

326 Commonwealth Avenue,
Boston, Massachusetts
March 30, 1942

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Department of Architecture,
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Cambridge, Mass.

Dear Sir:

This thesis, submitted to you here in report form, has been designed to meet the specific requirements of a definite and existing problem. The conditions which must be fulfilled have been presented in brief detail to facilitate an understanding of the problem. I have conferred with the officials of the Mesker Brothers Iron Company at some length, and feel certain that all assumptions concerning the solution have been made with a factual basis.

May I thank you for your suggestions toward a more complete and broad-minded view of the problem as it stands.

Sincerely yours,

TABLE OF CONTENTS

Title	Page
Extract from Faculty Rules.....	2
Letter of Appreciation.....	3
Historical Sketch.....	5
The Site.....	8
The New Plant.....	13
Processes of Manufacture.....	18
Storage and Shipping.....	21
Departmental Relationships.....	22
The Office.....	24
Materials and Cost.....	26

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326 Commonwealth Avenue,
Boston, Massachusetts
March 30, 1942

Mr. Louis A. Hamilton
424 South Seventh Street,
Saint Louis, Missouri

Dear Lou,

Because you have been of the greatest assistance to me in my thesis problem, I am writing you to express my thanks to the foremen of all departments for their splendid cooperation and invaluable suggestions, to Ralph for the time he spent in conversation about a new factory, and to Mr. Francis, to whom I owe the history and possible future of the company as written in this report.

And to you may I give my personal thanks for your comments on and explanation of the intricate workings of the factory, particularly the foundry department and the crane details, which have been indispensable.

I only hope that this thesis will be of eventual use to the company either in part or in toto. My regards to everyone in the office.

Sincerely yours,

HISTORICAL SKETCH

Like many other similar concerns, the Mesker Brothers Iron Company began in the late seventies in a small way. The founders secured a small portion of another plant in the manufacturing district just south of the center of Saint Louis, and converted it for operations in the metal working line. The plant and even the machines used were rented. After a decade, however, during which the company secured the confidence of the trade, the business developed rapidly. The founders purchased their own factory equipment, and additions to both buildings and equipment were made as the enterprise grew.

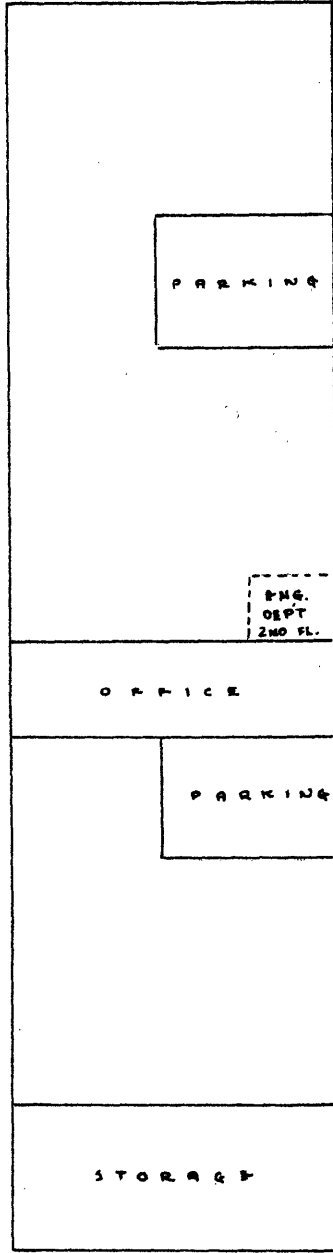
The metal working business has always been subject to frequent and drastic changes. The entire trade is at the mercy of the buying public and must therefore acquiesce to public demands. The business is a special order business, handled by Meskers not through branch offices but through various building agencies in strategically located cities throughout the country and its territorial possessions. An order may come in for a special job which may lead to repeat orders. Any new product is pushed by advertising, and if the demand is sufficient, that product is kept in stock. When demand dies, the product is replaced to meet a new demand.

