Some Features of the Toledo Steam Carriage.

PART II.

The valves of this pump are ball shaped, the discharge valve, which is shown in the drawing, being pressed down to its seat by a coiled spring, which is located in a dome-like extension of the valve cap. As will be seen from the drawing, these valves are gotten at and removed with the same facility as the valves of the crosshead feed pump.

Like most other modern steam carriages the Toledo has a combined muffler and feed water heater, which is shown in plan and elevation in Fig. 8. This device consists essentially of an aluminum case and a coil of pipe located within the case. The case is of flat cylindrical form, and is provided with eight vertical partition walls extending from base to base, but not entirely across from side to side, the missing portion alternating from side to side in the successive partitions. This arrangement provides a form of sinuous path within the case, which the exhaust steam from the engine must traverse.

The feed water arrives through the connection shown in full lines, and after passing through the coil leaves through the dotted connection to the boiler. The coil of pipe is arranged in the casing by casting the latter around it.

The muffler is located above the boiler in the carriage, the intervening space being about 4 inches high. It is thus fanned by the hot discharge gases from the burner, which is claimed to add to the efficiency of the device as a water heater, and also to decrease the visibility of the exhaust in cold weather.

A feature which is as yet found in only a few steam carriages, but which is, we believe, appreciated by users, is the one lever control, illustrated in Fig. 9. This lever is arranged on the right side of the carriage just inside the seat. The two functions of the lever are to operate the throttle valve and the reversing links. The lever is pivoted on the throttle valve shaft. In the drawing the lever is shown in the central position, and for this position of the lever the valve is closed. The valve opens gradually, as the lever is moved either backward or forward.

It will be noticed that the control lever has an extension beyond the pivot shaft, and at the end this extension is developed into a sort of shoe with a cam slot. A double armed lever pivoted on a rigid support has the end of one of its arms guided by means of this cam slot. The end of the other arm of this lever is connected by a rod to the usual bell crank on the engine which controls the links. It will be noticed from the drawing that the middle part of the cam slot is considerably inclined to the centre line of the control lever, while the outer portions of the slot are almost concentric with the pivot of the lever. This means that the links are moved to practically their extreme positions

