HOW GOLF CLUBS ARE MADE IN LARGE QUANTITIES.

BY DAY ALLEN WILLEY.

The increased love of out-door exercise in America is responsible for several new industries which have already become so important as to give employment to a large force of workmen and represent the extensive investment of capital.

One of the industries which has had its inception in the United States only within the last few years is the making of golf clubs and balls. It is unnecessary to refer to the remarkable popularity of the game, and to-day one can find "golf courses" all the way from the Atlantic to the Pacific. Organizations devoted to the pastime have been formed in every community of significance in the country, and the army of players is composed of residents of every State in the Union. During the two or three years following the introduction of the sport, players depended principally on the British factories for the contents of their bags, and the cost of the imported outfit deterred many from enjoying a day on the course. American enterprise, however, was quick to note the opportunities to manufacture and sell this class of sporting goods, and some of the larger companies making bicycles, tennis racquets, croquet sets and base-ball clubs added a golf department. So extensive has the industry become that in the West as well as the East are plants employing over five hundred hands each, whose entire product is the golf club. It forms one of the principal industries of a town in Massachustetts, where one factory turns out a thousand clubs daily in the busy season.

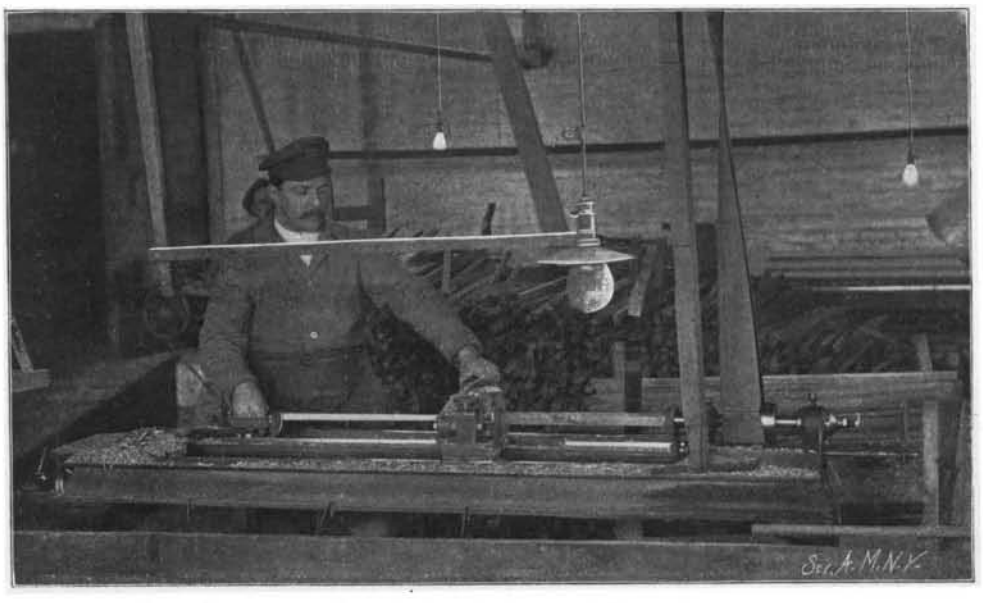
In spite of its apparently simple construction the golf club passes through an elaborate series of processes before it is ready for the market. It consists of two main parts, the shaft and head. As the former is usually of wood, material is selected with a view not only to its hardness, but toughness; the best quality of hickory is preferred for the purpose, each tree being carefully examined in the forest before it is cut down. The wood comes to the factory sawed into planks of a suitable thickness, and is again sawed into square strips of the requisite length. A simple form of turning lathe is used to round off or turn the shafts, but as yet no power device has been invented which will complete the shape, and considerable labor is required with hand tools to work it down to the exact dimensions; this operation necessitates long experience and a good eye to insure the proper tapering of the shaft. So particular is the manufacturer that sometimes 50 per cent of the sawed shafts may be rejected on account of some slight defect before unnoticed.

Hammering Steel Heads in the Blacksmith-Shop.

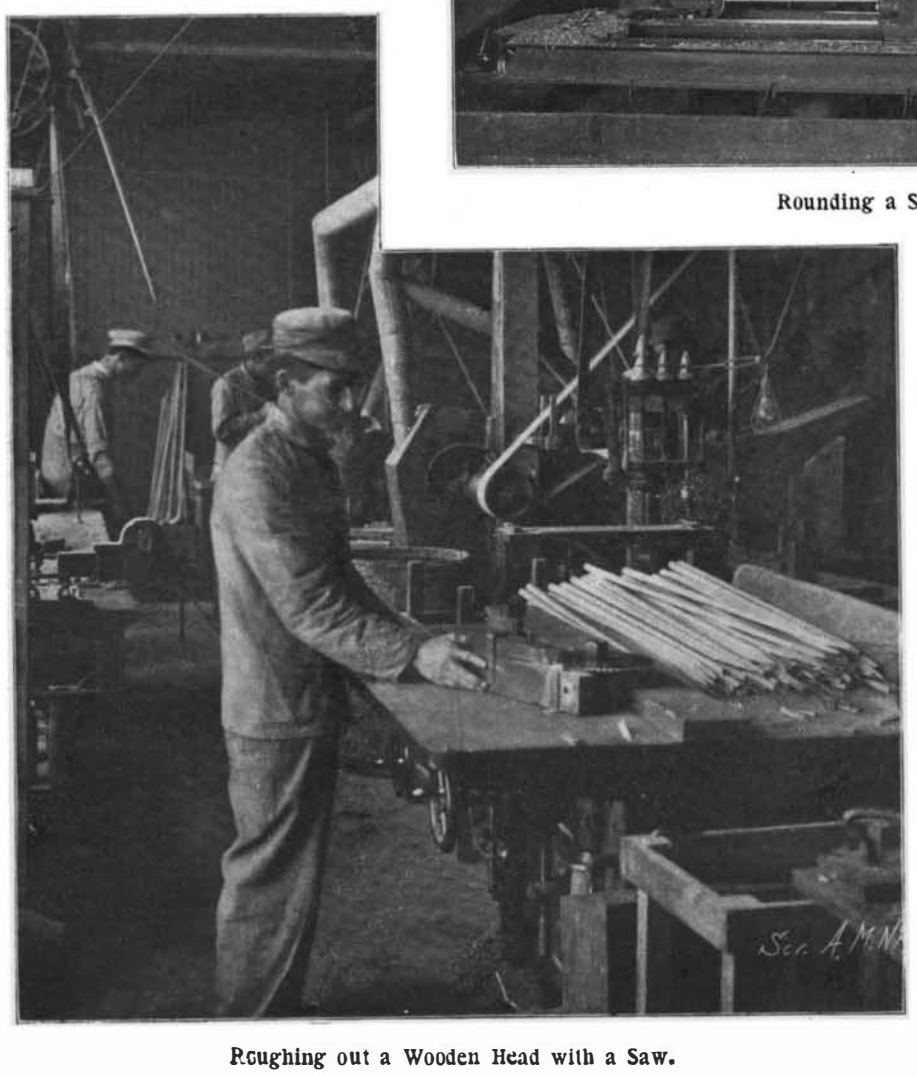
The next process is to join the shaft to the head—another operation requiring much skill, as a perfect fit must be insured to withstand the strain at the joint. Dogwood and persimmon are most extensively used for the wooden head. They come to the head-maker in blanks from the saw. A machine specially designed for the purpose cuts them down to a rough semblance of the head, but here again the rest of the work must be done by hand, and chisel, file and sand paper are indispensable. The shaft and head are spliced one to another by means of a strong cord. The operator winds about the joint a fine cord, made of waterproof material, each strand fitting so closely and evenly that it seems a part of the wood itself when the whipping is completed. The so-called iron clubs are composed almost entirely of steel, as it is found that a mild grade of this material is best suited for these clubs. First quality heads are made entirely by hand, and here the blacksmith's anvil and hammers come into play, yet the cleek makers become so expert in their line that they can duplicate almost any model of head, not only in size, but almost precisely in shape, so deft are they in wielding the hammer. Most of the metal heads, however, are drop forgings, and to this process is largely due the greatly reduced cost of the golf outfit, for it saves much time and labor. All of the heads, however, are finished on polishing spindles which, revolving rapidly, act upon the surface as sandpaper does on wood, removing all rough spots and giving them the luster of silver when the operation is completed.

The putting on of the grip or handle is done so rapidly that a skilled workman will complete the operation in a little over a minute. For the best clubs horsehide is used entirely, but sheepskin is found to be a fair substitute, and is wound on the other grades. The hide is cut into strips of the proper length and width by machinery, but the workman wraps the grip around by hand with a few dexterous motions, clinching the loose end with small brads or glue. Sometimes the entire shaft is covered with the finishing coat of varnish, but first the wood is saturated with shellac, which enters the fiber and plays an important part in protecting it from the weather. Over this is placed the varnish, and after a vigorous rubbing the club is ready for the player.

Scotland is the home of the most expert makers of the golfer's outfit, and to them is due much of the skill which has been acquired by the Americans. A large number of



Rounding a Shaft on a Lathe.



Roughing out a Wooden Head with a Saw.

Finishing the Shafts with File and Sandpaper.

THE MAKING OF GOLF CLUBS.

artisans of the old country have come to the United States to ply their trade, tempted by the higher scale of wages. One enterprising corporation has a colony of Scots at its New England factory. It is an interesting fact that the best workmen are players themselves, and skill in handling the clubs has given them a knowledge of the proper shape and "lay" of the clubs which they could not otherwise obtain.

THE BATTLESHIPS "CONNECTICUT" AND "LOUISIANA."

The two battleships for which Congress made provision by act of Congress of July 1 last, will be, when finished, the finest of their class in any navy. Steadily, season by season, the size of these great fighting machines has grown. To-day we have reached a displacement of 18,000 tons full laden, and there is no assurance that the next of the type won't be still larger twelve months hence. Four million, two hundred and twelve thousand dollars seems a pretty large sum to pay for the hull and machinery of a fighting ship—especially when the guns, armor, miscellaneous equipment, and stores complete, when ready for sea will demand quite a couple of million more. But the peace of the nation calls for these safeguards, and the welfare of every one of our rich ports demands this protection in time of war: it is treasure spent the better to guard still greater wealth.

Before a line of the present vessels was drawn the Board on Construction thoroughly discussed their essential features and, incidentally, settled for a long time to come many much-debated questions which had provoked differences of opinion for years back. Sheathing and coppering were disapproved; the extent and thickness of armor protection were increased; the batteries were improved and better sheltered; torpedoes were relegated to other classes of vessels; the application of electrical motive force was considerably widened; and the coaling facilities (the bugbear of most vessels) were amplified vastly, while the ammunition supply, by the introduction of a very novel feature, was increased to a degree considerably in extent of possible rates of fire. The advantage of this, apart from a bountiful feed to the gun station, is the speed with which a ready supply can be brought up to the firing position within a short while.

The general dimensions and features of the ships are: Length on load water-line, 450 feet; breadth, extreme, at load water-line, 76 feet 10 inches; displacement on trial, not more than 16,000 tons; mean draft to bottom of keel at trial displacement, 24 feet 6 inches; maximum displacement, full load, 18,000 tons; mean draft at maximum load, 26 feet 9 inches; coal carried on trial, 900 tons; total coal bunker capacity, 2,200 tons; steaming radius, at 11 knots, about 7,000 knots; steaming radius, at full speed, about 2,500 knots; maximum speed, not less than 18 knots; maximum indicated horse power, estimated, 16,500; complement (flag-ship) officers, seamen and marines, 801.

Trial displacement will mean vessel and equipment complete with 900 tons of coal, 66 tons of feed-water and two-thirds supply of ammunition and general stores.

The hulls will be of steel throughout with the usual cellular subdivisioning of the double bottom and the inner body. Some forty-odd of the water-tight doors and five of the armor gratings are to be closed by power from a central emergency station. These doors can be independently opened and closed by power—the pressure of a button starting the work, and their action is sufficiently slow not to catch anyone in transit. The advantage of the system is obvious in case of accident. The freeboard, at the line of the main deck, is nearly 18 feet, and runs uniformly from bow to stern. This insures good sea-keeping qualities, the ability to work the main battery in any kind of fighting weather, and airy and commodious quarters for officers and enlisted men, besides plenty of room for the stowage of hammocks where they can be kept dry and well-aired—a feature vital to the health of the crew. The arrangement of the forward upper bridge is somewhat novel, affording a very wide field of observation, while the glazed bronze housing or screen at the center will completely shelter the people at the wheel from driving spray. There will also be a bronze chart house on the lower bridge deck (non-magnetic) in which the standard binnacle will be kept free from the influence of steel work. The conning tower on these ships, which will be 9 inches thick, is located immediately below the upper bridge, a deck higher than heretofore. This insures a wider field of observation for the commanding officer in action. The armored tube from this tower to the protective deck is 6 inches thick. A signal tower, 6 inches in thickness, of steel, is located aft on the superstructure deck just abaft the mainmast.

The hull is primarily protected by a broad water-line belt of armor 9 feet 3 inches wide throughout the range of maximum thickness and 8 feet wide thence to the bow and to the stern. Amidships, for a distance of 92 feet, this belt will be 11 inches thick. Thence forward and aft, respectively, for a distance of 93 feet, it will taper from 9 to 7 inches. The next run of 37 feet will range from 7 to 5 inches. For 34 feet following this the armor will be 5 inches thick, and thence to the bow and to the stern it will diminish to 4 inches. The sides immediately above the water-line belt as high as the gun deck and for a fore-and-aft distance of 284 feet will have armor 6 inches thick, while the space occupied by the 7-inch guns on the gun deck will be protected by 7 inches of armor for a distance of 236 feet. Athwartship bulkheads at the ends of the thickest side armor will be 6 inches thick, and athwartship bulkheads at the ends of the lighter side and case-mate armor will be respectively 6 and 7 inches thick. The protective deck, which extends from bow to stern, will be an inch and a half thick on the flat over the engines and boiler spaces; on the slopes forward and aft it will be 5 inches thick. A coffer dam 30 inches thick will be worked from end to end of the ships between the protective and the berth decks; and on the berth deck, forward and abaft the transverse armor respectively, there will be another coffer dam of the same thickness, but only 3 feet in height. The protection thus afforded the ends of the ships is pretty thorough.