At the outset the company made cornices and house fronts. During the first world war they made cookstoves and tent pins. At present they make steel and wrought iron sash

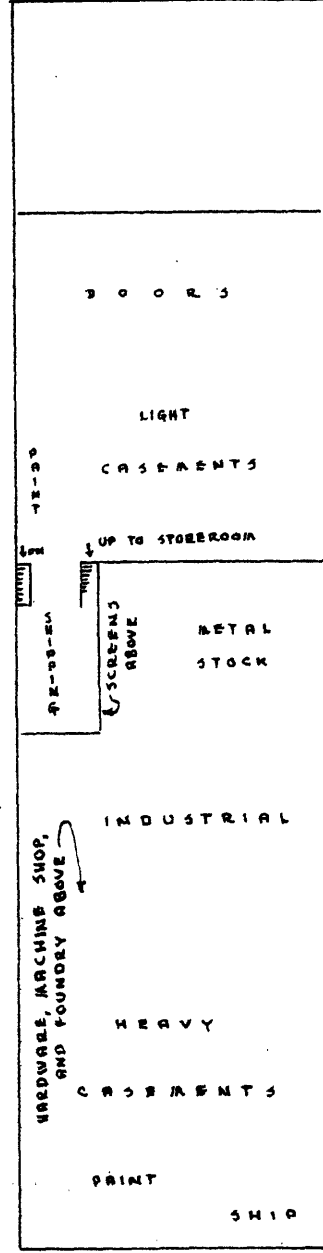
of all types, hollow metal doors, security and explosion sash, and bronze mesh screens. Under present war conditions they are continuing sash fabrication to meet government orders, but the officers are looking toward the eventuality of converting the plant for the manufacture of army equipment.

On the following page is a map showing the general layout of the present factory. The map alone bespeaks the need for a new plant, for the present plant is an extremely odd conglomeration of ancient and semi-modern buildings with machinery and departments thrown together in a more or less haphazard fashion. This inefficient layout was of course occasioned by an expansion policy whereby additions were made to the original building, and adjoining buildings were occupied as the business developed its productive capacity beyond its cramped quarters. The point has now been reached where no further expansion is feasible without rebuilding.

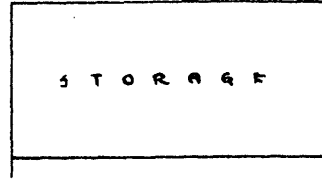
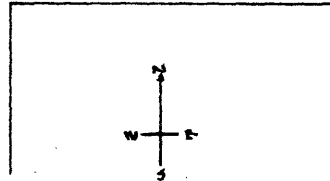
SEVENTH STREET