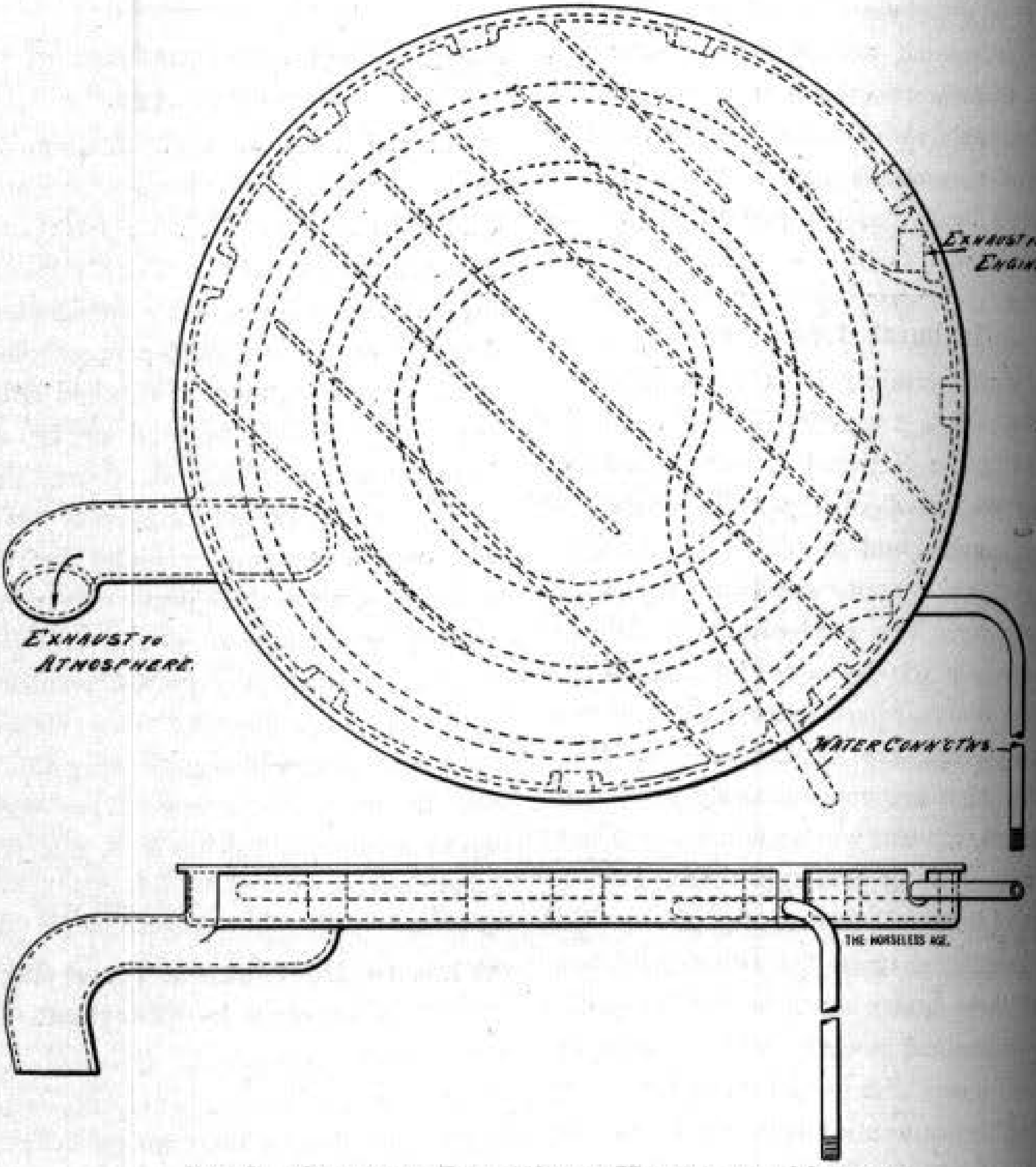

FIG. 8.—COMBINED FEED WATER HEATER AND MUFFLER.

