PROFESSOR TREADWELL ON HOOPED CANNON.

Professor Treadwell has issued another pamphlet on hooped cannon, in which he demonstrates some new principles in addition to those which he has heretofore expounded.

In his pamphlet on the same subject, issued in 1845, he showed that in a gun with walls of a thickness equal to the bore, it would require four times the pressure to produce cross fracture that it would to split the gun lengthwise. He therefore argued that in making cannon of wrought iron the fiber of the iron should be wrapped around the gun instead of being parallel with the bore.

In the little book published in 1856, the position was taken that the iron should be put on in the form of hoops, and the outer hoops should be stretched, or in a state of tension. This results from the fact, that where a cylinder formed in this way is extended by internal pressure, the inner hoops are stretched more in proportion to their lengths than the outer ones. Our author says:—

"If we make a cylinder of 41 concentric hoops of equal thickness, disposed one within another, and exactly fitting, so that the particles of each hoop shall be in equilibrium with each other, the diameter of the largest being five times that of the smallest, then the force of each, beginning with the innermost, to resist distention, will then be represented by the following numbers:—

1000	250	111	62
826	225	104	59
694	207	98	56
591	189	92	54
510	174	87	51
444	160	82	49
391	148	77	47
346	137	73	45
309	128	69	43
277	119	65	41
			40

"An inspection of these numbers must, I think, impress any one with the fact, that it is impossible to increase essentially the strength of cannon by a simple increase of thickness."

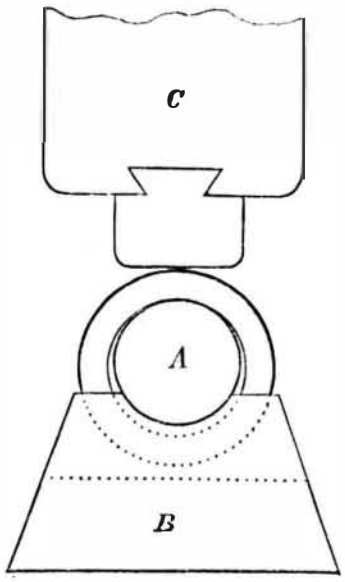
But if the hoops are of malleable metal they will be drawn out by the pressure between the gases and the inclosing hoops, as iron is drawn by being beaten on an anvil. Professor Treadwell says that owing to this property fractures in bronze and wrought-iron guns commence at the exterior surface, while in cast-iron guns they commence at the interior.

Wrought iron is somewhat elastic; if stretched only a very little it will resume its original length; but if it be stretched beyond the limit of its elasticity it will be either permanently elongated or ruptured. If the inner hoops of a cylinder are extended by internal pressure beyond the limit of their elasticity before they are restrained by the inclosing hoops, they will be ruptured; the strain will then come upon the next hoop and thus all will be broken in succession, their strength not being combined to resist the pressure. This combination of strength can be attained only by having the inclosing hoops all in a state of tension.

The elasticity of wrought iron may be very much increased by cold hammering and stretching. This was proved by Professor Treadwell in an elaborate series of experiments, which are described in the new pamphlet just published. It is proposed to strengthen the guns by giving to the bands this increased elasticity.

"To construct one of the hoops for a cannon of the size before-mentioned, that is of 14-inch caliber, the hoop having, when finished, 27·972 inches internal diameter, and being 3½ inches thick, and 15 inches long (or broad), I take a flat bar, say 14 inches wide, from half an inch to an inch thick, and of such length that, when wound into a coil, it shall form the thickness required for the hoop, after allowing for the waste in welding, forging and finishing. After its ends have been scarfed to a long wedge form, it is to be heated to a low red heat, and then wound upon a cylinder of say 25 or 26 inches diameter, as a ribbon is wound upon a block. Next, it is to be heated in a proper furnace to a good welding heat, and then, being placed upon an arbor, or mandrel, of about 25 or 26 inches diameter, and between proper dies, sets or swages, it is to be completely welded, or the several layers or coils are to be made to form one piece. This may be done by compressing it with the swages, by a hydrostatic press, or by a steam hammer. After it is properly welded and condensed in this way, and has cooled as low as 600°, it is to be placed upon a cold arbor or mandrel (shown in section at A, Fig. 7), which is supported at both ends by the

Fig. 7.



upright studs of the heavy iron frame, B. It is then to be hammered by the steam hammer, C, until its internal diameter is enlarged to about 27 inches. The last part of the hammering is to be performed after the hoop has become cold. Instead of operating in this way with the steam hammer, we may produce the same effect upon the hoop by a rolling-mill, in which the operating part of the rollers is made to project beyond the housings, or frame.

Fig. 8.