GALLEY



SIXTH STREET

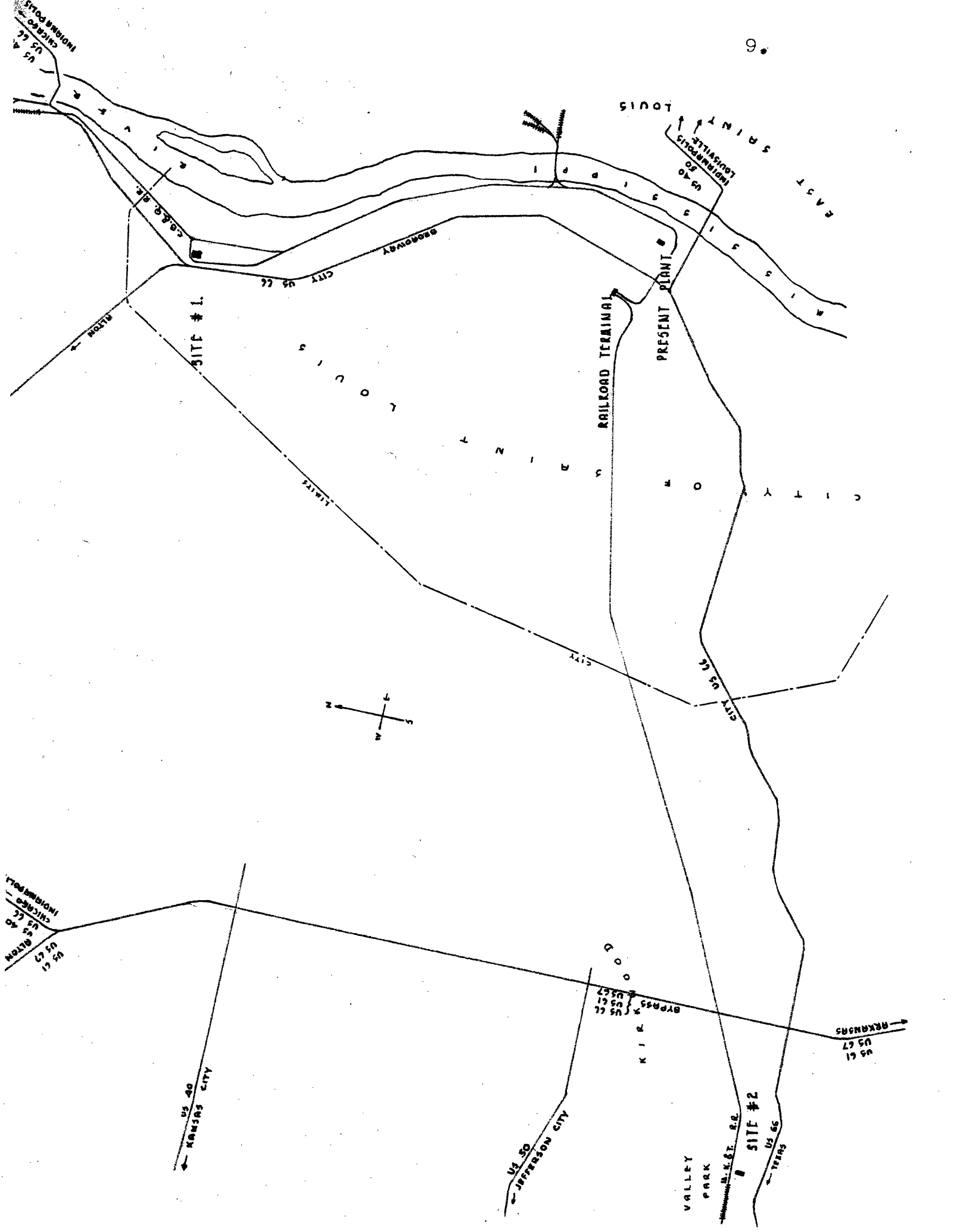


THE SITE

The officers of the company have considered the necessity of building a new plant when financial conditions are sufficiently stabilized to warrant a change of location. Toward that end they have carefully scoured the available land in and around the city of Saint Louis for possible sites. Chief requirements are a level or nearly level plot situated on either a direct railroad route or a spur track and close to a through truck route. Two general locations fulfill these qualifications:

1. In the bottom land along the west shore of the Mississippi River there is land available for factory construction, about eight miles north of the city proper. The district is zoned for factories, the land is level, truck routes pass directly north and east and around the city toward the southwest within a mile, and railroad tracks infest the district. Street car lines run one block away; bus transportation is not at present available.

2. Southwest of the city and well into Saint Louis County is a stretch of clear, flat land admirably suited for a factory whose workmen could live on small farms nearby. This valley, occasioned by the Meramec River, is nine and one half miles from the city limits of Saint Louis, and eighteen from the center of the city. Heavily travelled US 66 speeds directly into Saint Louis and the bypass routes to the east, and toward Texas to the west.



The Missouri Pacific Railroad follows the highway at a respectful distance. There are no streetcar lines out this far, but the community, known as Valley Park, can be reached by bus from Kirkwood which has good bus and trolley service into the city. There is ample farm land with fertile soil.

(For a map of Saint Louis and these two site locations, please note the map on page 9.)

The decision as to which site will be purchased lies with the owners of the company, but the new factory has been so designed that it will work equally well on either site. For several reasons the intown site is economically best. More than sixty per cent of Mesker products are sold and distributed in Iowa, Illinois, and the Saint Louis area. As these shipments are made solely by trucks, the time and mileage saved would be considerable, and since rail shipments more often go east than west, to have the factory located near a shipping terminal would for that reason be desirable.

If the Thatcher Avenue or similar site in north Saint Louis is chosen, the problem of shipments is solved rather well, for trucks may cross the nearby Chain-of-Rocks bridge directly into Illinois or they can follow Broadway into the center of the city. By streetcar the site is about twenty-five minutes from the city proper. There is little ~~space~~ space for residential building in this section, but above the site in the hills are a number of flats and

small residences. Chief objections to this location are the dirt and noise of other factories, lack of area, resultant inferior working and living conditions, and the heat.

