THE CIGAR SHIP.

On Monday afternoon at four o'clock Mr. Winans' yacht, better known as the " cigar ship," was launched privately from Messrs. Hepworth's yard in the Isle of Dogs. Some time must elapse ere she is ready for sea, and meanwhile we propose to lay before our readers a fuller and more accurate account of this remarkable vessel than has yet appeared in print.

A " cigar ship " is no longer a new thing under the sun. Three have been actually constructed, and launched, and tested, while a fourth—the subject of the present article—is approaching completion as we write. Therefore, we shall not assume that engineers are ignorant of the popularly received notions regarding the principles which these vessels are intended to embody, nor that they are utter strangers to their history and general construction. The idea of forming a ship which should resemble a cigar in shape originated with the Messrs. Winans, American engineers well known in connection with the railway systems of Russia and the United States. To which of the three gentlemen, whether to Mr. Ross, Thomas, or William Winans, the credit of the first idea is due, we shall not stop to consider. The question is of the less importance that all three have entered upon the task of reducing the principle to practice with an energy, skill, and lavish expenditure sufficient to dignify any experiment. Nor is it necessary that we should pretend to pronounce a dogmatical opinion on the merits or demerits of the scheme. We shall best discharge the duty we owe to our readers and to ourselves by reserving all expressions of opinion on matters at present in doubt until they have been advanced a step towards solution by further experiment. Meanwhile we can assure those who take an interest in naval architecture and marine engineering, that the cigar ship scheme constitutes one of the most remarkable experiments on record, and that it has reached such a point that it deserves more attention than it has hitherto received in this country. Although the scheme has been before the world for some seven years—steam being first applied to the propeller of the first yacht on the 7th of January, 1859—it is certain that very little is accurately known either as to what Messrs. Winans want to do or how they propose to do it. As far as we are aware the first cigar steamer was a thing *sui generis,* and absolutely novel in principle if not in construction. Naturally enough she constituted a splendid subject for dissertation and discussion, of which people were not slow to avail themselves. On the one hand the thing was praised to the skies, on the other abused to the lowest depths, the greater part pf the work both of praising and abusing being performed by gentlemen who, to speak plainly, did not know what they wrote about, attributed things to Messrs. Winans which had no existence whatever save in their own imaginations, and made statements regarding the performance of the ships, nearly as exact as the little fancy sketches which were too often accepted by an inquisitive public as a "correct likeness" of the cigar snip. We shall not exactly attempt to right all these wrongs ; but knowing as we do that notwithstanding page upon page has been written about them, none of the cigar ships yet built have ever been described with sufficient accuracy and at sufficient length to impart a just idea of their actual construction, we propose to correct a few erroneous notions, by explaining exactly what are the very simple objects had in view by Messrs. Winans, and by describing at greater length than has ever yet been done the last and most perfect specimen of the cigar steamer as she now lies in the West India Dock.

