

WROUGHT-IRON GUNS.

Of the three materials which have been used for the construction of heavy ordnance, cast iron, wrought iron, and steel, the one that has proved the least satisfactory is wrought iron. Guns not larger than 68 pounders may be made successfully of wrought iron, as they may of cast iron and other materials, but of all solid wrought iron guns larger than the 68 pounder, but one has exhibited an endurance equal to that of cast iron guns of the same size, while nearly all have burst after a very few rounds. From Holley's work on "Ordnance and Armor," we gather the following particulars in relation to all solid wrought iron guns larger than 68 pounders that have ever been made. It will be observed that the endurance of the 13-inch Horsfall gun, which is considered so extraordinary, is less than that of the 13-inch cast iron gun that was illustrated on page 324, Vol. IX., SCIENTIFIC AMERICAN.

"The most remarkable piece of this manufacture is the 'Horsfall Gun,' fabricated in 1858, and recently made famous in target practice at Shoeburyness.

"This gun is a solid forging of wrought iron, bored out. The trunnions are forged upon a separate ring, which is held in place by a key. The weight is 53,846 lbs., 2·21 oz.; the gun is not rifled.

"Above 8,000 lbs. of powder, and 60,000 lbs. of 282 lb. solid shot have been fired from this gun at various rounds; among others, there have been 90 rounds with 50 lbs. of powder, 21 rounds with 40 lbs., and 6 rounds with 50 lbs., at Shoeburyness; 2 rounds with 80 lbs., at Liverpool; 13 rounds with 20 to 45 lbs., and 50 rounds with 30 lbs. With 45 lbs. of powder, a number of shells were fired loaded with lead to weigh 310 and 318 lbs."

The gun was then examined and seven cracks were discovered in the bore, varying from $\frac{1}{10}$ of an inch to $13\frac{3}{4}$ inches in depth.

"After the gun had endured these tests, and had been presented to the British Government by the makers, it was left unprotected on the beach of Portsmouth. By renewed exertions, the Mersey Company at last obtained permission to fire it at the Warrior target. It was found nearly buried with shingle and much injured by rust. Having been taken to Shoeburyness, it fired several rounds of 282 lb. shot with 74 lbs. of powder, with terrific effect at short range. The cost of such guns in England, would be about \$12,500.

"The Prince Alfred gun, shown in the great Exhibition of 1862, was forged hollow, on a plan patented by Lt.-Col. Clay, of the Mersey Iron Works, and intended principally to overcome the defect of unequal shrinkage and initial strain and rupture. Broad plates, bent to the proper curve, were laid and welded upon a barrel made of rolled staves."

It has a caliber of 10 inches, and weighs 24,094 lbs. "This gun has been fired but twice, and then as a smooth-bore; first, with a 140 lb. shot and 20 lbs. of powder, and, second, with the same shot and 30 lbs. of powder."

"The 12-inch wrought iron gun, in the Brooklyn Navy Yard, was forged like the Horsfall gun, by the Mersey Iron Works, in 1845, to replace the Stockton gun. Its dimensions are:—total length, 14 feet 1 in.; diameter over the chamber, 28 in.; length of bore, 12 feet; diameter of bore, 12 in.; weight, 16,700 lbs. It was received after the bursting of the Stockton gun, of which it is a copy, in shape, and has never been mounted for service. It has been fired once with two 224 lb. shot and 45 lbs. of powder."

"The British Government has ordered several guns of 6 $\frac{1}{2}$ inches bore, to be forged hollow, like the Alfred gun. One of these, weighing 7,282 lbs., was fired 10 rounds with 68 lb. 10 oz. shot; 10 rounds with 136 lb. 8 oz. shot; 10 with a 204 lb. shot; 10 with a 273 lb. shot; 10 with 340 lb. 8 oz. shot; 10 with 410 lb. shot; and 10 with a 476 lb. shot. At the 70th round the gun burst into eight pieces. Subsequent experiments on the metal gave a tensile strength of 45,359 lbs. per sq. inch."

Three 12-inch wrought iron guns were made some years since, under the direction of Commodore Stockton, for the U. S. Government.

"The first, called the 'Oregon' gun, was forged in England. After considerable use with charges of 20

to 30 lbs. of powder and 216-lb balls, it cracked through the reinforce, but was hooped and fired afterwards without injury. This gun is now in the Navy Yard at Philadelphia.

"The 'Peacemaker' was forged in the United States, by Messrs. Ward & Co."

The gun burst on board the United States steamer *Princeton*, after a few discharges, killing several members of President Tyler's cabinet. The failure of these large wrought iron guns is doubtless the result of imperfect welding of the several bars of which they were formed. It is claimed that this difficulty can be overcome by the Ames process of constructing cannon, which consists in welding successive coils together so as to build up the gun lengthwise. We published in our last volume two accounts of trial of one of these guns, but in neither were the particulars of the caliber and weight of the piece given. It was, however, stated that the gun was fired 700 rounds, with shot and shell ranging from 104 to 151 $\frac{1}{2}$ lbs. in weight, and with various charges of powder, reaching as high as 30 pounds. If these statements are correct, the Ames gun has exhibited an endurance far beyond that of any other wrought iron gun yet constructed by the plan of solid forging; and if guns can be made uniformly of this strength, wrought iron will enter into competition with steel as the material for heavy ordnance. We should suppose, however, that the great difficulty of handling, forging and welding these enormous masses of iron would make wrought iron guns more costly than those of steel, which can be cast in the proper form, while the steel guns would be somewhat superior in strength and durability.

BOOKS AND PUBLICATIONS.

