

valve, and the articles rest upon the slab untouched by the flame. This does the work ordinarily executed in large and expensive muffles, and independent of the saving of the muffles, runs otherwise more economically than a muffle furnace.

Fig. 6 shows a large melting furnace. This is used for brass or bronze foundry work. The flame enters tangentially and with a slight downward inclination, and the products of combustion escape from the bottom of the furnace. There is no escape of gas or flame from the top, and when the metal is at its hottest, one can stand over the crucible and look down into it without inconvenience.

Fig. 7 shows one of the special furnaces to which the process lends itself so admirably. It is a modification of the oven furnace just described, and is designed for tempering mowing machine cutters. These are fed to the machine on an endless chain, their bases resting thereon, the cutters being supported in an approximately vertical position. The effect of this is to produce differential tempering, the edges being brought to the higher heat, so that as they fall into a tank of oil or water the cutting edge is made hard and the body is left soft. Fig. 8 is a soft metal furnace. In such furnaces as this Babbitt metal, solder or other of the more fusible alloys may be compounded, or it may be used for melting the more fusible metals for castings.

Fig. 9 shows another interesting apparatus, a furnace for bluing screws or other small articles, such as the parts of a bicycle chain. Within a gas furnace rotates a drum, provided with helical partitions. The screws are fed in at the back and as the drum rotates pass through the furnaces, each one in an absolutely definite time, and a constant stream pours out from the front of the furnace, all blued to the exact tint required. By varying the amount of gas used or by feeding the pieces more or less rapidly, any desired result may be obtained with certainty.

Fig. 10 shows a gas forge. This apparatus provides for the needs of a blacksmith or drop forger. For the latter especially it is designed. The piece of metal introduced at the opening, O, is rapidly brought to the desired temperature. Fig. 11 shows another special apparatus, a furnace for maintaining lead in a state of fusion to be used for hardening steel tools. In this furnace the hotter metal is kept in fusion at any desired temperature, so that uniform results in tempering can be secured by it. This furnace has vertical burners entering opposite to each other at top and bottom, so as to maintain all portions of the metal at an even temperature. Thus a long bar of steel plunged in the metal is heated evenly from top to bottom.

Fig. 12 shows a muffle furnace. This is a more familiar type and is used by assayers, enamellers, and in many classes of operations. It is lined with fire clay and the muffle bottom is protected by an extra slab so that it will not sag. It is found that a muffle with a gas fuel lasts much longer than in the ordinary coal furnace, which also applies to crucibles.

Fig. 13 shows the brazing table, where two blowpipes fitted on adjustable supports bring their flames to impinge on the object to be brazed. This was originally built for bicycle work, but its operations have been found to be so good that it has been adopted by the brazing trade in general. Although our illustrations represent the works at Elizabeth, N. J., the general offices are at 80 Nassau Street, New York.

Space is not permitted us to go into details of the American Gas Furnace Company's apparatus as fully as we might desire. It is enough to say that a very large variety of furnaces for every conceivable kind of work is furnished, and that by the use of their gaseous fuel a great direct economy is secured, as well as the

both factory is lighted and partly heated by the gas as well as given its power.

GAS ENGINE TRICYCLE.

Verily, the field of usefulness formerly held by the horse is narrowing daily. To steam, electricity, and the ubiquitous bicycle comes an ally in the form of explosive gas, so cunningly applied to the propulsion of vehicles as to threaten his utter rout. The accompanying illustration shows the latest improvement in adapting the gas engine to the running of wagons on ordinary roads.

This tricycle is propelled by a two horse power Golden Gate balanced gas engine. It has been tested on the streets of the city under varying conditions as to grade and roadway, and has proved in every instance satisfactory, being easy to control as regards starting, regulating speed, turning, stopping, etc.

The machine is calculated to carry three persons on the single broad seat, though operated by one, with surplus power sufficient to trail one or two buggies or a loaded wagon, according to the character of the road. It carries twelve hours' supply of

gasoline, or two and one-half gallons, and can easily attain a speed of from ten to twelve miles per hour on favorable ground. Being geared in such a manner that the movement of a lever increases or decreases the speed enables the driver to climb grades of considerable pitch.

It is claimed to be perfectly safe and is simple in construction, the design of the inventor being to have as few pieces and parts as possible. The wheels and frame supporting the engine are strong and the entire machine is constructed in the most substantial manner, as if intended to withstand hard usage. It was built on an order from a gentleman in Santa Maria, Cal., by A. Schilling & Sons, 211-213 Main Street, manufacturers of the Golden Gate gas engine.—Min. and Sci. Press.



GAS ENGINE TRICYCLE.

indirect one due to a more perfect regulation of heat and to less wear and tear upon the furnace.