No city is more humid than Saint Louis. Humidity along the river vies with summer temperatures, and any movement brings perspiration. During the eight or nine weeks of winter the dampness makes the cold intense. This humid belt stretches back from the Mississippi River for about fifteen miles until the heat is tempered by the hills of Saint Louis County. The city retains the heat of the day; the county does not, for there are no buildings to foil the breeze and absorb the sun's rays.

The Mesker Brothers Iron Company, in spite of its expansion, is still a small company when compared to Truscon and Fenestra, their foremost competitors. Profits are not great enough to pay handsome wages, although that is the aim of the officers. And on this point hinges a great deal.

Let us assume that a site is bought in Valley Park. Workmen could either buy land and build, or live in one of the suburban towns. The majority do not have enough money to build; a good many help support their families and save expenses by living with them. If these families live in the city, the workmen must commute to Valley Park, a full hour and a quarter from downtown Saint Louis. If the family moves to a suburb, the other working members

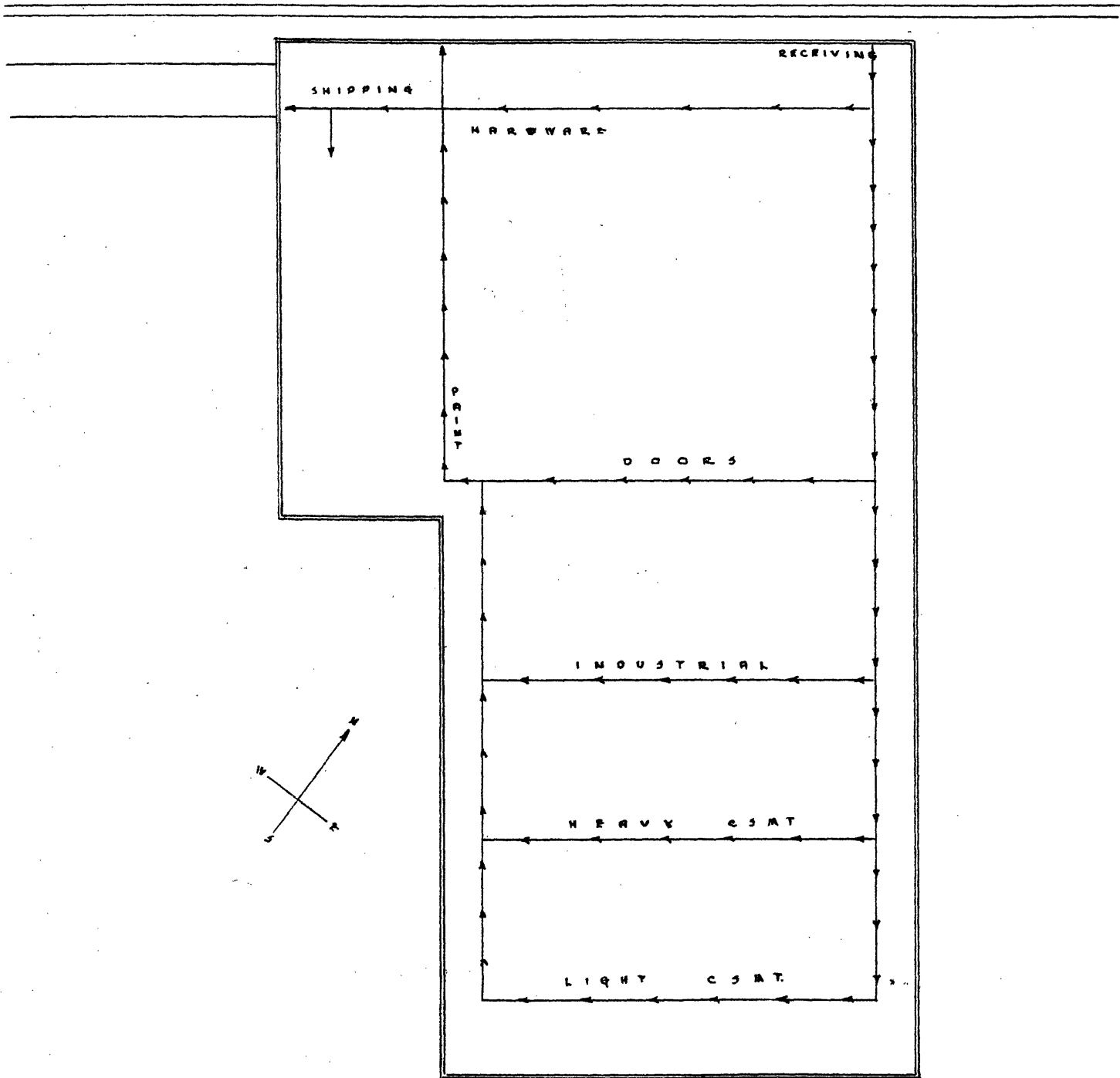
must commute. Most of the secretaries live with their families and pay board and room at home. If they were to live away from home, they would lose by having their own rent to pay. In compensation, however, they could have better and healthier living conditions, greater open area for recreation, far superior working conditions, and a mild reprieve from the heat.