Messrs. Winans have for their object the construction of a ship which shall combine the qualities of speed, safety, economy, and comfort in a pre-eminent degree, and they propose to secure these qualifications by forming a ship as a circular spindle capable of being made water-tight all over, and therefore of behaving in a heavy sea much as a corked bottle behaves, while her great length as compared with her immersed midship section, and the reduced surface which she offers as compared with her capacity, are expected to secure speed. Without entering deeply into abstruse questions of fluid resistance, we may point out that the principal force to be overcome by the engines of a steamer is due to the friction of the water on the immersed surface of the hull. But in the case of vessels built on the ordinary sharp lines, it will be found that this surface bears a very indefinite relation to their powers of flotation. Thus sharp bows, far from supporting themselves by their own buoyancy, throw a considerable load on those sections of the hull nearer the stern, and the surface presented by such bows is out of all proportion to the capacity of that part of the hull which they constitute. A keel and the immense surface of dead wood tinder, the stern, also present a large area of resistance, and thus it is claimed for the circular spindle, without keel, dead wood, or bows, that for a given capacity it presents less surface than any other form ever adopted in practical shipbuilding; and this statement is helped out by the well-known fact that the area of a circle is greater than that of any other figure which can be circumscribed by a line of a given length. It is also expected that certain advantages can be gained from the use of propellers of a greater diameter than is admissible under normal arrangements. The consideration of this latter proposition may be postponed for the present. Thus far for speed. Messrs. Winans propose to secure safety by constructing their ship of the best possible form to resist and baffle the action of the waves, and by carrying out the water-tight compartment system to its utmost allowable limit. As the spindle presents no flat places to the impact of the waves, their impulse is always resisted by an arch which tends to break their force by deflecting and dividing their mass, and as the ship has strictly speaking no waist, and in hard weather when everything is battened down, no deck openings, seas may break over her without in any way endangering her safety as they would that of an ordinary ship with a flat deck and large hatches near the water. In point of fact, when in hard-weather trim the cigar ship might be submerged several feet below the water for a quarter of an hour without serious inconvenience to those on hoard. We must however correct the mistaken impression which is generally entertained, that the ship is intended to pierce the waves instead of riding over them ; nothing can be further from the thoughts of her builders. That she will pierce a wave now and then is a species of accidental concomitant of her shape, but it is not intended that she should do so, and it is hoped that she will ride over waves instead of passing through them. On encountering a wave of more than ordinary height her sharp bow will enter it no doubt, but as the bow proceeds its powers of flotation are called into play, and hence the moment its displacement exceeds its load it will rise, the water tumbling off to either side much as the earth falls away from the plough-share. It is possible that the idea that the ship is specially intended to pierce the waves, and in fact spend much of her time under water, has done more to draw down unmerited ridicule on the scheme than any other point connected with it. The upper portion of the hull is only intended to act the part of the hurricane deck which all sharp and fast steamers—such as the Holyhead mail-boats—must carry as a necessity. And it is just as reasonable to suppose that the Leinster or Ulster are specially designed to drive through the waves as that the cigar ship is. As to comfort, it is known that one of the most serious discomforts to which a crew can be exposed is caused by the intrusion of water below. Now so long as the cigar ship remains whole, water cannot find its way below when it is necessary to keep it out, any more than it can get inside a duck or a gull. But it is obvious that this advantage cannot be secured unless extraordinary pains are taken to provide ventilation. We shall see presently what steps Messrs. Winans have taken to secure this point. It thus becomes evident that the ship is designed to behave in a sea much as does a Mother Gary's chicken, or to use our first simile, a corked bottle, and it is well known that both set the waves and the wind at defiance by yielding to them. Even an Atlantic gale is gentle as a zephyr so long as nothing opposes its fury ; and its powers of mischief are reduced just in the same ratio as the opposition.

We have stated that the present is the fourth ship built by Messrs. Winans on the " cigar " principle. The first, launched at Baltimore in the latter part of 1858, was 235ft. long; the maximum diameter of the hull being 16ft. This vessel resembled two sugar-loaves placed base to base, and connected by a peculiar arrangement. The hull practically consisted of two portions, identical in every respect. The bulkheads which answered to the flat bases of the sugar-loaves being placed within a few feet of each other, left a space between, within which rotated a propeller 25ft. 4in. in diameter. In order to connect the two sections of the hull, a sleeve was employed surrounding the propeller, 25ft. 6in. in diameter inside, and 10ft. or 12ft. long. This sleeve was affixed to the fore and aft sections of the hull by strong gusset-shaped stays of plate iron, disposed in the plane of the axis of the ship. The propeller, projecting beyond the hull, was thus half submerged, and remained absolutely unaffected whether the ship pitched or rolled. Its submersion was always the same, and the engines never manifested the slightest tendency to race in the heaviest sea. With this vessel many experiments were conducted. It is said that she attained a speed of 17¼ miles per hour with extraordinary economy of power, and upon the whole her builders considered that the results obtained demonstrated the success of the principle with which their names are now identified. But she was very far indeed from that perfection which her builders hope to reach ultimately. She therefore underwent numerous alterations, but the grand defect was too radical in its character to permit of mitigation. The frictional resistance of the submerged portions of the sleeve was enormous, and the entire arrangement was deficient in that strength which was required to render the ship pre-eminently seaworthy. After a time it was decided to begin *de novo,* and a cigar ship or rather boat, 70ft. long and 9ft. diameter, was launched some months since at St. Petersburg, Russia. This boat was fitted with a single small propeller beneath her bottom, and therefore wholly submerged. The vessel was roughly got up for experimental purposes, the propeller being driven by an old portable engine, yet we understand that she ran off 9 knots per hour—a remarkable result if we consider the conditions under which it was obtained. The position of the propeller in this case was nearly as unsatisfactory as it could well be, since it added enormously to the boat's draught, and was constantly exposed to damage in shallow water. A third boat was then built at Havre, by MM. Nilus and Son, and launched about a month since. This boat very much resembles that built at St. Petersburg, being approximately of the same general dimensions —72ft. by 9ft, and 33·4 tons burthen, but she is fitted with arrangements for trying the ordinary propeller wholly submerged, or a semi-submerged propeller, or four submerged propellers arranged on what we may term the quarters of the vessel. She has a double-cylinder high-pressure engine, driving, by the aid of gearing, a number of distinct shafts passing through tubes and stuffing-boxes projecting from the hull, and to any one or all of these shafts, propellers may be affixed and driven together or separately by the gearing, at pleasure. The boiler is of peculiar construction, resembling those which have been adopted in Messrs. Winans' last yacht, to which we have now fairly come.