BURGH'S LAND AND MARINE ENGINES AND BOILERS.—The proportions of the several parts of engines and boilers is a matter of much importance, and we are frequently in receipt of letters asking advice on this subject. The work in question contains many rules for finding the sizes of different parts by ordinary arithmetical calculations, and cannot fail to be useful to mechanics and constructors of steam machinery. Rules are also given for obtaining the radius of the link used in link motion, for determining the position of the eccentric with relation to the crank, the size of the feed pump, steam ports, and, in short, every detail of any importance that is necessary has received attention.

Mr. N. P. Burgh, the author, has been concise with his rules but diffuse in his observations on steam engines. He says:—"The London engineers are undoubtedly the *ne plus ultra*, in every sense of the word, relative to marine engines." And again on page 31:—"The rules given for the feed pump are generally both abstruse and obtuse, thus confounding the uninitiated with perplexing calculations having no reference to the cause of requirement." What is an obtuse rule?

Herry Carey Baird, No. 406 Walnut street, Philadelphia, Pa., is the publisher of this work, and it can be had free by mail by addressing him at that place.

WOODWARD'S COUNTRY HOMES.—This is a book of 166 pages, and contains a large number of very chaste and beautiful designs for snug, comfortable homes. We have the neat laborer's cottage, the gardener's cottage, the farm cottage, design for a rural church, design for ice-house, school-house, carriage-house and stable, old house remodeled, chapter on gates, together with several designs for the more expensive class of suburban residences. The chapter on what is termed balloon framing with the clear diagrams is worth alone to country builders the whole cost of the book, which we understand to be \$1 50, sent by mail.

The work is published by Messrs. Geo. E. & F. W. Woodward, No. 37 Park row, office adjoining our own.

We have long known these gentlemen as architects, and we regard them as among the most reliable and skillful men in the profession. Their new work on Country Homes ought to be in the hands of every man that builds or contemplates building a home.

TRANSACTIONS OF THE AMERICAN INSTITUTE FOR 1863.—The three societies of the American Institute—the Horticultural, Farmers' Club, and the Poly-

technic Association—are the means of disseminating a great deal of useful information on various subjects.

These meetings are held in room No. 24 of the Cooper Union—the Polytechnic every Thursday evening throughout the year, when chemistry applied to the arts and sciences, petroleum, mechanics, machines, steam and hydraulic engines, and all that relates to American industry generally are discussed at greater or less length.

The proceedings are stenographically reported, and are afterward recorded in the minutes of the Institute, being finally published in book form.

The volume for 1863 is before us, and is interesting to mechanics and others by reason of the excellent reports and superb engravings which it contains. The Wheeler & Wilson button-hole machine, the Elliptic machine, and Root's steam engine are illustrated and fully described, while matters relating to the farmer's interest are also to be found.

This work can be obtained by addressing J. W. Chambers, Secretary of the American Institute.

How thin Steel can be Rolled.

Several interesting communications on the subject of thin rolled iron having been published, the *Birmingham Post* gives an account of an experiment in rolling steel. It seems to us that in this case the experiment was continued beyond the limits of endurance, for the texture was destroyed in the operation.

"To the lively competition in iron rolling, excited by the receipt of an iron letter from Pennsylvania, we have now to add an interesting note on the degree of thinness to which steel can be rolled. The samples we have seen were rolled at Mr. Gillott's works, and have been sent to Messrs. Holtzapffel and Co, to be measured by their micrometer gage. Messrs. Holtzapffel and Co. say:—"We have carefully measured three sheets of steel, and find the average thickness to be one eighteen-hundredth part of the English standard inch. The thinnest tissue paper we have been able to purchase at the stationers' shops measures one twelve-hundredth part of an inch; those samples of cast rolled steel show very fine holes and have a porous surface, but still are perfectly smooth and easy to write on, and the porosity can only be seen when they are held up to a good light. It is believed that steel may be rolled still finer when other experiments are made."

What is an Inch of Rain?

The late weekly return of the British Registrar-General gives the following interesting information in respect to rain fall:—"Rain fell in London to the amount of 0·43 inches, which is equivalent to forty-three tons of rain per acre. The rain fall during last week varied from thirty tons per acre in Edinburgh, to two hundred and fifteen tons per acre in Glasgow. An English acre consists of 6,272,640 square inches; and an inch deep of rain on an acre yields 6,272,640 cubic inches of water, which at 277,274 cubic inches to the gallon, makes 22,622·5 gallons; and, as a gallon of distilled water weighs ten pounds, the rainfall on an acre is 226,225 pounds avoirdupois; but 2,240 pounds are a ton, and consequently an inch deep of rain weighs 100·993 tons, or nearly one hundred and one tons per acre. For every one hundredth of an inch a ton of water falls per acre." If any agriculturist were to try the experiment of distributing artificially that which nature so bountifully supplies, he would soon feel inclined to "rest and be thankful."

A PIECE OF IMPERTINENCE.—A letter has just been received at the Navy Department from Sir William Armstrong, the well known English gunmaker, in which he urges this Government to imitate the example of France and Russia, by manufacturing his guns. To this piece of scientific impertinence, Capt. Wise of the Ordnance Bureau has written a caustic reply, in which he tells Sir William that the Armstrong guns captured at Fort Fisher afford us the means of testing their supposed efficiency. Upon these guns was found an inscription, setting forth that they were a present from Sir William Armstrong to Jeff Davis.

ENGLISH jewellers are now setting small Brazilian beetles of green and gold color, which are found in immense numbers at Bahia, in gold and silver to form bracelets, brooches, etc.