Since the problem becomes one of working conditions and living conditions versus the economy of transportation in both time and money, the decision must be made by the officers who are not yet willing to reach a conclusion. I would like, therefore, to submit for their comparison the same plan, relatively, for each of the two sites under discussion.

THE NEW PLANT

The factory is divided into six manufacturing departments, each with its own equipment, each a separate entity. Processes of manufacture (see page 18) do not vary greatly. Common to all departments are the paint shop and the hardware department, where the products receive hardware applications. Steel as delivered to the factory comes in pressed panels approximately twenty feet by five feet, and in cast sections about fifteen feet in length. It is shipped in from steel mills in Saint Louis and East Saint Louis, Illinois. At the present factory delivery is made by trucks, for their is not only inadequate equipment for the distribution of this metal, but there is not enough storage space to accommodate a full freight carload. In the new factory, however, all raw steel will be delivered by rail.

This steel will be stored at the east end of each department. An overhead crane, with a capacity of twenty tons, will carry it from the freight cars to each department. From the storage piles the metal will be taken as needed, will be cut and punched, and the doors or windows will be fabricated. This fabrication process will run in each department from east to west (please see flow diagram on page 14). At the west end of the factory will be a monorail system with hooks at ten-foot intervals. The fabricated sash will be placed on these hooks and will travel to the



paint department where they will be either dipped or brushed according to specifications. They will then be set aside to dry before continuing on in the same direction to the hardware department. There the sash will be taken off the hooks while one of a number of hardware applications may be attached. The sash are then ready for inspection. After this final inspection they continue on to the shipping area from which they may go one of three ways: onto trucks for local delivery, into freight cars for distant delivery, or into the storage area as stock sash.

The industrial door department, making the heavier and bulkier doors, cannot use the monorail system. Doors are carried to the paint department where they are painted by hand. They are then set on small trucks and wheeled to the shipping room.

Location of departments is of primary importance, and in this particular factory the disposition has been governed by the amount and weight of material used. For that reason the industrial door department is located nearest the shipping and receiving departments. Flat steel is extremely unwieldy to handle and should therefore be carried the shortest possible distance. The heavy casement department uses a 3/16-inch section in most cases, as compared with the lighter 1/8-inch section used in the manufacture of light casements and industrial sash. Since, however, the heavy casement department can use some of the punching and drilling equipment used in the light casement department and some of the

cutters used in the industrial sash department, it has been placed between the other two regardless of weight considerations. Wire and spline used in the making of screens are so light that weight is of no importance in determining the location of the screen department. Since screens are not attached to windows in the factory, this department may be located anywhere near the shipping area. The foundry is used solely in the casting of bronze hardware. These castings are for ventilator hardware exclusively, such as friction shoes, cup pivot centers, handles, spring catches, etc. The foundry should, therefore, be placed adjacent to the hardware department and the machine shop. Preferably it should be on an outside wall to facilitate heat and smoke control.

Of the smaller divisions of the factory, the shipping department is most important, and should be located at the end of the production line adjacent to the truck outlet, to the rail outlet, and to the storage area. The paint department must also be near the end of the production line so that one-directional flow can be achieved. The store room should be as centrally located as possible, since it is used by all departments. The machine shop has its own supply room where expensive high speed and carbide tungsten tools are kept. The storage area should be in conjunction with the shipping department so that sash and doors placed in stock can be easily taken out of storage and shipped.

