# PLANT OF THE FERRACUTE MACHINE CO.

## HOW A NEW JERSEY CONCERN WAS REBUILT AFTER A FIRE.

### Interesting Features of a Plant Whose Product Includes Punch Presses of Many Designs.—A Shop that Cannot Burn.

BY AN EDITORIAL REPRESENTATIVE OF THE IRON TRADE REVIEW.

The original plant of the Ferracute Machine Co., Bridgeton, N. J., was totally destroyed by fire three years ago. The fire, occurring at a time when business was brisk, seriously interfered with the plans of the company and caused considerable inconvenience in filling the orders on the books, as well as preventing the acceptance of as much new work as could have been obtained. The officers of the company, before rebuilding, arranged that the construction of the new shops should be such that the business would never again be interrupted by fire. It was decided that the shops should be of fire proof construction in the fullest sense of that word, and that the combustible material in them should be reduced to an absolute minimum. This idea has been thoroughly carried out and practically the only combustible material to be found in the works today, aside from the office building, are the tops of the benches and the tool chests of the workmen. In the buildings themselves, not an iota of wood has been used.

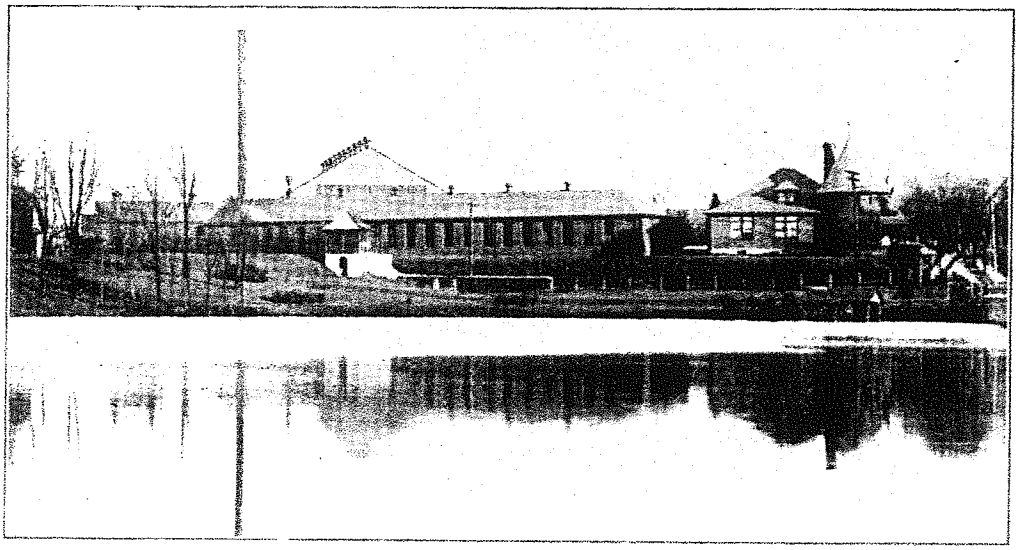

FIG. 1.—EXTERIOR OF FERRACUTE MACHINE CO. PLANT, BRIDGETON, N. J.

#### Building Construction.

The illustration, Fig. 1, is an exterior view of the plant. The building at the right, with the tower, is the office; the long low building immediately in the rear contains the carpenter and pattern shops, pattern storage and power plant. The low building at the rear of the power plant is the forge shop, while the gable of the machine shop projects above the roof of the power plant.

The product of the Ferracute Machine Co. consists of punch presses of all sizes and designs. The work ranges from the machining of very heavy castings and forgings down to extremely delicate operations; and the plant for doing this character of work must possess a varied assortment of accurate tools. Good light is also an essential to accurate work, and this is furnished by providing the walls, both side and end, liberally with windows and also by a large skylight let in the roof of the building.

The machine shop is of red brick, the dimensions at present being 200 x 100 feet. The rear wall is constructed of corrugated iron, so that it may be easily moved and the shop extended further when any increase in capacity is desired. The building is surmounted with a single peaked roof, the skylight heretofore mentioned extending its entire length and having a width of 38 feet. It is constructed of fire proof materials throughout; the roof is of red tile and glass, supported upon a steel frame work; the floors are of concrete, while the window frames and sashes are of metal.

The light is further improved and the fire risk diminished by the elimination of all belts in the shop. Every machine is provided with an individual motor, these being geared to the machines by a number of different methods as will be related below. The leads for the motors are carried in underground conduits with outlets at the various machines. The tools are kept scrupulously clean and the place presents a far different appearance than is usual in a heavy machine shop.