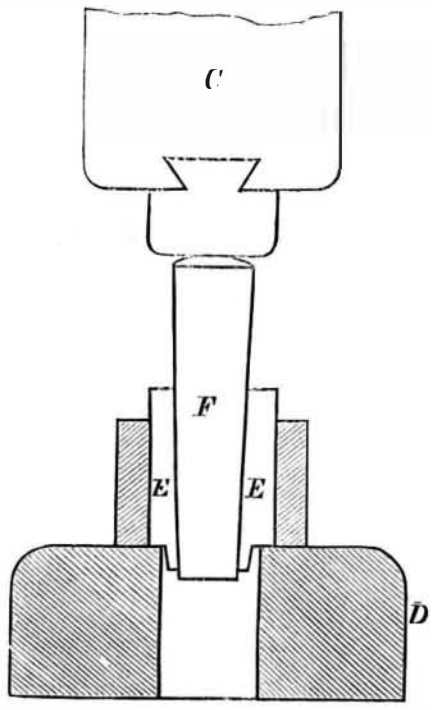
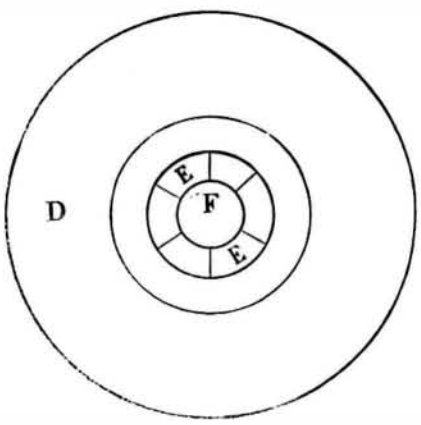


Fig. 9.



"After the hoop has been condensed and enlarged in this way, it is next to be placed upon an annular anvil, D D, (Figs. 8 and 9), and the segmental swages or blocks, E E, are to be adjusted within it. These segments form a cylinder upon their outer surface, but inside they form a hollow cone. A solid conical plug, F, is fitted to be driven into this hollow cone within the swages. With this arrangement, the whole being under the drop or steam hammer, C, the plug is driven by repeated blows into the hollow cone, by which operation the hoop is stretched sufficiently to destroy all conflicting strains or tensions that might have been produced in it by the hammering. The strain is thus reduced to a circumferential direction, and the hoop put as near as possible into the condition of the hard wire after it had been subjected to the first series of strains.

"The hoop may be stretched by this last operation the $\frac{1}{100}$th part of its diameter, and, if it is made of very soft and tough iron and has not been hammered very hard, much more than this quantity. The extent, however, to which this hammering and cold stretching may be carried, must depend upon the quality of the iron and the heating and working to which it has been previously subjected. It will be well, when the stretching is commenced, to have the hoop warmed up to 200° or 300°.

"After the hoop has been prepared in this way by cold hammering and stretching, it is to be bored and turned; and, whether it is to be fixed to the gun by a screw thread, or by any equivalent, it is to be carefully and equably heated to such a temperature (but never up to an annealing heat), as shall expand it sufficiently, and, in this state, is to be placed upon the gun."

Professor Treadwell's pamphlet is published by Messrs. Little, Brown & Co., of Boston.

The Manufacture of Soda Water.

H. M., of Canada West, wishes for information in regard to the manufacture of soda water. Soda water is simply water saturated with carbonic acid under pressure. Water has the property of absorbing its own volume of carbonic acid at all pressures. At the atmospheric pressure a cubic foot of carbonic acid weighs $\frac{1}{544}$th as much as a cubic foot of water; at 2 atmospheres the quantity or weight of carbonic acid in a cubic foot is doubled, at 3 atmospheres it is trebled, and so on. As a cubic foot of water absorbs a cubic foot of the gas at any pressure, of course the higher the pressure the larger is the quantity by weight which the water will absorb. In making soda water the gas is compressed to the extent of some 10 or 12 atmospheres, and then when the pressure is removed the gas escapes, producing a sparkling effervescence. As the carbonic acid is generally obtained by pouring sulphuric acid upon marble dust, the apparatus must be so arranged as to prevent the poisonous sulphuric acid from getting into the beverage. This is done by the manufacturers of soda water apparatus. There are several of these manufacturers in this city, among whom are William Gee, William Johnson, A. & H. Johnson, and John Matthews.

An iron-plated frigate with a spur, named the *Ancona*, has been launched at Bordeaux for the Italian government. The *Ancona* is fitted with engines of 700 horse-power, and is to carry twenty-two guns. She is 220 feet long, 45 feet wide and 28 feet deep. She is covered with teakwood to the depth of twenty inches, and the iron plates are fastened over the teak. The flooring of the deck is covered with sheet iron. The *Ancona* measures 4,250 tuns.

The Pekin *Gazette* contains a report from the Chinese government on the extinction of the rebellion, which ends with the following words:—"It is, therefore, most needful that thanks be offered to the gods for their assistance. Wherefore, the Board of Rites is directed to examine into the services rendered by the different gods, and to report to us."

A distinguished agriculturist, of England, recommends the mixture of willow leaves in all kinds of fodder. Osier peelings may also be added with advantage. The mixture of the leaves and peelings above mentioned will be particularly useful in preventing the rot, a disease so prevalent among sheep in winter, from making its appearance.