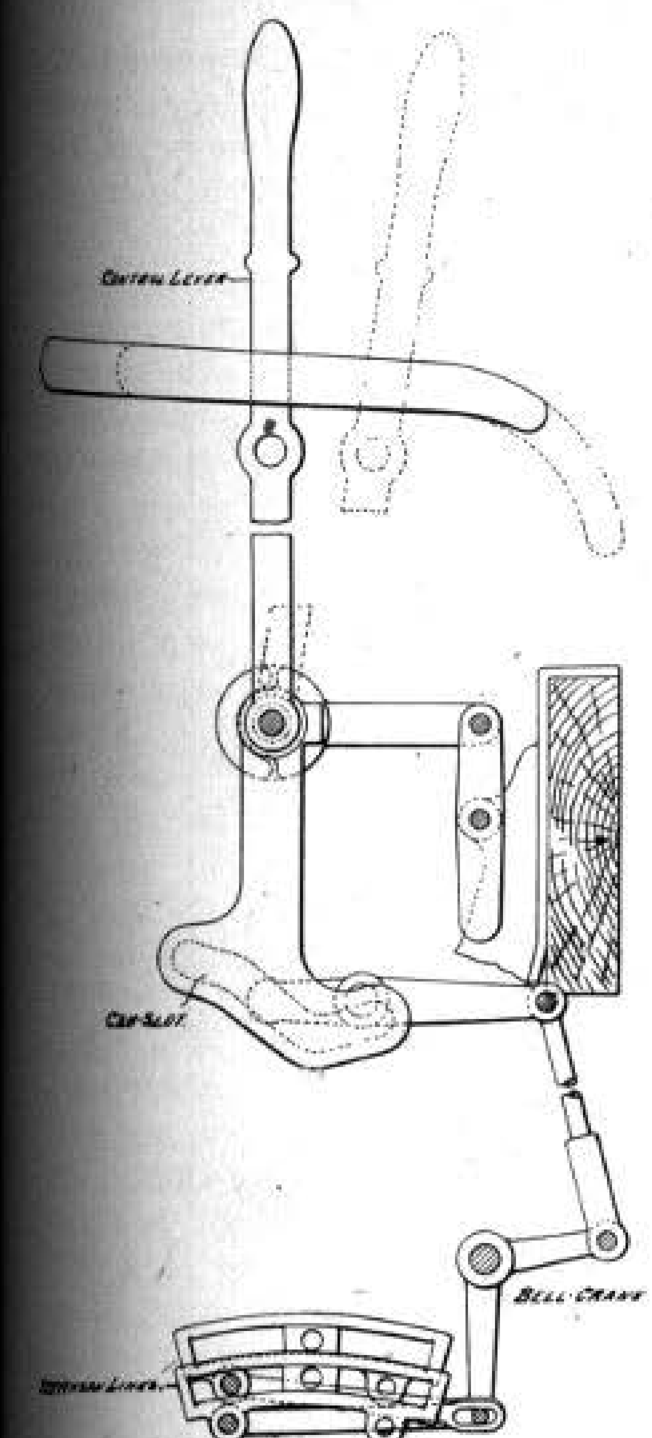

FIG. 9.—ONE LEVER CONTROL.

and the full valve travel is obtained after only a comparatively slight movement of the control lever.

The objection is sometimes urged against the single lever control that with it the operator is liable to suddenly reverse his engine and to thus subject his machine to abnormal strains. It is, of course, obvious that an experienced driver will avoid such mistakes, but the manufacturers state that their engine, chain, differential gear, &c., are sufficiently strong to

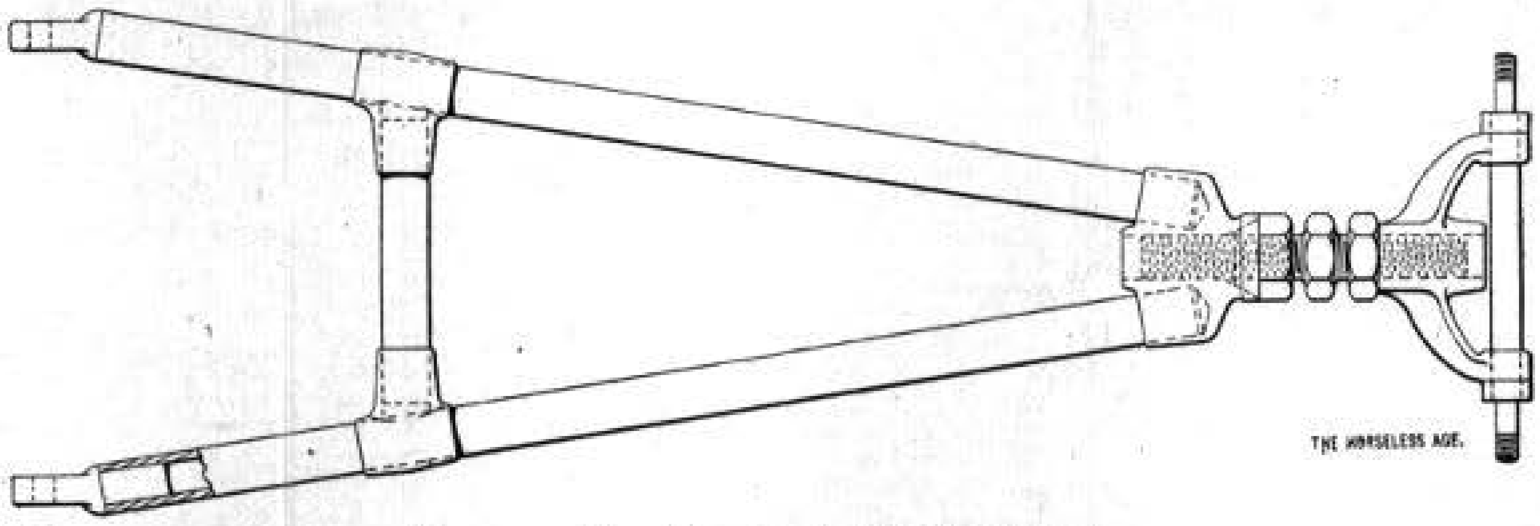

FIG. 11.—THE CHAIN ADJUSTING STRUT.

withstand any shocks which may thus be imposed upon them.

