

HYDRO-PNEUMATIC GUN CARRIAGE.

We illustrate herewith, from *Engineering*, the revolving hydro-pneumatic gun carriage, especially designed for naval purposes. The engraving we now publish shows the perfected system in all its details, and indicates both the loading and firing position of the gun, which is mounted upon a revolving carriage. The circular travel described by the wheels upon the lower deck is 12 feet 9 inches, and at the upper deck the framework is free to turn round an inclined path 17 feet 6 inches diameter, upon which rollers set at an angle take their bearing, the revolving motion being effected by bevel gearing, as shown. Under the carriage is placed an hydraulic cylinder, the ram of which has a T-shaped head, and is provided with small rollers which bear upon the under side of the moving part of the carriage. In the lower part of the carriage, that which has no movement except a circular one, a vertical opening is left on each side, as shown, and these serve as guides for the ascending or descending ram, the end of the T-head, projecting through the openings on either side. Parallel links, the position of which, when the gun is in firing position, is vertical, are secured at the lower end to the bottom of the fixed part of the carriage, and at the upper end to the movable part, their motion being the same as the links in a parallel ruler, as the gun rises or falls. Connected with the hydraulic cylinder is a pipe leading to an air vessel, and having a valve chamber containing a spherical valve. A bye-pass pipe, which can be opened or closed by a lever from the gun platform, establishes an independent communication between the air chamber and that portion of the main pipe between the valve chamber and the hydraulic cylinder. In the rear of the air chamber is a small pipe for supplying water-deficiencies by leakage. The action of the mechanism is as follows: Water is pumped into the apparatus until the air in the air chamber is placed under a considerable pressure. When the gun is loaded, and it is desired to raise it, the opening of the bye-pass establishes a communication with the hydraulic cylinder, the ram of which rises carrying with it the gun. The valve is then closed, and when the piece is fired the recoil throws it back with a constantly decreasing velocity, due partly to the increasing resistance of the coupling links, and partly to the increasing pressure within the air chamber.

PONSARD'S IMPROVEMENTS IN APPARATUS FOR PUDDLING IRON, ETC.

[From *Mechanics' Magazine*.]

According to this invention, just patented by Mr. A. Ponsard, of Paris, it is proposed to combine with a tubular stirrer which is suspended at or near its center of gravity so as to be easily maneuvered a coil of pipe, which is made to closely surround the fore part of the stirrer, through which coil cold water is caused to circulate for the purpose of preventing the burning of the end of the stirrer. The stirrer itself is suspended by a flexible pipe or by a properly-jointed metallic pipe from an overhead fixed main pipe extending along any number of furnaces, and supplied with compressed air from a blower or other source, such air passing down the interior of the stirrer into the liquid metal in the furnace. A handle is fitted on to the rear end of the stirrer for facilitating the working of the same, and a stopcock is provided on the stirrer for regulating the passage of the blast there-

through. A second stopcock is also fitted on to the cold-water pipe in a position convenient to the hand of the puddler. The cold water is also supplied through a flexible pipe from a fixed main overhead, and is carried direct to the point of the stirrer, either by quick coils or by a straight length of pipe parallel to the stirrer itself, and then returns by a series of close coils back to the rear part of the stirrer, where it communicates with a flexible pipe for carrying off the water which has been heated by the metal in the furnace. The stirrer may either consist of a tube extending the full length required, or this tube may stop some distance short of

tweezer in substitution for the ordinary water tweezer. Figs. 1 and 2 of the engravings show in section the application of the improved rabble to a puddling furnace; Fig. 3 is a longitudinal section drawn to an enlarged scale of the rabble detached, and Figs. 4 and 5 show in longitudinal section on an enlarged scale two different arrangements for applying cold water circulation to the rabble. This rabble is composed, as shown in Fig. 1, of an iron tube, *a*, attached to a tube, *b*, which carries a cock, *c*, and a handle, *d*, for the purpose of manipulation. The tube, *b*, is by means of a flexible tube, *e*, placed in communication with a conduit, *f*, fed by a blast engine, which may serve to supply one or more puddling furnaces. The flexible tube, *e*, may be composed of metal and jointed, or of caoutchouc, leather, or strong cloth coated with caoutchouc, and provided with an external strengthening covering. It is arranged so as to form also a support to the rabble, and thus relieve the workman, who has simply to conduct it into the molten cast iron, the agitation of which is effected by the outlet of the air which escapes from the end of the rabble. In order to prevent the tube, *a*, from being injuriously affected by the high temperature to which it is subjected there is suspended at the side of the air inlet tube another flexible tube, *g*, Fig. 2, maintained constantly supplied with cold water from a reservoir, where it is compressed under considerable pressure. This tube is connected to the iron tube, *h*, which is laid along the rabble to its extremity, and then wound around it spirally and brought back to its starting point, where it is attached to another flexible tube, *i*, which serves to carry away the water which has become heated. A cock, *j*, is provided within reach of the workman for the purpose of regulating at will the rate of flow of the water in order to prevent its vaporizing in the tube, *h*. In the arrangement shown in Fig. 4 the inlet water