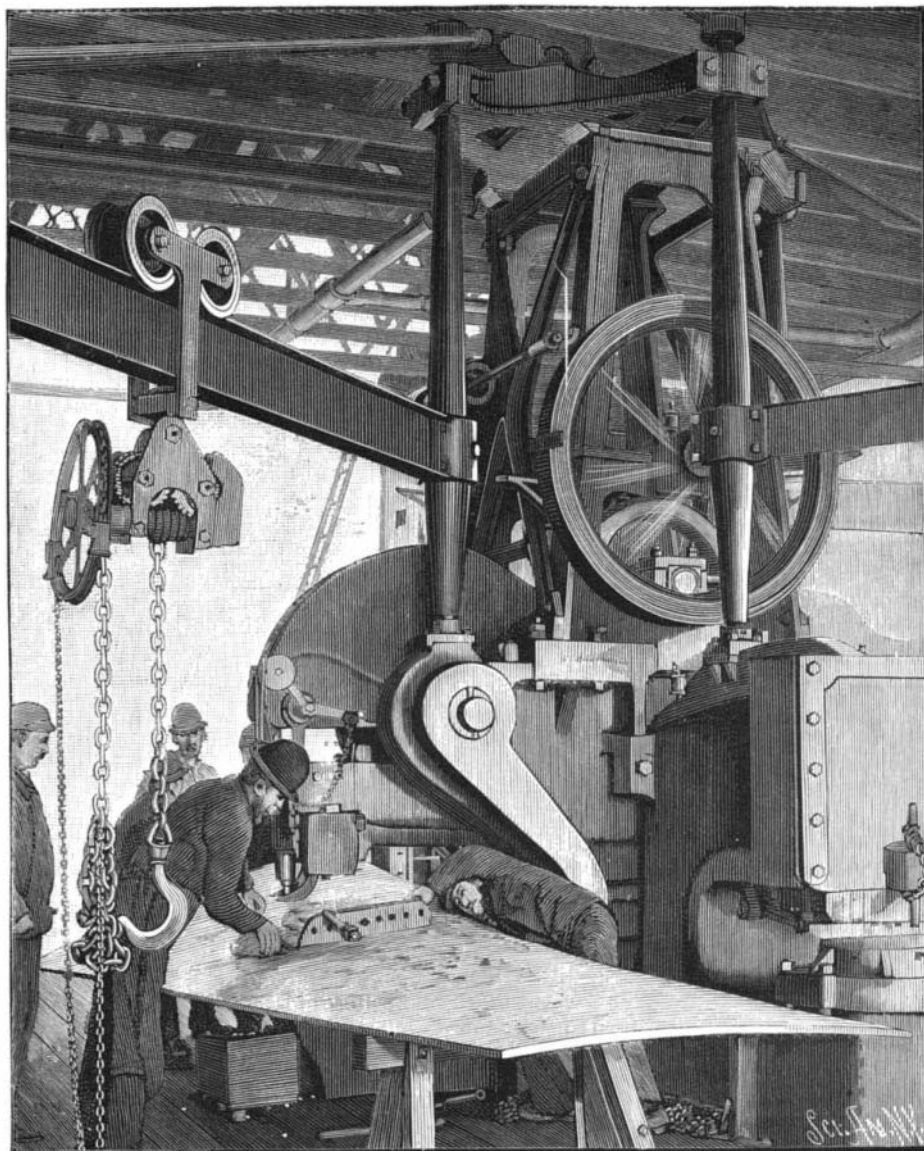
Every apparatus is evidently the result of painstaking care and thorough technical knowledge, and their aim appears to be to produce the best, irrespective of immediate profit. Their work has received flattering recognition from the Franklin Institute, and the fact that these furnaces have been recognized as most efficient for certain grades of work is evidenced by the fact that a number of these furnaces are exported annually to foreign countries.

In the factory at Elizabeth, and elsewhere, the gas is used to supply incandescent burners. It also is used in radiators to heat rooms. Thus the Eliza-

HYDRAULIC JAW PLATE PUNCH.

The accompanying illustration represents one of the powerful hydraulic jaw plate punches in use in the William Cramp & Sons Ship and Engine Building Yards in Philadelphia. The punch is one of many similar punches used in constructing the great war ships and merchant marine vessels for which the Cramps have gained a great reputation. This particular form of punch is used to cut the plates which are to form the hulls of the vessels to the desired shape. The punch is situated in the ship yard near the immense stays which hold the great vessels while in course of construction. The illustration has been made from an instantaneous photograph taken while the punch was in operation.

Before placing the plates in position for punching, the exact form of the plate desired is marked on the original plate by a wide chalk line. The plate is then carried to the punch by means of an ordinary traveling hand crane and pulleys, which are clearly shown in the illustration, and to aid in holding the plate in a horizontal position several ordinary wood trestles are generally employed. The steel punch consists of a knife with a very blunt edge which cuts or punches out disks of metal one inch in diameter. By punching the plate so that these disks overlap one another it is of course possible to cut the plate quickly and neatly to the desired pattern. The illustration shows the punch at work in cutting a plate of steel one inch thick. The friction produced by the punch



HYDRAULIC JAW PLATE PUNCH.