The rear axle construction is illustrated in Fig. 10. Generally speaking, the design is quite similar to other steam carriage driving axles, but it possesses a number of special features of apparently minor importance, but by which very desirable ends are secured.

The sprocket wheel is secured to the differential gear in the middle thereof, and a brake pulley is provided on either side of the sprocket. The two pulleys are each surrounded by a brake band which above and below are united by steel strips which arch over the sprocket wheel. This construction insures a central or balanced application of both the chain pull and the brake tension.

The differential gear, it will be observed, is of the bevel gear type. It will also be noted that it is keyed to the axle, or rather, the side gears are keyed to the half axles, with Woodruff keys. Perhaps the most important feature of the entire construction resides right in the method of fastening the differential to the axle. Referring to the right-hand side gear, which is shown in section, it will be noticed that the hub of this gear extends out quite a distance on the lower side of axle, while above the axle it is cut off short. The reason of this is that one-half of the cross section of the hub is cut away for almost the entire projecting length, and that a piece similar to that cut away is substituted in the form of a cap. This cap is clamped to the hub by means of four cap screws, as plainly shown in the drawing.

The object of this construction is to permit the removal and reattachment of the differential gear without taking out the half axles. All that is necessary to do to effect this is to loosen the chain and brake connections, take off the caps and the gear complete can be taken out from below.

Each of the half axles has a ball bearing, the balls near the wheels being of ½ inch diameter, and those near the differential 7-16 inch. Special provisions are made for oiling these ball bearings. A hole is drilled from above through the bearing housing and through the rear axle sleeve extending into it, and a tube is inserted the upper end of which is closed by a plug (as seen on the right in Fig. 10). Through this tube oil can be admitted to the rear axle sleeve. Longitudinal grooves are cut into the half axle at each end through which the old finds its way to the bearings. The balls are protected from dust by felt washers, as shown.

A word in regard to the method of fastening the wheels to the half axles. They are held from angular dislocation by three Woodruff keys, and from axial motion by a flat headed screw screwed into the axle, which is locked by a set screw of smaller