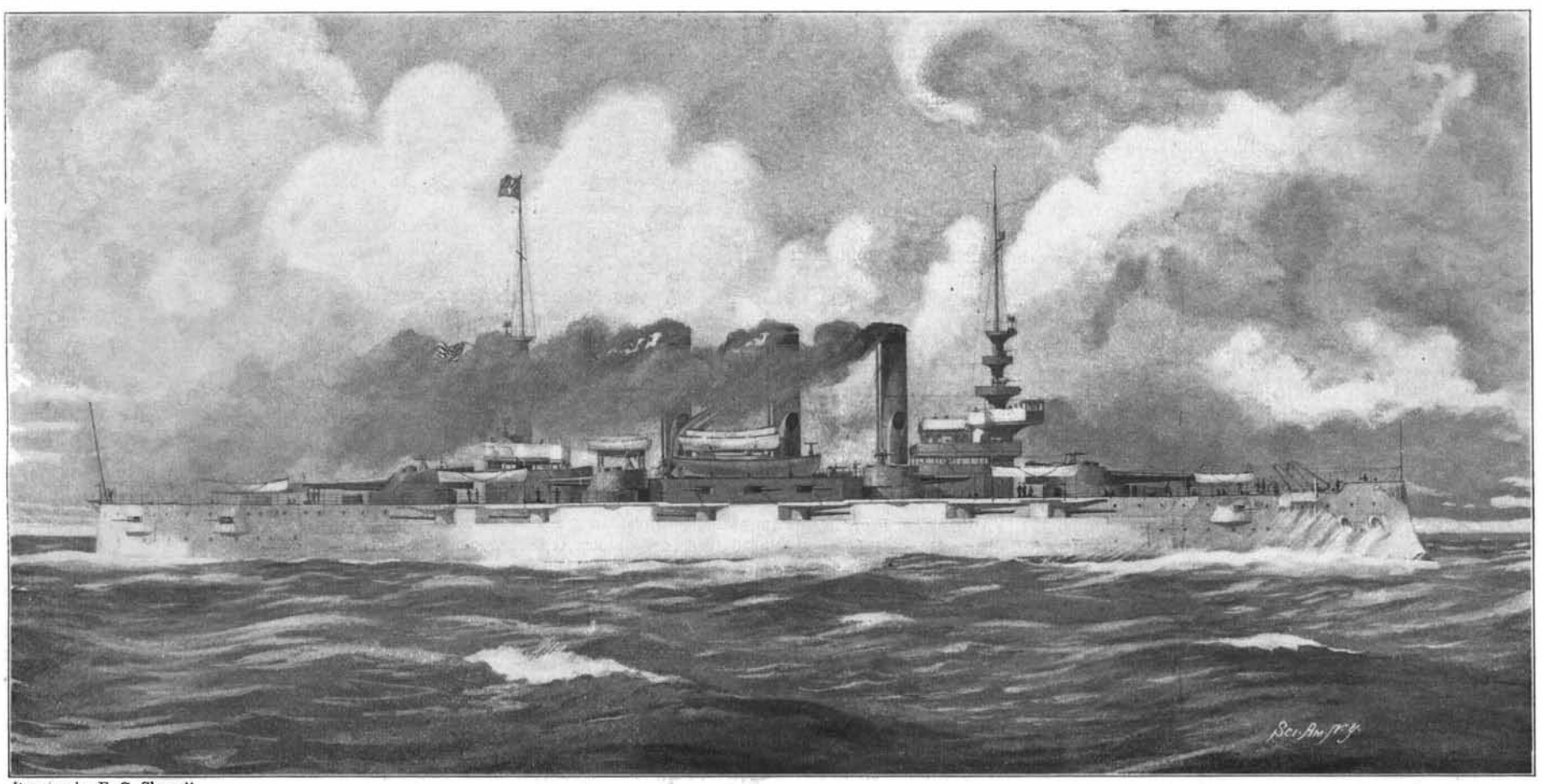
The armament will be: Main battery—Four 12-inch, eight 8-inch, twelve 7-inch breech-loading rifles. Secondary battery—Twenty 3-inch, 14-pounder rapid-fire guns, twelve 3-pounder semi-automatic guns, six 1-pounder automatic guns, two 1-pounder semi-automatic guns, two 3-inch field pieces, two machine guns of .30 caliber, six automatic guns of .30 caliber.

The 12-inch guns will be mounted in two elliptical balanced turrets, of the barbette type, with slanting fa_es. These turrets will have face plates 12 inches

Putting on the Grip.

Winding the Joint of the Head and Shaft.

THE MAKING OF A GOLF STICK.



Drawing by F. C. Skerrett.

Displacement: on trial, 16,000 tons; maximum, 18,000 tons. **Speed:** 18 knots. **Maximum Coal Supply,** 2,200 tons. **Armor:** Belt, 11 inches to 4 inches; turret guns, 6½ and 12 inches; broadside guns, 7 inches. **Armament:** Four 12-inch, eight 8-inch, twelve 7-inch, twenty 3-inch, twelve 3-pounders, eighteen 1-pounders and automatics. **Complement: 801.**

FIRST CLASS BATTLESHIP "CONNECTICUT"