

The American Bridge Company's Ambridge Works

The Eye Bar Shop

[pp. 10 – 13 in The Iron Age, September 15, 1904]

(Re-formatted for clarity by Vern Mesler, Nan Jackson, 2021)

In *The Iron Age* for August 4, we published a description of the great bridge plant of the American Bridge Company at Ambridge, Pa., particular attention being given to the design and equipment of the main bridge shop. We now take pleasure in laying before our readers a description of the eye bar shop in which hydraulic machinery is employed in the production of eye bars up to any size required.

The Building.

The eye bar shop is a steel building 220 x 225 feet, with concrete curtain walls, and has a floor space of about 50,000 square feet. It is especially designed for the handling of the long bars necessary in eye bar work, and is divided into three bays, the middle bay and two side bays. The middle bay is 60 feet wide and is served by a 20-ton electric traveling crane, with 35 feet head room under it. Each of the side bays is 80 feet wide and 20 feet 6 inches in the clear between the floor and the bottom part of the roof trusses. Each of the side bays is served by parallel sets of electric traveling cranes, with 27 ½-foot span.

The building itself is a steel frame with heavy roof trusses, firmly braced to carry the numerous overhead cranes, and is supported by columns in the side walls and by two columns which are centrally located, one of each side of the middle bay. The walls are of concrete, laid in panels 8 feet high, with numerous sliding doors on all sides. Above the concrete is a continuous belt of sliding windows 10 feet high. The roof of the middle bay is raised 8 feet above the roofs over the side bays, this space being inclosed with sliding windows. Dormers in the roofs over the side bays and skylights in the roof over the middle bay shed additional light. The balance of the siding is corrugated steel.

Half of the building is equipped with especially designed hydraulic machines for forging heavy eye bars (*i. e.* those above 8 inches wide), while the other half is reserved for a set of lighter machinery, with which eye bars up to 8 inches wide may be forged and handled more speedily. The furnaces and machines are placed in a row along the middle bay in the order in which they are used, so that the process is a progressive one from start to finish. The side bay in use is equipped with the necessary roller tables and skids, but otherwise left clear for the passage of eye bars from one operation to the next. Electricity for the motors and water at a pressure of 800 pounds per square inch are supplied from the power house nearby.

Heating and Upsetting.

The stock is run into the shop on a narrow gauge track, from which it is taken and charge into the furnace by a specially designed charging crane, which runs along the side bay in front of the furnaces and the machines. It consists essentially of an electric traveling crane of 27 ½-foot span. It is fitted with a lifting beam which is a box girder 41 feet long. This lifting beam forms a runway for three four-wheel trolleys, which carry electro magnets of 2500 pounds lifting power each. The traverse of these trolleys is accomplished by an independent motor connected with the trolleys by an endless rope. Telescopic guides, strongly braced to the bridge, serve to prevent any swaying of the lifting beam due to the traversing of the trolleys. This crane carries stock to and from the furnaces, inserting the ends or withdrawing them by simply traversing the trolleys.

After heating, the bars are delivered by the charging crane to the hydraulic upsetter, Fig. 1. The process performed by this machine is the upsetting and forming of the heads, which is accomplished by dies, moved by hydraulic rams. There are three rams, as follows: The upsetting ram, the die closing ram and the hydraulic grip. These rams may be operated at pressures varying from 800 to 7000 pounds per square inch. The higher

pressures are obtained by means of intensifiers. The rams are controlled by hand pilot valves, conveniently arranged for the operator. The upsetting cylinder is horizontal, while the die closing and grip cylinders are vertical, being carried by massive housings. The functions of the rams may be inferred from their names; the upsetter moves the dies, thereby forming the head; the die closer prevents the dies and bar from buckling, and the grip prevents the bar from backing out of the machine. The dies are readily changed to accommodate the machine to the varying sizes of eye bars. As mentioned before, this machine is served by power driven roller table, with reversible rolls, which reduces the handling of the bars to a minimum.

Punching.

After upsetting, the bars are taken by an electric crane to a hydraulic punch, Fig. 2, which punches the pin hole to a less diameter than the finished hole. This punch is operated under a pressure of 6000 pounds per square inch. Four vertical bolts take all the punching strain.