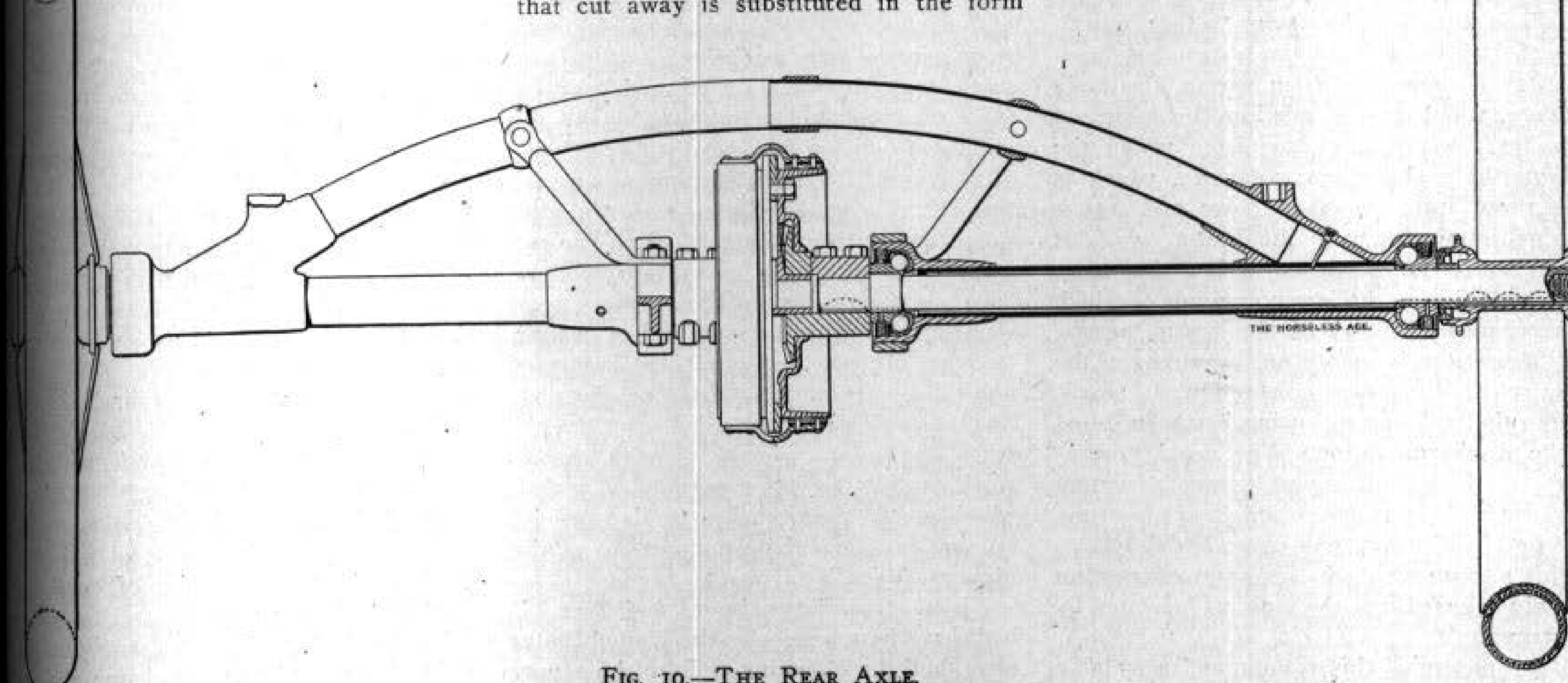

FIG. 10.—THE REAR AXLE.

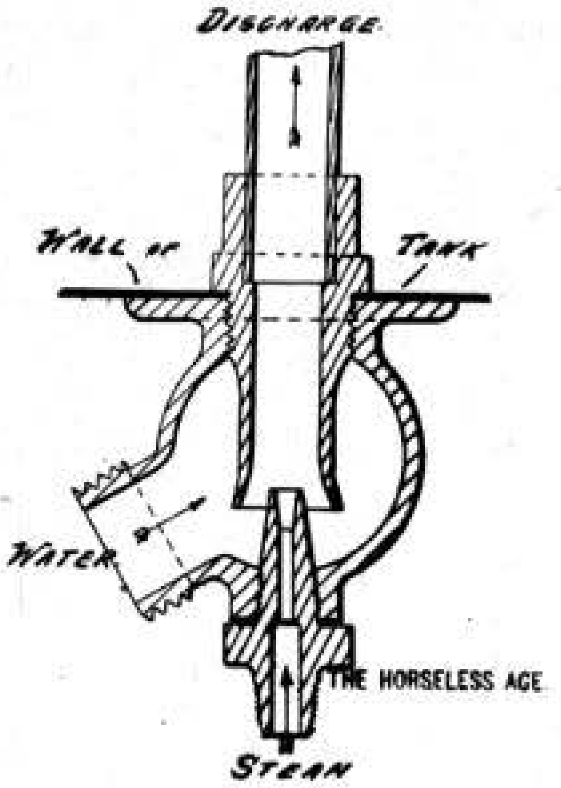

FIG. 12.—EJECTOR.

diameter, as plainly shown. The outer end of the wheel hub is closed by the usual cap.

The chain tightener or engine strut of the Toledo carriage is of tubular construction, as seen from Fig. 11. It is in two parts, which are connected by a stud with right and left hand threads, by means of which the adjustment is made. This stud has a hexagonal head in the middle by which it can be turned. Turning it one way lengthens the strut and turning it the other way shortens the strut. After the adjustment has been made the stud is locked in position by means of two lock nuts, which are drawn up tightly against the internally threaded parts.