This vessel was commenced nearly two years since by Mr. Hepworth of the Isle of Dogs. After she had made some progress, however, Messrs. Winans deemed it best to complete her themselves, and for that purpose they made the necessary arrangements with Mr. Hepworth for the use of his yard and plant. Nothing can so effectually dispel preconceived notions regarding Messrs. Winans' theory as the actual inspection of this vessel. Every facility for this purpose has been courteously placed at our disposal by her builders, and we have been through her, as she lay on the stocks, from end to end. We have examined her from the stuffing-boxes at either end—only to be reached by crawling snake-like through small ports in the water-tight bulkheads, along the little gangway which covers her shaft—to her sumptuously fitted saloons and state rooms. Our readers possibly imagine a damp, crank, dangerous, unsightly, craft ; on board which nothing but a keen love of science would induce a man to risk his life. We may just whisper the confession that the opinions we held were something very like this. Yet would we have all men banish such ideas at once and for ever. The Winans yacht is as strong, perhaps, as it is possible to make a vessel; before we have done, our readers will have an opportunity of judging of the merits of the precautions taken to avoid risk of foundering; and her saloons and state rooms exceed in comfort those of any ship of her displacement—500 tons—whose decks we have ever trod. A fact due no doubt in some degree to their height. Thus the clear head-way in the main saloon is 10ft., and this advantage is also extended to the state rooms, where every inch of space has been economised so skilfully that more of it would be apparently superfluous.

The hull is 256ft. long from point to point, and 16ft. in diameter. Her launching draught with engines, boilers, &c., on board will be 8ft., while her stores and ten days' coal—175 tons—will take her down about 30in. deeper. In form she is a circular spindle, tapering each way from the centre. No portion of the hull is a true cylinder, and the form actually given to it has been only adopted by the builders of the yacht after a long course of experiments by trial and error had demonstrated that it gave a minimum of resistance. The lower portion of the hull is composed of ⅝in. plates of the very best iron ever used in shipbuilding. The upper half of $\frac{5}{16}$in. steel plates from John Brown and Co. She is perfectly flush outside, being double and treble rivetted throughout. The joint straps are all of great breadth, chain rivetted where any longitudinal strains have to be resisted. In this respect the workmanship is simply faultless. The hull proper is 224ft. long, and 4ft. diameter at the extreme ends, which consist of cast iron discs of great strength, with heavy return flanges. These flanges are placed within the open ends of the wrought iron tube and carefully rivetted in with three rows of rivets, the plates being then caulked down on the cast iron outside. In the centre of each disc is formed a stuffing-box of somewhat peculiar construction, through which passes the screw shaft of Krupp's steel ; in, this place 15in. in diameter. The weight of the shaft and propeller is supported by rings of lignum vitae, arranged within the stuffing-box. Immediately outside the cast iron terminals of the hull come the screw bosses of the same diameter at the inner face, but following the proper circular curve in the direction of their length.

The forward faces of these bosses carry cones of plate iron, making with the boss a length of 16ft. and rotating with the screw. These cones conform in outline to the curve of the rest of the ship even down to the little steel spikes which render the ship literally as sharp as a needle, and by their buoyancy they do something to reduce the weight to be supported by the stuffing-boxes. We shall postpone the consideration of the propellers for the present. We have thus each end of the ship terminated by a blunt surface, 4ft. in diameter—the transverse section of the spindle or hull—and revolving in close proximity with these, the screw bosses, each 4ft. in diameter and a couple of feet long, to which are attached the two portions which we may suppose to have been removed to get a section 4ft. in diameter, these portions revolving with the screw. It will be seen that this arrangement is after all merely a modification of that adopted in the first ship. In her, let us suppose that the after end only, contained the machinery, &c., while—the sleeve being suppressed—the forward section was attached to, and revolved with, the screw boss. We should then have an arrangement differing in nothing from that actually adopted in the present yacht, but in the relative proportions of the revolving and stationary sections of the hull; and we have no reason to doubt that this arrangement is the best which could possibly be adopted under the given conditions.

The hull is strengthened and stiffened, first by thirteen transverse bulkheads of stout steel plates ; secondly, by the decks, also of steel, one before and the other abaft the engine-room, giving, in all, including the bunkers, twenty-one water-tight compartments; thirdly, by the engine-frames, which tie her together vertically, floor and upper deck; and lastly, by rings of angle and bulb iron disposed at frequent intervals. Before going further, it may be well to give a general idea of the arrangement of these bulkheads and decks. The first compartment forward contains the rudder-head and its gear, to which we shall come presently, and the screw shaft. As the hull is little over 4ft. diameter here, there is of course no deck. The second compartment is also without a deck, but being more roomy, the screw shaft is here boxed up, and the surrounding space is employed for the stowage of stores of various kinds. The fourth compartment forward is provided with a deck put in about 20in. below the centre of the ship, and fitted up with sleeping berths for fourteen men and boys. It is set apart for the firemen and coal trimmers. Next to this comes a fore saloon or smoking-room about 15ft. long and 11ft, wide ; next to this, state rooms for captain and officers. Then the boiler room divided from the engine-room by a bulkhead. Still travelling aft we come next to the main saloon, a beautiful apartment some 25ft. by 15ft. Next to this are state rooms. Then a cabin for the crew, with berths for eight or ten, part of the room being taken up by the anchor windlass. In other respects this compartment answers to that provided forward for the stokers. Behind this again is a compartment without a deck for stores, and aft of that again the last compartment containing a second rudder-head—for the ship has two—the screw-shaft and stuffing-box. All these compartments are provided with heavy metallic doors abutting on india-rubber. The doorways in the first two bulkheads forward and aft are only large enough to suffer a man to creep through, but the others, at the feet of the companions are nearly 6ft. high, with semi-circular heads. These doors are of steel plates set in a heavy brass framing, so painted as to resemble bird's-eye maple mouldings. The brass rings are fitted with pointed

set screws acting like ordinary shot-bolts, which when the door is closed pass behind suitable plates on the bulk-heads, and by the wedge-like action of their points draw the doors home, water-tight, against india-rubber strips provided for the purpose. The decks are tied down to the floor of the ship by stout stays to prevent them from being blown up by the confined air should the ship spring a large leak below. As there is no direct communication with the compartments beneath what, we suppose, we must term the main deck, they can only be reached from the upper deck. They are solely devoted to the stowage of coal. It will thus lie understood that each inhabited compartment is provided with a deck that may be termed the main deck, beneath which coal is carried. Although this arrangement is exceedingly conducive to safety, it is thus far inconvenient that after the boiler-room bunkers are exhausted, all the coal must be conveyed some little distance along the upper deck to the boiler-room bunkers, after having been hoisted in buckets through tubes or shoots by light whips rigged on the masts.

It is now time to turn our attention to the upper deck. This is a platform 10ft. 6in. wide amidships and 130ft. long, constructed over the central portion of the length of the hull. It consists of two walls of plate iron rising from and rivetted to, but forming no integral portion of the hull. These are of such a height, that the deck just rests on their upper edges and the highest point of the circular upper portion of the hull; spandrils being left at either side, between the walls, the deck, and the skin, containing ventilating trunks about which we shall have something more to say. This deck tapers off to each end, and is surrounded by vertical bulwarks about 2ft. 6in. high, and a wire running line supported by polished brass standards. At the forward end these bulwarks terminate in a species of bow, like that of an ordinary steamer, carrying a beautifully carved and gilded American eagle as a figurehead; at the after end in a simple shield. Standing in, or rather on these bows, the black hull, stretching away nearly 65ft. in advance appeared very remarkable, even as the vessel lay on the stocks, and will no doubt appear still more so when rising and falling on the waves, now lifting its length clear above the swell, and anon partially burying itself in the foaming wake of the leading propeller like a porpoise reluctant to leave the surface. It has been said that the yacht would lie like a log, as a toy for the sport of the waves, should any casualty occur to her machinery. The statement has no foundation in fact; amidships are two short though graceful funnels, and forward and aft on the upper deck are two telescopic masts, capable of spreading a very considerable expanse of canvas—quite as much indeed in proportion as is usually carried by paddle-wheel steamers. The lower portions of these masts are made of boiler-plate terminated above by cast-iron cup-shaped capitals, thus far resembling small subsidiary funnels, for which indeed we believe they have more than once been mistaken. Each cup serves to conceal two small cast-iron rollers over which run a pair of light but strong chains. The ends of these are attached to the heel of a stout wrought iron hollow spar—the top-mast in fact. When struck, this spur descends within the lower mast, taking the chains down with it. In order to raise the top-mast it is only necessary to haul on the chains. These running over the rollers elevate the mast to the proper height, and being properly secured form shrouds for the lower mast. The arrangement is simple and elegant. All the canvas carried will be " fore and aft." The deck is provided at either end with a cook house and steward's pantry, from which companions descend into the compartments set aside as cabins for the crew and stokers, the companions to the fore and aft saloons also open on this deck of course, and are provided with somewhat unusual expedients for keeping out water. So far we have placed before our readers something more than a general description of the construction and arrangements of the hull of this remarkable yacht. The consideration of her machinery, fittings, &c., we must reserve for another paper.