Head Rolling.

From the punch the bars go to the rolls, which is the next machine in the row, also shown in Fig. 2. The head roller is essentially two independent hard steel rolls, which are carried by massive side housings, and independently driven by electric motors. The rolls are mounted one above the other, the upper one being adjusted by heavy screws, which are operated by an independent motor. This machine is also served by a roller table. The rolling completes the forging operations of one head, after which the bars are sheared to exact length by a special hydraulic shear. The shear, like most of the other machines, is served by a roller table, and is located on the opposite side of the bay, so that the bars may be sheared without turning them end for end. The shear is quite similar to the punch and consists of a top and bottom steel casting, the castings being held together by four tension bolts. The top casting carries the hydraulic cylinder and ram which operate the knife.

After shearing, the bars are turned end for end and heads are formed on the other end in the same manner, as just described. With heads forged on each end, the bars are ready to be straightened. The bars go to a horizontal gag press of special design, Fig. 3. The press has one fixed head and one sliding head, which is operated by a hydraulic ram. The heads have several vertical slots, into which fit different sized gags, and in the middle of each head is a gag held in an inclined slot. The position of the middle gags is controlled by motor driven screws, and may be changed at will, thus varying the bite of the press. The movable head is returned to its open position by a push back ram, located under the bed. Roller tables extend from both sides of the press and are controlled by a man in a pulpit, directly over the bar and in such a position that he can determine if the bar is straight. This man also controls the adjustable gags in the press. One other operator is required to control the rams, which is accomplished by hand pilot valves.

Annealing.

After straightening the bars a crane delivers them to the roller tables, which serve the annealing furnace, shown to the right in Fig. 4. The bars are loaded flatways and charged into the furnace by the power driven rolls, all of which operations consume but a few minutes. This results in a saving of several hours' time over the old method of annealing. The furnace is built of channels, bolted flange to flange, similarly to the heating furnaces. The lining is of fire brick, with fire brick arches forming the top and bottom. The walls are tied together by vertical posts and buck stays. The eye bars are supported in the furnace upon mechanically driven rollers, which are hollow and are cooled by an air blast. The fuel here, as in the heating furnace, is oil, burned in the same kind of special burner. The products of combustion are conducted to a stack 4 feet in diameter by 60 feet high by a series of underground flues. After heating, the bars are allowed to cool in their own atmosphere. It is proposed to build a similar furnace at the other end of the roller table, so that either furnace may be used as a muffle for the other one, thereby making the process a continuous one.

The two furnaces, with the tables between them, will reach across the shop, a distance of 220 feet, and are equally convenient for light or heavy work. By the use of these furnaces not only time is saved, but a very

even heat is obtained, so that the bars come out of the muffle practically as straight as they went into the furnace, thereby saving the expense of restraightening them and also avoiding the injurious results of straightening a badly warped bar. Whatever final straightening is necessary is done on a vertical geared gag press, Fig. 4. The cross head is actuated by an eccentric of 1 inch throw, which is in turn motor driven. The cross head is fitted with dovetailed slots, which hold the different gags. The lower stationary head is in two independently adjustable parts, with a movable gag on a central support between them. The upper head may be adjusted to one side of the machine or the other to accommodate the machine to wide or narrow eye bars, by means of a power driven screw. The lower gags are adjusted by wedges, which are operated by hand screws. This machine is very compact, occupying a small floor space o only 6 feet by 7 feet, and like the horizontal gag press, is operated by two men, similarly stationed.

Boring.

After the eye bars are perfectly straight, they are taken by an overhead electric traveling crane to the boring mill, Fig. 5, which is the last machine in the bay. It consists of two independent boring heads, one of which is fixed and one of which is movable on ways about 75 feet long. The boring heads may be set at the required distance apart and the two holes in the bar bored simultaneously. The bars are punched so near to the finished sized hole that the holes are finished at one cut. While the machine is of standard construction, the heads are equipped with special centering chucks, which quickly and accurately locate the bars. When bored the eye bars are completed and an overhead crane loads them on the buggies on an adjacent narrow gauge track. The interesting and instructive features of the eye bar plant are as follows: The special design of the building, as shown in the ground plan, Fig. 6, adapting it to the convenient handling of the long bars; the systematic arrangement of the machines tending toward the same end; the special hydraulic machinery and furnaces, and last, the efficient crane service, which makes the handling of the heavy bars such an easy matter.