The right-hand end of the strut, as shown in the drawing, is the end that connects to the engine, fastening lugs being cast on the engine casing for this purpose. The opposite end of the strut fastens to the rear axle yoke.

An accessory that is frequently a great convenience to a steam carriage owner is the ejector or automatic water tank filler shown in Fig. 12. It acts on the principle of the injector used for feeding steam boilers, and for the benefit of those who are not acquainted with this device the modus operandi will be explained here.

It is seen that the device, which is soldered into the wall of the water tank, consists of essentially three parts: The body piece, which has connection (by means of a hose) with the source from which the water is to be taken; a nozzle, which is screwed into the body piece and has a pipe connection with the boiler, which is controlled by a valve, and a discharge pipe or fitting, the lower opening of which surrounds the end of the steam nozzle. When steam is turned on, by means of the valve in the steam connection, it passes into the tank through what has been called the discharge fitting. The rapid flow of steam through this part causes a suction effect in this passage in the direction of the flow of the steam, and water is drawn into this passage through the water connection and is ejected into the tank, as indicated by arrows.

By means of this ejector and a suitable length of hose the tank can be filled from

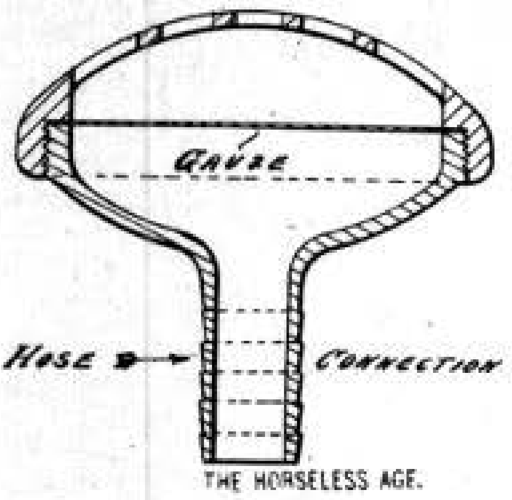

FIG. 13.—THE STRAINER.

any convenient source along the road, such as watering troughs, ponds, &c. Sometimes, however, the water from such sources is rather dirty, and dirt of any kind, it is well understood, is very detrimental in the boiler, and even more so if it should get as far as the engine. The water must therefore be strained before it is delivered into the tank. This is accomplished by drawing the water into the hose through a strainer, as illustrated in Fig. 13. The strainer is in two parts screwed together, and between the parts is clamped a sieve of fine mesh wire gauze. The outer part or cap is pierced with comparatively large holes for the water to pass, and serves to keep coarse and fibrous vegetable impurities away from the sieve, which would soon obstruct the passage through it. The sieve takes care of fine impurities. The neck or connection piece of the strainer is seen to be provided with external grooves, to provide a firm hold for the end of the hose.

Nickel-Iron-Carbon Alloys.

BY HARRY E. DEY.

PART VI.

STRUCTURAL BEAMS AND SHAPES.

The following statement of Mr. E. F. Wood in regard to bridges applies equally well to the frames of automobiles:

"The increase in elastic limit by the use of nickel in steel makes possible an increase in the span, or a decrease in the weight of bridge sections. The resistance of nickel steel to jarring shocks renders its use in eye bars for bridge construction particularly desirable. Such eye bars are subject to repeated jarring strains, and the failure of an eye bar means the collapse of a bridge. The necessity thus arising for the use of a steel with high elastic limit (about 70,000 pounds) has led to the use in some cases of 0.40 carbon simple steel. This percentage of carbon renders steel sensitive to heat treatment, and in heating to forge the eye the bars are in danger of becoming crystalline from overheating. The same high elastic limit can be obtained by using an 0.18 to 0.20 carbon steel, with 3 to 3.5 per cent. of nickel, which steel is less liable to damage by overheating than the simple steels of the higher carbon."

Nickel steel shapes, beams and T and Z bars have been made for the United States navy, and the following is from the report by Commander J. G. Eaton: