

**The Knowledge Bank at The Ohio State University**  
**Ohio State Engineer**

**Title:** Modern Chain Making

**Creators:** Dick, George

**Issue Date:** Jan-1929

**Publisher:** Ohio State University, College of Engineering

**Citation:** Ohio State Engineer, vol. 12, no. 3 (January, 1929), 13, 24.

**URI:** <http://hdl.handle.net/1811/34540>

**Appears in Collections:** [Ohio State Engineer: Volume 12, no. 3 \(January, 1929\)](#)

# MODERN CHAIN MAKING

By GEORGE DICK, '31

For many centuries chain has been used by man, and yet it was not until recent years that a practical method of producing a high quality product at a high rate of speed developed.

The old method had many disadvantages. The "chain-maker" works eight hours a day in stifling heat, the temperature of the metal being so high that he is compelled to work stripped to the waist, with a piece of asbestos tied to his cap to shield his face from the intense glare. He must labor over each link of the chain, forming and welding it with his hammer. Consequently, the chain is produced very slowly, the best chain-makers being able to make only one hundred pounds of chain a day. Such hard labor necessarily demands high wages, and this makes an enormously high cost of production. The quality of chain produced by this method cannot be compared with the quality of electrically made chain.

The old method is still used, however, and will probably continue to exist for many years. This is due to the fact that some chains are not easily adapted to machinery and can be made cheaper by the "fire-weld" process.

Progress demanded a new method, whereby the world would be supplied with a good quality, high-speed production chain. The automobile industries, the railroads, and the ship-building concerns all prompted the chain industry to bring its methods up-to-date. As a result of this great demand for chain the modern electrical chain machinery was developed.

The electrical process necessitates an exactness and precision which is found in every up-to-date industry. This applies with emphasis to the wire from which the chain is made. Good wire must be made of high grade iron, annealed to such a degree that, when bent in the form of a link, it will retain its shape. It must also be regular in size, a slight variation of one-thousandth of an inch causing a considerable amount of trouble in the forming and welding of the links. A high grade of wire is essential if a good chain is desired, and it is impossible to use the cheap "rods" that are used in the "fire-weld" process. The wire ranges in size according to the size of the chain that is manufactured.

The formers are the first machines used in the process. They are made in three sizes, as follows: type one, used for chains varying in size from three thirty-seconds to one-quarter of an inch; type two, used for chains from one-quarter to seven-sixteenths of an inch; type three, for chains seven-sixteenths to three-quarters of an inch. The wire is fed into the machine by a moving feed-arm which, at each stroke, supplies the machine with the exact amount of wire for one link. This piece of wire is cut off by a cutter, and passed into the machine where it is bent around a "king-post" to form a link. Two fingers then grasp the link by the ends and turn it into a vertical position, so that another piece of wire may be passed through it and wrapped around the post. This is repeated

indefinitely, the chain falling out of the bottom of the machine at a high rate of speed. The rate varies according to the size of the chain; the smaller chains are run as fast as sixty links per minute, and larger ones as slowly as eleven links per minute. The various cams and gears that are necessary to perform these operations make the "former" quite an intricate piece of mechanism. In spite of this fact, it is surprising how little attention is necessary to keep the machines in running condition. Twenty formers are operated by two men, a mechanic and a helper. A constant check is necessary on the product, so that it will be regular and well formed. Each link, at this stage of the process, has an opening in the side which must be welded by the welder.

The welding machine is not as complicated as the former, but the chain is worthless unless the opening in each link is made as firm and strong as the original wire. The heart of an electric welder is the welding transformer. The transformers for welding chain are made up of a laminated iron core, a primary consisting of three hundred seventy-five turns of Number 0 copper wire, and a single-turn, cast-copper secondary. The whole transformer, when assembled, weighs about twelve hundred pounds. The purpose of this part of the machine is to change the two hundred and twenty volts to about six volts and a very high welding amperage. The current is conducted to the welding electrodes, called "jaws," which make contact with the link. These jaws grasp the link at the same time the circuit breaker turns on the current. With a loud roar the current rushes through the link, and meeting with the greatest resistance at the opening, it heats the wire at that point. When the metal starts to bubble, the operator pushes a lever, and the jaws give the link a tremendous shove, pushing the white hot metal together. At the same time, hammers squeeze the weld into shape, and the machine automatically carries the next link into the jaws. The rough link is trimmed smooth by a special cutter on the machine. One revolution gives sufficient time to weld a link. Small chain is welded at a rate as high as forty links per minute, and the slowest speed on large chains is seventeen links per minute. One of the most important improvements on the welder is the automatic "tripper." This simple little device is timed so as to automatically trip the welder when the welding heat has been reached. It enables one man to run as many as six welders, speeding up production with maximum efficiency.

After the chain is welded it is passed on to the tester, where it is pulled to remove all bad links. The tester consists of a hydraulic press, having a balancing beam which is graduated in pounds. One length of chain is tested at a time. One end is hooked to the block about fifty feet away from the press. The other end is fastened to the piston rod of the press and the oil is turned into the cylinder. When the beam tips at the desired

(Continued on Page 24)

## MODERN CHAIN MAKING

(Continued from Page 13)

number of pounds pressure, the oil is turned off and the tested length taken off the block, to be replaced by a new length. If the chain breaks, as it frequently does, a temporary repair link is slipped into place and the length pulled again until it stands the test. After it has been satisfactorily tested, it is taken to the inspector, who takes out the temporary repair links, and puts in their places new links which are then returned to the welder to be welded. After the chain has been completely repaired, it is again inspected during which time all rough surfaces are refinished.

For all ordinary purposes the chain is now finished and ready for the market. The chain from this point takes many directions: some of it is polished by tumbling it for hours in metal "tumblers"; other chain is plated to preserve it in storage; while much of it is tempered so that it will stand unusual wear.

The advantages of the new electrical method are apparent. First of all, the hard labor which shortened the life of the "chain-maker" has been obliterated, and the work of making chain can now be done by the average workman without physical strain. Production has been increased enormously by the new process, thus cutting the price of chain and presenting enough chain to satisfy the enormous demand for the product. The cost of production has been cut, the old method producing about one-hundred pounds of chain per man per day, and the new method (with one man operating four machines) about two thousand pounds per day. The great expense of keeping up the oil and gas furnaces has been replaced by the moderate expense of repairing the chain machinery. Lastly, a higher quality of production is possible with the electrical process. The machine chain is regular, since all links are identically alike, but the links made by hand are very irregular. Then, too, when the real test is made on the hydraulic tester, it is found that the electric-weld chain will outstand fire-weld chain.