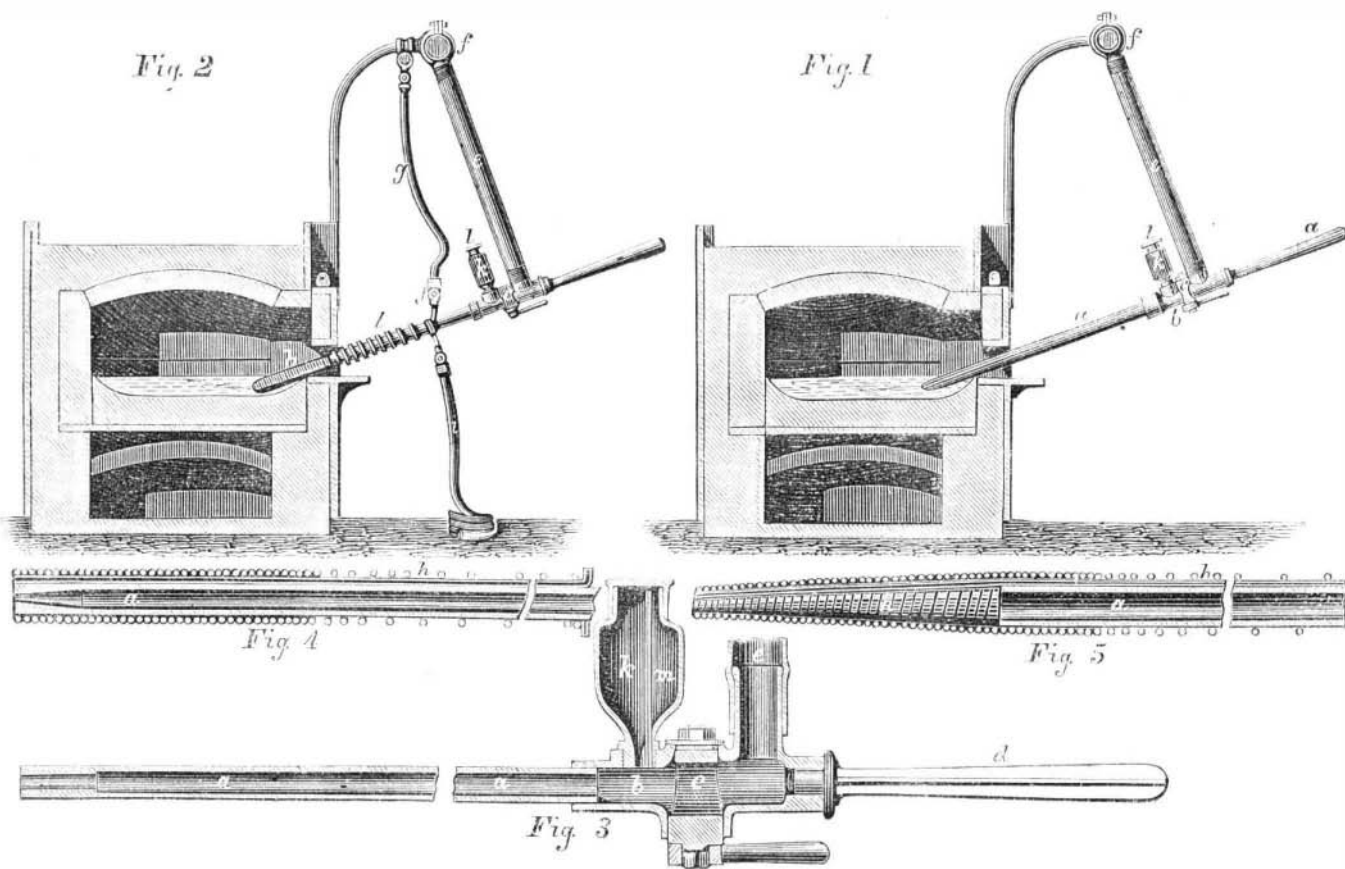
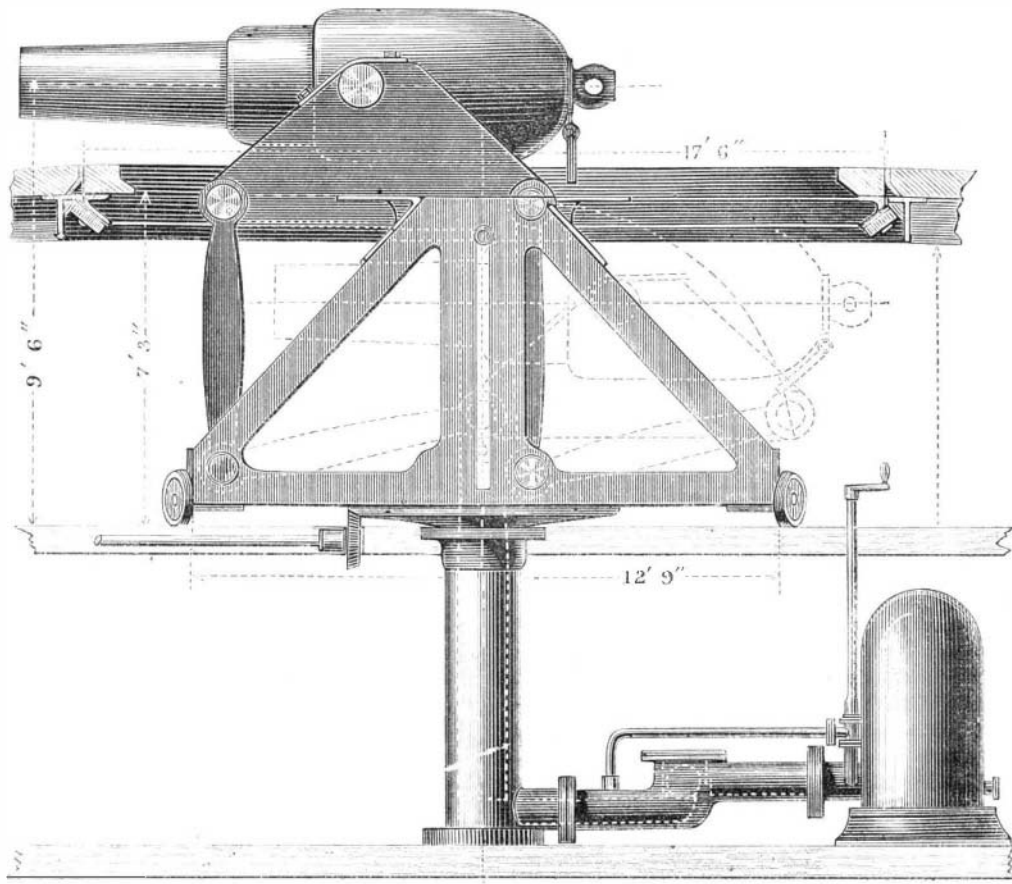
MONCRIEFF'S HYDRO-PNEUMATIC GUN CARRIAGE.