The building is divided into three bays by two lines of columns supporting the crane runways. The center bay is spanned by a 20-ton Niles and a 10-ton Pawling & Harnischfeger electric crane for handling the material being assembled into the completed machine. The side bays are each spanned by a five-ton Niles crane for transferring the heavier work to and from the various machine tools. The operator of the 20-ton crane rides in a cage suspended from it, while the five-ton cranes are controlled by a man

on the floor who operates suitable switches by suspended cords.

As is usual in shops constructing heavy work, the side bays are occupied by the lighter tools. The heavier tools are arranged along the edges of the central bay, while the middle portion of it is reserved for erecting. Portions of the side bays are divided off to form the store room, the tool room and the die room. The smaller lathes and lighter

maximum of storage space, while occupying a minimum of room.

**Tool and Die Rooms.**

The tool room is directly across the shop from the store room and contains machinery for the making and facilities for the storage of the various tools used about the shop. Its equipment comprises two tool grinders, a drill grinder, several tool-makers' lathes, a radial drill, drill presses and a shaper. Appropriate cabi-

cated in the side bay directly beyond the tool room, and contains a large number of tools used exclusively for making the dies used in connection with the various presses turned out by the rest of the shop. The machines in the die room comprise a planer, several shapers, slotters, vertical and horizontal milling machines, together with a number of lathes, drill presses, rotary grinders, grinding planers, etc. The dies when completed

