant. With the completion of

the plant at Decatur we hope that we will have attained a realization of this big idea.

### Selection of Building Site.

About six months ago it became apparent that we must supply additional floor area and equipment to meet the ever-increasing demand for small motor production. Our engineers began looking for a site on which to erect a plant that would produce a given output. The industrial committee of the city of Decatur called our attention to the plot of ground on which the plant has been built. This plot

seemed to our engineers and officials to be ideally located. The plot of ground being adjacent to the railroad lines, switching facilities were easily attainable, while such other facilities as the proper amount of gas, proper fire protection and water supply, power or energy for running the machinery and lighting the plant seemed to be present in sufficient quantities to meet our early requirements. Investigation of the labor market also showed that it appeared to be such as to warrant the construction of this plant.



VIEW OF DECATUR PLANT, GENERAL ELECTRIC CO., ERECTED IN 60 DAYS BY H. K. FERGUSON CO.

### Size of the Plant and Type of Buildings.

After our engineers had satisfied themselves regarding the general facilities which were necessary for the operation of a plant, the management decided to build a plant that would produce 500 small motors per day; this plant to be so arranged that it could be extended to an ultimate capacity of 2,000 small motors per day. From this information the size of the plant was very readily determined, while from experience and with the desire to produce the most efficient and modern plant conceivable the one-story building seemed most desirable. This type of building built according to what is known as the saw tooth type of building seemed to best fill the requirements. This type of building also had the advantage of properly distributing the light throughout the plant and providing proper ventilation. In fact, it seemed best adapted for making an ideal workshop

of the platforms. It is designed with a self-supporting steel structure, brick curtain walls up as high as the window-sills and continuous sash, the sash being supplied by the David Lupton's Sons company, Philadelphia, Pa. The roof is constructed of 2" yellow pine sheathing, the entire roof being weather-proofed with an asphalt and asbestos built up roof. The end walls above the continuous sash are constructed of wooden sheathing, the outside being fire-proofed with asbestos shingles intended to imitate slate. They are also

lately fire-proof.

The floors are constructed of 2" thick Creosote block, the product of the Midland Creosoting company, Toledo, Ohio. These blocks are laid in the most approved manner on a 6" concrete sub-floor. The inner spaces between the blocks are filled with pitch. This floor represents a very

tion is placed on the walls under the windows while the pipe radiation is placed in the trusses overhead. A boiler of approximately 200 horse power will be required to generate the steam necessary to heat this building. The system employed in heating is known as the Warren-Webster system. By this system steam is supplied to the radiation by means of overhead supply lines at low pressure, while the condensation is returned to the boiler by means of vacuum pumps and special valves. A vacuum of approximately 8" is maintained on the return lines. Automatically the condensation is discharged into the heating boiler as required. The heating system has been installed by A. Hattersley & Sons, Fort Wayne, Indiana; Welsch & Pensternmaker of Indianapolis, Indiana, were consulting engineers.

### Fire Service Protection.

The building is entirely protected from fire by a complete system of automatic sprinklers installed by The Grinnell company, Providence, R. I. By this system man automatic sprinkler head is installed over approximately every 50 square feet of floor space. This head is equipped with a fusible link which in case of fire melts and discharges the water over the area it is intended to protect. Approximately 900 heads are installed in this building. All heads are connected to a series of piping inside of the building and are controlled by valves placed at convenient points outside. These lines are in turn connected with an outside underground fire service pipe consisting of cast iron pipe 10" in diameter and under. Hydrants, hose houses and fire hose are located at convenient points about the outside of the building. The whole system is connected to the city fire service.

To provide an adequate source of supply that would be immediately available in case of fire, an elevated steel tank having a capacity of 75,000 gallons will be installed. This tank will be built upon a steel tower 100' above the yard level. This tank will be fitted with a small pump which will take the water at city pressure and elevate it into the overhead tank. The water in the tank is intended to supply water to the open sprinkler heads until the second source of supply, which is the pumping station, has time to build up sufficient water pressure.

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## A WASHING MACHINE MOTOR WILL BE MANUFACTURED AT DECATUR PLANT

BUILDING IS SO CONSTRUCTED THAT RAW MATERIAL IS BROUGHT IN AT ONE END AND COMES OUT AT THE OTHER A FINISHED PRODUCT READY FOR MARKET.

The officials of the General Electric company in designing and equipping the Decatur plant have given first consideration to the economical and rapid production of one type and size of washing machine motor. The building is so situated that raw material is brought in at one end of the building and the finished apparatus delivered at the other door. The raw material, consisting of a special grade of sheet iron used in making the rotor and stator cores, round steel for shafts, bronze rod for bearings, copper strip for end rings, copper rods for stator rivets, sheet brass for collector rings, castings for bearing brackets or end flanges, insulated copper wire for rotors and insulating material (consisting of both treated and untreated fibre and varnished cambric), is unloaded and placed in stock in the north end of the building.

We will now endeavor to follow up some of this material through the factory, beginning with the sheet iron. This sheet iron is delivered to the factory in sheets about 33 inches wide and about 8 feet long. The first operation is to pass a sheet through a gang slitter, which slits the sheet into five pieces approximately 6 inches wide. There is attached to this slitting machine a device for placing upon the sheets the small amount of lubricant which is necessary to the proper operation of the punches and dies. From the gang slitter these narrow pieces are delivered to the punch press department, where they are fed through powerful punch presses which punch out two pieces. The inside piece is termed the rotor blank and the outside piece the stator blank. From this press these blanks are taken to smaller presses, which repunch them into rotor punchings and stator punchings. These finished punchings are then delivered to the core stacking department, where they are assembled into bundles of definite height. The rotor punchings are then assembled in a special fixture and pressed down to size, after which the shaft is pressed into position. These rotor cores are carefully inspected, and, if satisfactory, delivered to the winding department. The stator punchings are assembled in a fixture and the copper and rings put in place, and after the copper rivets have been assembled into the slots this stator is taken to a very powerful hydraulic press, where the core is pressed to a specific dimension and the rivets are all headed over. From the hydraulic press these riveted stators go to the soldering department, where they are properly fluxed and dipped in a tin bath to insure satisfactory electrical connections between the rivets and the end rings. These stators are now taken to a broaching machine, which broaches the inside, giving them the exact required diameter. From here they are taken to a specially-equipped turret lathe, where the outside is finished and the rabbets made for the bearing flange fit. As explained later on, the inside diameter and the diameter of the rabbet fit must be very nearly exact in order to secure a motor which will operate satisfactorily. The nameplate holes are now drilled, and drills are also passed through the clamp bolt holes to remove any excess solder. These stators are now delivered to the sand blast department for sand blasting to remove any oil or dirt that may have accumulated, and after the sand blast they are dipped in a lacquer, and as soon as they are dry they are delivered to the assembly department.

In the manufacture of shafts automatic machinery is used extensively. The bars are taken from the stock room and pointed. In other words, the square corners of the ends are ground off so that the bars may feed properly on the automatic machines. One type of automatic is used in centering and machining one end of the shaft and cutting off to length. These

short pieces are then taken to another type of machine, where they are placed in a magazine, from which they are automatically fed into the machine proper. This machine will finish up and center the other end of the shaft. From here these shafts are taken to the grinding machines, where they are ground to very accurate dimensions. They are now delivered to the rotor stacking department, where they are pressed into the rotors, as explained elsewhere.