The hardware department must be closely allied with the machine shop, and although it is not of momentous importance, this department should if possible be at the end of the production line. Because of the likelihood of damage in shipment, hardware is applied in the factory only on local residential jobs and occasionally to doors in local shipments. Usually, however, all locks, hinges, screws, bolts, etc., are packed in a bag or box and wired to the windows or door for which they were fashioned.

PROCESSES OF MANUFACTURE

The door department.

Mesker Brothers manufactures five types of industrial doors — Vulcan, series 14, accordian, and sliding doors, and overdoors. The Vulcan door is an inexpensive door for interior use; the series 14 door is also a 14-gauge door, but for exterior use. Also manufactured are pressed steel door frames for use in lieu of channel frames. For all doors the manufacturing process is relatively the same. Metal panels are cut to size on a shearing machine; they are then attacked by grinders. All work in this department, once the steel is first cut, is done on huge saw-horses. Grinding and welding machinery is located off the floor, and the grinding and welding instrument itself can be easily moved within a fifteen-foot radius. The metal to be used for rails and stiles is placed in a pressing machine, and the corners are sheared and ground. Holes are drilled for the hardware. Then the door panels, either solid or louvred, are welded into place. If the window will have glass panes, the sash bars are next welded in place. The completed door is transferred to the paint shop where it is given a base coat of grey oxide primer.

The light casement department.

This department fabricates basement sash, utility sash, and what are known by the trade name of Guildhall casements for residences. The sash bars are first cut

into the proper lengths. Holes are drilled in them. These bars are then put in a straightener and trued up. Then the bars are air welded together, and the excess weld ground off. Then the sash are fastened in frames to be hammered into alignment. Fixed sash are then sent on the monorail to the paint department. If the sash are to be ventilated, the vent bars must be cut and welded by the above process, the completed vent must be inserted, and the hinges and lever arms applied before the sash leaves the department for its shop coat of paint.

The heavy casement department.

In this department metropolitan, master, and custom build casements are manufactured. Casement doors, for which there is occasional request, are also made here. As I have said, the custom built casements require a heavier section than light casements, and the section is entirely different, being similar to but stronger than the industrial section. The process of manufacture, however, is the same. When heavy frames are needed for the casement doors, they are cut and welded as outlined above.

The industrial sash department.

Here are manufactured pivoted and projected sash, explosion windows, security sash, and continuous top-hung sash. Torsion, rack and pinion, and screw type operators are not manufactured by Mesker Brothers, but are bought, along with hardware for sliding and accordian doors, from

hardware manufacturers. The fabrication once again proceeds through the same steps as in the casement departments.

Screen department.

The frames of these screens, made of solid section steel, are cut to size. The bronze mesh is then inserted in the frame bar, pressed in place, and the other bars are welded on. Then the screen is punched for fittings, and put back in the press to stretch the mesh taut. All screen fittings, such as clips and screws, are made in the hardware department.

Foundry.

The foundry consists chiefly of three oil fired blast furnaces pushed with compressed air. These furnaces are small, and are used for brass casting only. Each pot will hold about two thousand pounds of brass, and it is possible to make four or five heats from each in an eight-hour day.

Machine shop.

In the machine shop, of which the hardware department is actually a subsidiary, the rough bronze castings and other hardware fixtures are tooled and worked. They are then turned over to the men in the hardware section for filing, rubbing, polishing, and actual fitting.

STORAGE AND SHIPPING

Because weather conditions are unfavorable for winter building, business is slack from November until the middle of April. From then on during the summer and early fall, orders come in as fast as they can be adequately and properly handled. During the winter months when fulfillment of orders occupies only fifty per cent of the workmen's time, a stock supply of sash and doors in the greatest demand is fabricated to alleviate the summer rush. For this reason considerable storage area must be provided. The stock is given the customary one coat of protective paint and is ready for immediate delivery; the storage area must thus be so situated that stock sash can be transferred directly to trucks and freight cars. Loading of trucks is done solely by hand, as the trucks, owned by the company, are small, only large enough to handle the ordinary small local orders and larger jobs which require the sash at designated intervals. Shipments into adjoining states are made on larger trucks which can be loaded more quickly by hand than any other way. If the sash and doors are shipped by rail, there is often a short delay on orders so that a freight car may be completely filled to save expense. These freight cars are loaded a little at a time, no loading machinery of any kind being necessary.