Figures

Fig. 1 – The 30 x 44 Inch Upsetter in Eye Bar Shop

Fig. 2 – Eye Bar Punch and Head Rolls in Eye Bar Shop

Fig. 3 – The Horizontal Gag Press in Eye Bar Shop

Fig. 4 – The Vertical Gag Press and Annealing Furnace in Eye Bar Shop

Fig. 5 – The Boring Mills in Eye Bar Shop

Fig. 6 – Not included

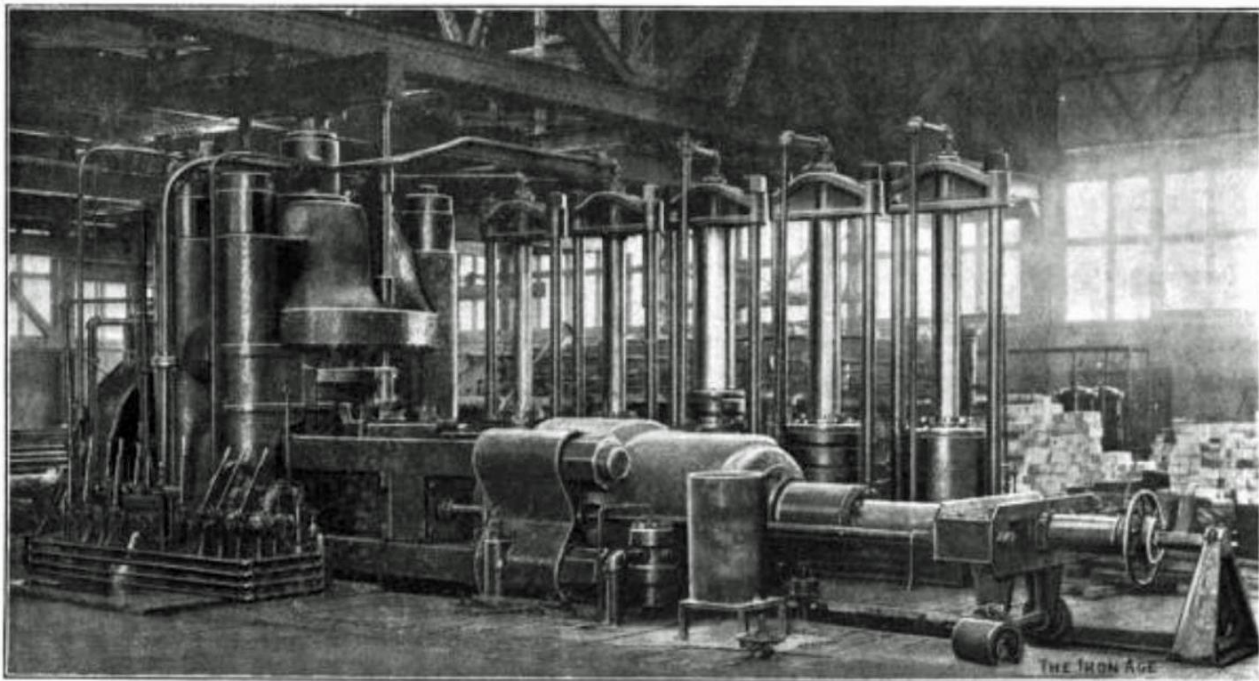


Fig. 1 - The 30 X 44 Inch Upsetter in Eye Bar Shop