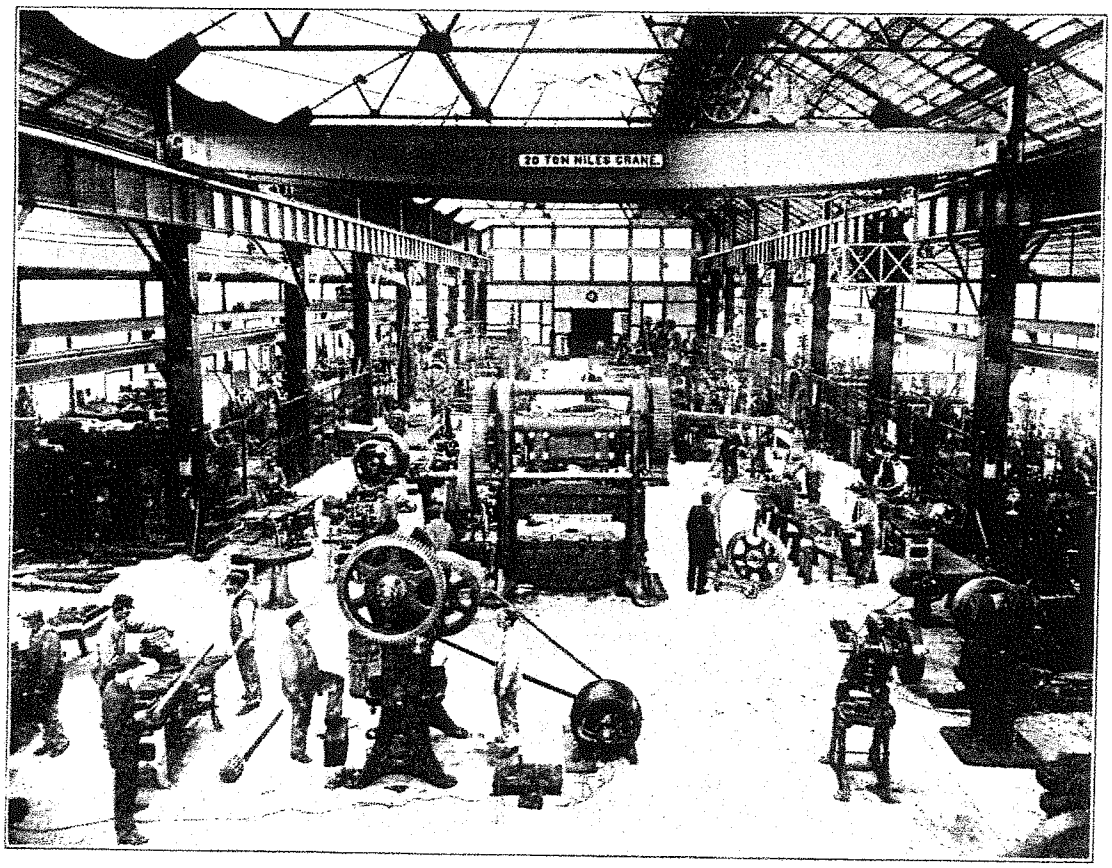


FIG. 2.—INTERIOR OF MACHINE SHOP, FERRACUTE MACHINE CO

planing tools are grouped together at one end of the shop below the store room, which is shown in the illustration, Fig. 2 at the left. In this portion of the plant ten lathes are installed, arranged perpendicularly to the wall in order to economize room. There are also two turret lathes and a number of other tools, including shapers, universal, plain and vertical milling machines, and a number of drill presses. The store room contains the smaller standard parts, used in the construction of the presses, which are distributed as required upon the presentation of appropriate orders. These parts are stored in steel racks and bins, of such size and shape as to provide a

nets and storage racks are provided for the tools, which are checked out to the men in accordance with the usual system. The long tools of small diameter, such as drills, reamers, taps, etc., are kept in a novel form of cabinet which utilizes every inch of storage space. This is formed of an angle-iron frame, in which are placed corrugated sheet metal strips forming a series of compartments occupying the full area of the rack, and providing storage space for a large number of tools. It is illustrated in the sketch, Fig. 3.

In a plant manufacturing presses, the die shop is always an important feature. In the plant under discussion, it is lo-

are immediately taken to the main shop where they are fitted to the presses under erection.

**Arrangement of Heavy Tools.**

The central portion of the shop contains, as heretofore mentioned, all the heavier tools, the tools of any one kind being grouped as nearly as possible together. Four planers of varying sizes are thus arranged side by side at the lower end of the shop. Immediately adjoining them are four horizontal boring mills, one vertical mill and some drill presses. On the opposite side of the shop are two large grinding lathes and a number of radial drills, drill presses, and a large lathe which has been blocked

up to permit the swinging of larger pieces than it was ordinarily designed to handle. Next to this is a very long heavy lathe used especially for press shafts.

The gears used on the presses are all cut from the solid, this work being done in a pair of automatic gear cutters located on the edge of the central bay just alongside the boring machines. All the presses, after erection, are run for a given length of time, usually ten hours, in order to develop any defects in their construction. This is done by belting them to a portable motor of the requisite horsepower brought to the machine and placed

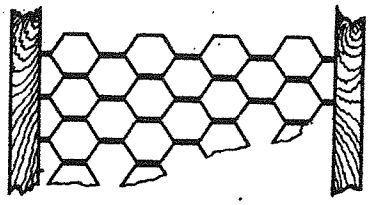

FIG. 3.—SECTION OF TOOL RACK.

at any convenient point in the central floor. A press being operated in this fashion is shown in the foreground in Fig. 2. Each clutch is thrown in and out of driving contact from 10,000 to 30,000 times, to test its hardness, freedom from temper-cracks, etc.

### Types of Motor Drives.

One of the most interesting features of the shop is the method of attaching the motors to the various machine tools. A few of the tools in use were recovered from the ruins of the old shop after the fire and rebuilt, so as to make them suitable for motor drive. Many of the tools purchased in a hurry since the fire were of the standard belt-driven types and also required the designing of motor attachments. The motors on some new lathes are placed on an extended subbase and geared to the machine. On the converted lathes, a shelf has been erected over the position formerly occupied by the cone pulley, and the motor either geared to the spindle or belted to an auxiliary shaft which is geared to the spindle. The illustration, Fig. 4, shows this latter form of drive. On some of the shapers, the motor is placed on a subbase and is belted to a train of gears driving the tool or connected to the shaft thereof by means of a silent chain drive. On others, the cone pulleys are retained, a constant speed motor being mounted upon posts at the rear of the machine. On the milling machines, a bracket shelf is built on the top of the machine and carries a cone to which the motor is geared. This cone is belted to the regular speed-cone furnished with the machine; see Fig. 5. On the planers, the motor is placed on top of the housings, according to the approved modern practice. The radial drills have the motor placed on a bracket shaft built at the rear of the column. Another bracket built at the top of the column carries a cone pulley shaft driven by the motor, and it in turn drives the original cone pulley at the base of the machine, as in Fig. 6.