DEPARTMENTAL RELATIONSHIPS

There is no close relationship between departments within the factory itself other than those already mentioned. Each department has its own foreman to whom each of his men are responsible. Workmen are not shifted from department to department except in rare instances. All orders are issued directly from the office to the foremen. In this way the foremen have no contact with each other except for the shipping clerk.

The shop men will have one large locker room where they will change clothes. They arrive at eight in the morning, half an hour ahead of the office force. They have half an hour for lunch which they make eat in the lunchroom provided for them. They are through at five except on Friday, when they receive their pay checks at 4:30 and are free until the following Monday. Only a very small percentage of the workmen use their cars, but adequate parking space has been provided.

The relationship of factory to office is also very simple. Foremen alone have any need to be in the office at any time. They check with the order manager throughout the day to receive any new orders which might have come in. They often need to confer with the head of the engineering department over details on the fabrication drawings. Occasionally they issue complaints to the personnel manager. This man, however, makes regular

visits through the plant to make sure there are no personal differences among the workmen. He is also in charge of first aid and must report and attend all injuries. For this purpose a well-stocked first aid room has been provided between the factory and the men's locker room.

The workmen are not allowed in the office. Their foreman is their voice. Their only contact is on payday. The men are paid by one of the girls under the cashier's jurisdiction with whom the men have only across-the-counter contact. A small room has been provided opening onto the hallway between plant and office for the sole purpose of paying the men.

THE OFFICE

Interdepartmental relations in the office are very tightly knit. The four departments — managerial, order, sales, and engineering — are interdependent. The sales department operates purely in the Saint Louis area; all other orders are sent in by mail or telegram by the eighty-four representatives. Quite often there is much preliminary correspondence before an order is signed. All queries are answered by the managerial force. For each order there is a letter file, kept by the order department. After an order has been signed and approved, it is sent to the engineering department if detailed drawings are needed or demanded. When these drawings are approved by the designing architect, the order goes to the proper foreman in duplicate, while the file containing the triplicate copy is put away. Payment on orders is received by the treasurer.

Of the five men on the sales force, the three salesmen spend much of their time making calls, while the two estimators have no contacts except occasionally with the draftsmen. Plans for a job come straight to the estimators, and the plans accompany the signed order to the engineering department. The personnel of the order and engineering departments have no further contact than the other members of their own department. Only the members of the managerial force have business with all de-

partments.

Unlike the factory, the office encourages switching employees from department to department that they might better learn the business in its entirety. None of the work is so specialized that it can't be learned in a few months, and the secretaries seem to welcome the change. Although there are no private offices in the present office, in the new office they will be provided only to separate the officers from the noise and confusion of the office force.

Office hours are from 8:45 a.m. till 5:00 p.m. with an hour for lunch. It has been a growing custom for the office members to bring their lunches and eat in the office. For this purpose a lunch room has been provided, with no service but a portable stove for making coffee or cocoa. Those using the equipment will be responsible for its condition.

MATERIALS AND COST

For the obvious reasons of economy and advertising value, the new factory building will be erected strictly of steel. As much of the new plant will be fabricated in the present plant as possible. The factory will be lighted on all sides by Mesker pivoted sash set in steel panels also made by Mesker. The walls will be of double thickness to act as a buffer against temperature and noise. Rock wool insulation will help materially. The roof will be of interlocking panel steel covered with tar or some other protective substance. Sawtooth skylights will be equipped with Mesker monitor sash. All columns and girders will remain unprotected except those surrounding the paint dip, the only place where a fire could burn.

The office will be built of a contrasting color brick, lighted by Mesker casements and projected sash, and covered by a flat gravel roof.

Because of fluctuating prices, a detailed cost sheet can not be accurately made, but on the following page is an estimate of building costs excluding land.

The factory:

Cubage: $150' \times 425' \times 30' = 1,912,500$ cu.ft.

$50' \times 125' \times 30' = \underline{187,500}$ cu.ft.

2,100,000 cu.ft.

Estimated cost per cubic foot: \$.35

$2,100,000 \times .35 = \$735,000$

The office:

Cubage: $10(22' \times 22') \times 25' = 121,000$ cu.ft.

Estimated cost per cubic foot: \$.45

$121,000 \times .45 = \$54,450$

Total cost:

$\$735,000 + \$54,450 = \$789,450$

or roughly = \\$800,000