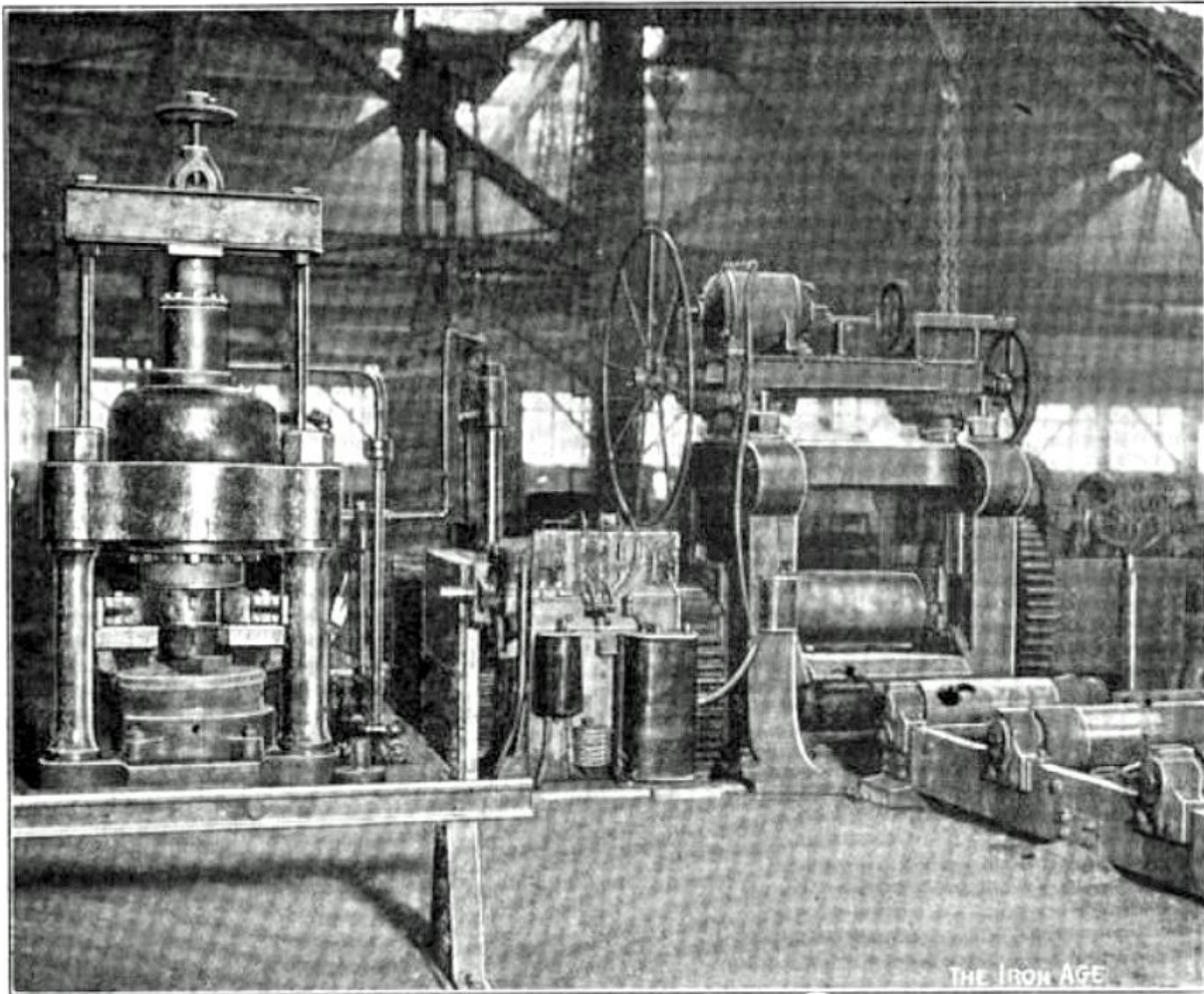


Fig. 2 - Eye Bar Punch and Head Rolls in Eye Bar Shop

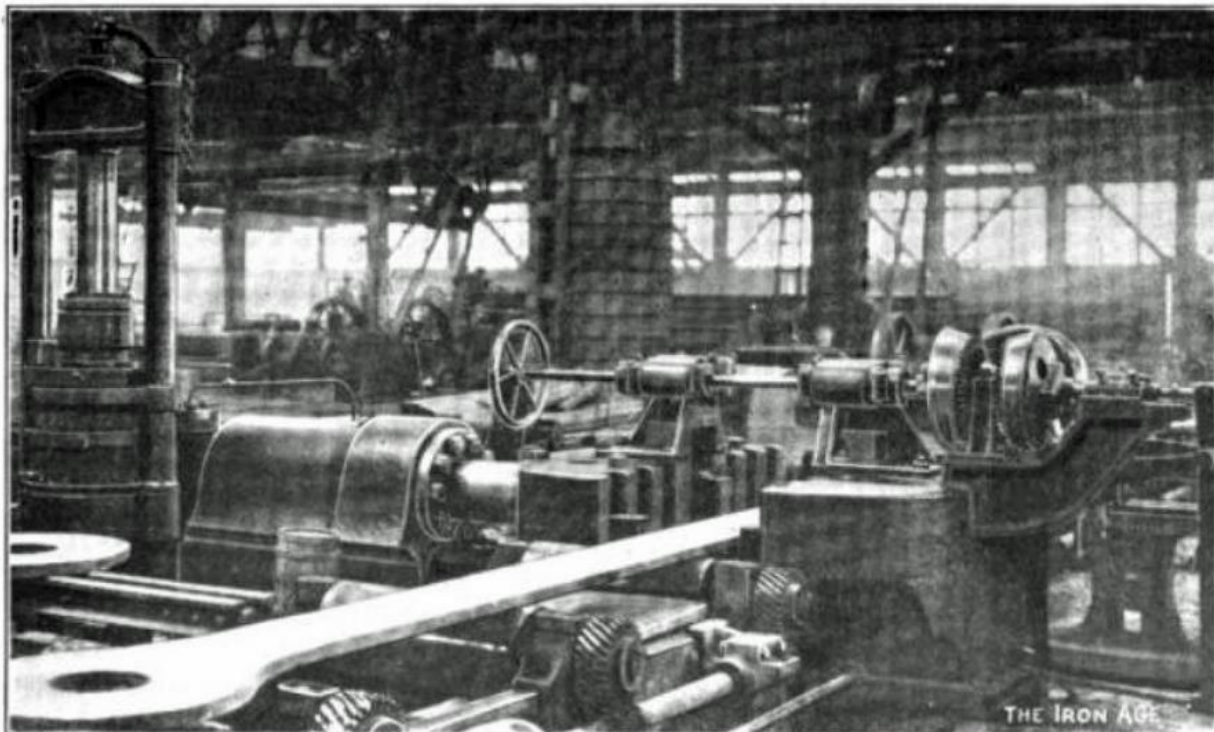


Fig. 3 - The Horizontal Gag Press in Eye Bar Shop