the end of the stirrer, the remaining length being composed solely of the cold water coils, before referred to, closely brazed together.

In order to facilitate the admixture of any of the well-known chemical reagents employed in the manufacture of iron and steel in a dried and pulverized state with the metal, a closed box or receptacle is fitted on to the stirrer, and communicates therewith, an air pipe being caused to enter the said box from the interior of the stirrer, so as to maintain an equal pressure therein and facilitate thereby the descent of the ordinary or any other suitable dried and pulverized chemical reagents into the tubular stirrer, whence they are forcibly expelled by the blast into the molten metal. The same apparatus may be used with a reverberatory furnace for mak-

ing steel, and, so far as regards the arrangement of the coiled pipe, is applicable as an adjustable pipe blast

Fig. 5 shows a modification of the preceding arrangements. In this the iron tube which forms the hollow rabble is dispensed with at the end which enters the furnace, and the spirals of the water tube, *h*, are brazed and welded together, thus forming a rigid durable tube of themselves. Whichever arrangement may be adopted the rabble as it is constantly cooled by the current of water traversing over or around it cannot be deteriorated or burned by contact with the incandescent matters in fusion, or if so, only very slightly. The operation of puddling takes place in the following manner: After having melted the cast iron on the hearth of the furnace the workman lays hold of the hollow rabble by the handle, *d*, and after having opened the cocks, *c* and *j*, plunges it into the molten cast iron so as to submit every portion of the material to the action of the air in order to refine it. This operation may be arrested at any stage; thus it may be suspended at the desired point in order to obtain puddled steel, or prolonged to produce wrought iron. By the simple forms and arrangements adopted for this tool these various operations are facilitated and rendered more convenient; the rabble may be readily withdrawn in order to test the degree of refining of the cast iron. This method of puddling at a high temperature admits of the steel being run into ingots in lieu of withdrawing it from the furnace in blooms as in ordinary puddling. With this new mechanical puddler it will be advantageous to operate upon a hearth of silica for pure cast irons, and



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