Clamp bolts, acorn nuts, rivets and other small parts are made on automatic machinery and delivered to the departments where they are needed. The acorn nuts, after having been properly inspected, are delivered to the nickel plating department, where they are nickel plated and polished. The various collector ring parts are made up from sheet material which is taken from the store room and sheared to proper sizes. From here they are delivered to the punch press department, where the many intricate pieces are punched out. Some of these parts must be zinc-plated and some of them given a bright dip. Other parts for the collector are made in the automatic screw machine department, such as hubs and clamping washers. These hubs, in order that the collectors may be properly riveted, must be very carefully annealed. This is done by placing them in an air-tight container and bringing them to a high

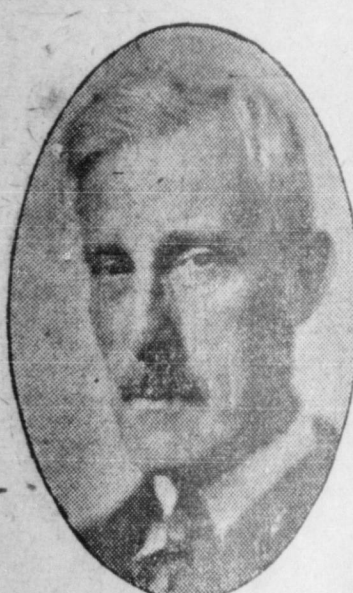


E. L. SIMPSON  
Manufacturing Supt. of Fort Wayne Works.

temperature, after which they are allowed to cool slowly. These various collector ring parts, after having been completed in the various departments, are brought to the collector ring assembly department, where the different parts are assembled by girls, each girl having her particular portion of the work. As the operation allotted to any one operator is completed the work is passed to the next operator, who performs her particular portion, so that in a very short time we have a completed collector. The collectors, after having been assembled, are carefully inspected and delivered to the armature winding department for assembly with the armature.

The castings for the bearing brackets, or flanges, are first very carefully annealed to make them more easily machined. The first machine operation is to drill the four clamp bolt holes. This is necessary for the reason that during the subsequent operations these holes are used in locating and holding the castings. After this first operation the castings are ground to remove any rough spots that may be on them. This is done in order that the castings may take a high finish when janned. There will be two different types of machines in the Decatur factory on which the machine work on these flanges may be done. One is what is termed a Bullard Multi-automatic, which is a multiple spindle machine, on each spindle of which work is being done on different

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E. A. BARNES  
General Supt. of Fort Wayne Works

to know all about the raw material entering into the product of a plant, but little or no attention has been paid to studying, helping and advancing the interests of the workers themselves. As general superintendent of this plant the management has, in a great measure, delegated to me the study and adoption of these conditions, and while we have felt that a situation of this kind must be approached in such a way as not to favor of paternalism, nevertheless it must be approached fearlessly so as to insure the best results for the greatest number of people. I will attempt below to describe a few of these activities. First comes our

### Fire Department.

This fire department has been organized and active since the year 1895. These men are specially selected from among our employees, and are scattered throughout the works so as to have available, immediately, in case of an incipient fire, an expert who can take charge. The fact that our fire department has put out numerous fires in these years is evidence that they are not kept on the premises for show purposes but for actual work. With the exception of two or three men every member of the fire department is employed on shop work and only respond to call in case of necessity. The plant is fully equipped with Metropolitan non-interfering fire alarm systems, and we have weekly fire drills, which drills familiarize our people with exactly what to do in case of fire. No stamped or panic can exist under these conditions.



C. H. MATSON  
Supt. Bldgs. and Maintenance Fort Wayne Works.

high initial cost which, however, is expected to render excellent service. It is not an experimental floor.

### Heating Plant.

The heating of this building presents quite a problem. The great amount of glass surface in the building as well as the large exposed wall and roof area makes it necessary to provide a large amount of radiation for heating purposes. It was therefore necessary to install approximately 18,000 square feet of cast iron and pipe radiation in order to maintain one story in height, has a total floor area of 63,000 square feet, exclusive

### Design of Building.

This saw tooth type of building is one story in height, has a total floor area of 63,000 square feet, exclusive