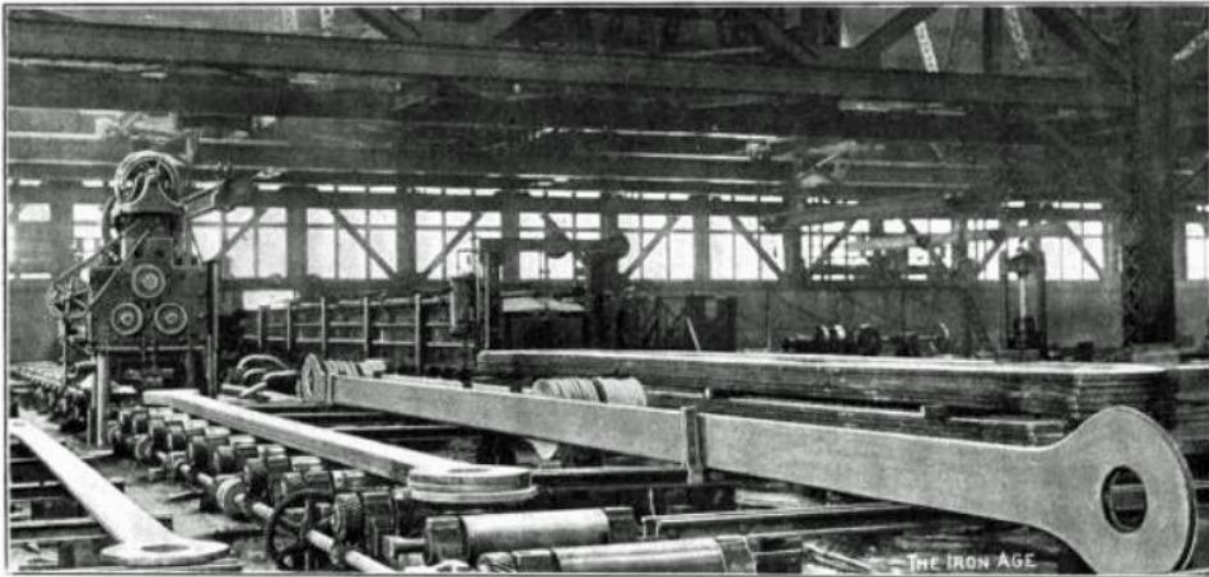


Fig. 4 - The Vertical Gag Press and Annealing Furnace in Eye Bar Shop

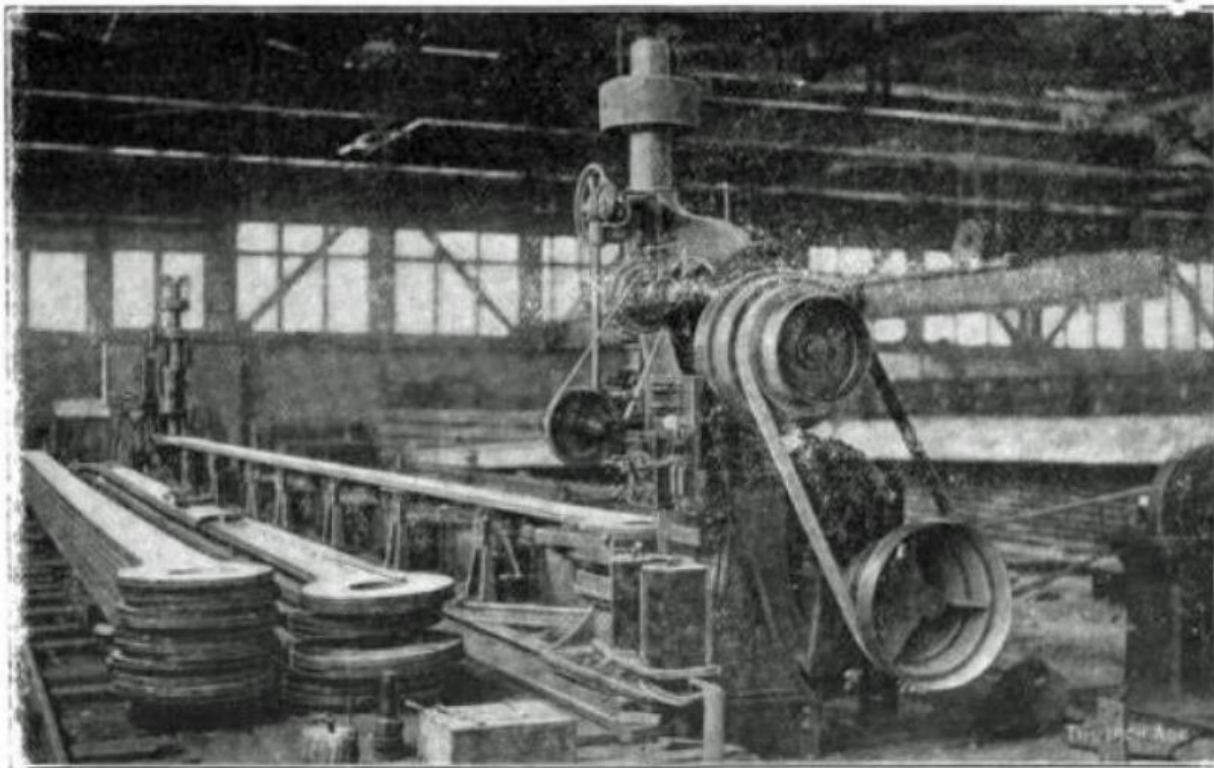


Fig. 5 - The Boring Mills in Eye Bar Shop