### Minor Facilities.

Another feature of interest in the shop is the type of work bench used. These

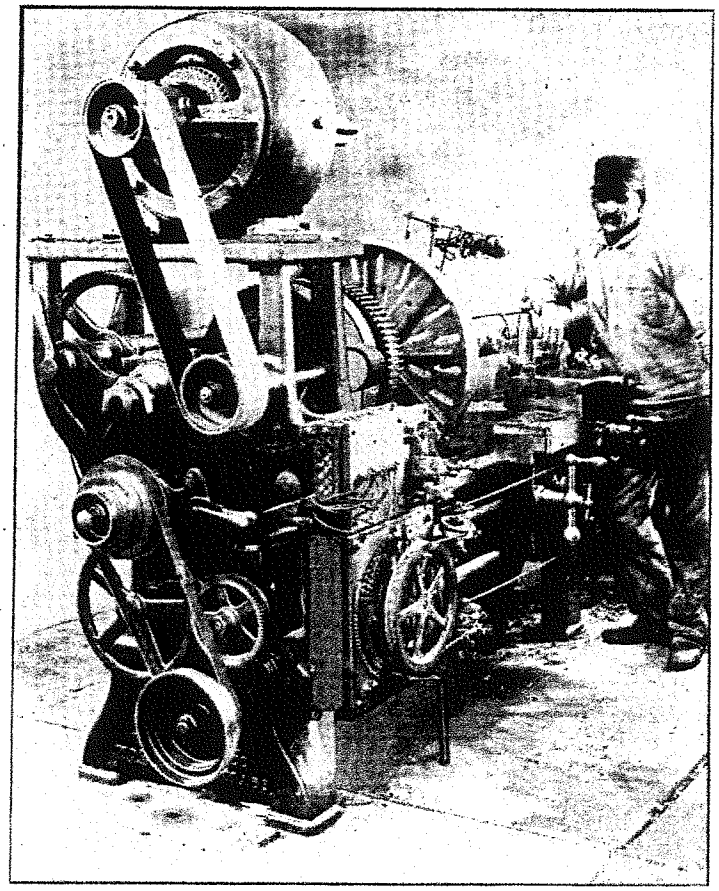

FIG. 4.—APPLICATION OF MOTOR TO LATHE.

consist of wooden tops bolted on to cast iron standards held together at the bottom by spacing pipes and rods. These benches are small in size and are scattered throughout the shop at the most convenient points. Being light and portable, they are readily placed wherever desired. Especially on the erecting floor, a number of benches will be placed alongside of a machine in the course of assembling. In the illustration of the main shop, Fig. 2, a number of these benches will be seen in the foreground, two of them being immediately alongside of a large press in the center of the floor. These are in addition to the wall benches and are a decided improvement over the usual arrangement of benches on the erecting floor which places a single long bench against the wall, it often being necessary for the workmen to travel a considerable distance every time a little work is to be done in a vise. With the arrangement in use at the Ferracute Machine Co.'s plant, the number of steps taken by the workmen on the erecting floor is reduced to a minimum. These benches are lined with heavy tin underneath and have iron shelves and drawers.

Another noticeable feature is the extensive use made of the Franklin portable cranes, one of which is seen immediately alongside of the large press previously mentioned. These light and handy appliances are a great convenience in erecting, as they frequently handle work too heavy to be lifted by the men and yet hardly large enough to call for the service of the large traveling crane. Such cranes and also all trucks and band-cars are equipped with roller bearings.

The forge shop is located at one side

of the machine shop and contains an ample equipment of power hammers, cold saws and other machinery for making the various forgings required in the construction of the presses. A down draft system allows a traveling crane to pass over steam-hammer, furnaces and forges.

The pattern shop has the usual equipment of buzz saws, planers and other pattern-making tools—all driven by separate motors. The power plant located in the same building is divided into an engine and boiler room; the former contains two horizontal Curtis turbines, each connected to a 230-volt, 75-kilowatt generator, furnishing electricity for operating the various tools and cranes in the shop, and doing all the lighting. The boiler room contains a 251-horsepower, water tube boiler, which is hand fired. A switch track runs between the machine shop and the power plant, and one end is directly over a 100-ton vault into which coal can be dumped for storage purposes. The boiler room is considerably below the level of the rest of the plant and opens directly into the coal vault. Plenty of room remains for duplicating both engine and boiler plant.

The comfort of the men has not been lost sight of, and a building has been erected for their use in the triangle between the machine shop and the building containing the power plant, pattern shop, etc. A partition divides this into two parts, one of which contains the wash basins and lockers for the men, while the other portion, which is a club room, contains chairs, reading tables and magazines for the men's use.

The office building, in addition to the general offices of the company, contains a drafting room and a unique photographic dark room. This room has no door, but its entrance is through a labyrinth whose surfaces are painted a dead black. Good ventilation is always secured, and in addition, it is always accessible to anyone who desires to converse with any person engaged in it. The plant is located alongside the Bridgeton branch of the Pennsylvania railroad, and a spur track from this road provides the shipping facilities.

The officials of the company are Oberlin Smith, president, engineer and general manager; Percival H. Smith, vice president; Enos Paullin, secretary and treasurer; Henry A. Janvier and William Ware, assistant engineers, in charge of press work and die work, respectively.

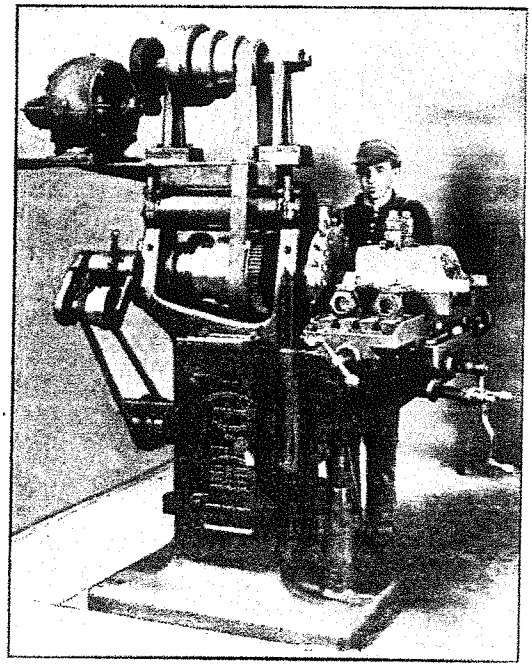

FIG. 5.—MILLING MACHINE, MOTOR-DRIVEN.

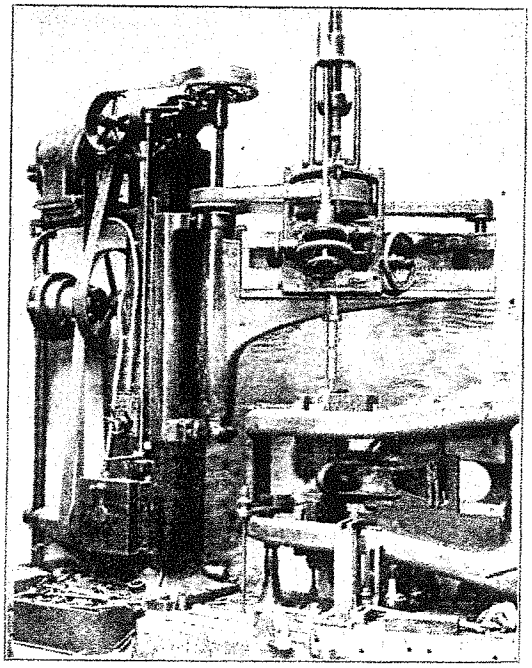

FIG. 6.—MOTOR-DRIVEN RADIAL DRILL.

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A summary for showing San Francisco's condition in December contains the following: Building permits, 687, value, $5,373,140; permanent building permits, 403; permanent building permits since the fire, 3,089; building contracts recorded, 208, value, $2,234,424; real estate transfers, 820, value, $3,500,000; postal receipts, $143,450; custom receipts, $1,012,609.79; bank clearings, $196,216,734.68, December, 1905, $161,317,530.53.

## GAS FOR HEATING AND REHEATING.

At a recent meeting of the Staffordshire Iron & Steel Institute, Mr. Charles H. Wall read a paper on "The Use of Gas for Heating and Reheating Purposes," an abstract of which follows:

The paper devotes some space to the theory of gas production and then gives a short history of the introduction of gas producing apparatus describing the producers of Bischof, Ekman, Ebelman and the Siemens. The author next considers the gaseous fuel of the producer and discusses the effect of the admission of air at various points in the producer. He presents the analyses of gases obtained from different types of producers and states that the actual heat loss in the heater does not exceed from 9 to 12½ per cent of the heat of the original solid fuel. The great secret of the success of gas firing is due to the fact that it does away with the intermittent series of heating and partially cooling actions which are unavoidable in coal fired furnaces and substitutes for them direct contact of flame with the heating surfaces which gives a constant and steady application of the temperature desired. Gas firing starts with the advantage of being capable of using the cheaper kinds of slack and small coal, which will give any required degree of heat.