Launching Big Battleships and Ocean Liners.

By David Pollock, M.I.N.A.

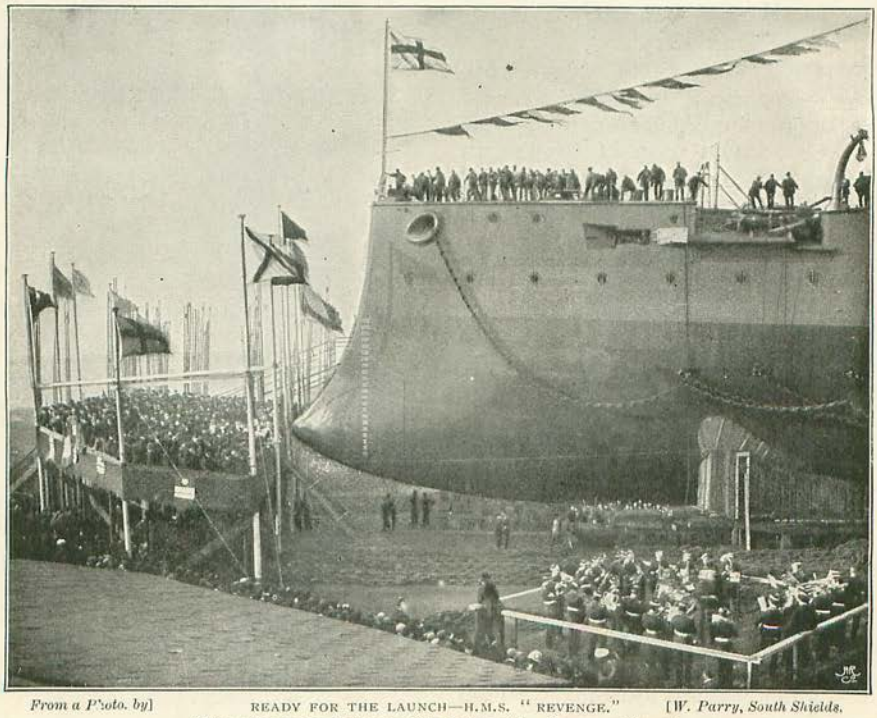
THE picture which Longfellow has drawn of a successful ship launch, while it naturally idealizes the plain facts of the case—even as concerned with the poet's time, when romance and pride of handicraft were stronger influences than they are to-day—nevertheless applies not inaptly to the modern event as it is frequently to be witnessed in one or other of our great centres of shipbuilding.

> And see, she stirs,
> She starts : she moves : she seems to feel
> The thrill of life along her keel ;
> And, spurning with her foot the ground,
> With one exulting, joyous bound,
> She leaps into the ocean's arms.

Even in these latter days, when mechanical science has largely taken the place of handicraft skill, excitement and emotion such as are here suggested are still to be remarked among the vast crowds which invariably gather to view the spectacle of some great ship—swift "ocean greyhound" or ponderous battleship — being bodily transferred from *terra-firma* to the yielding bosom of the deep.

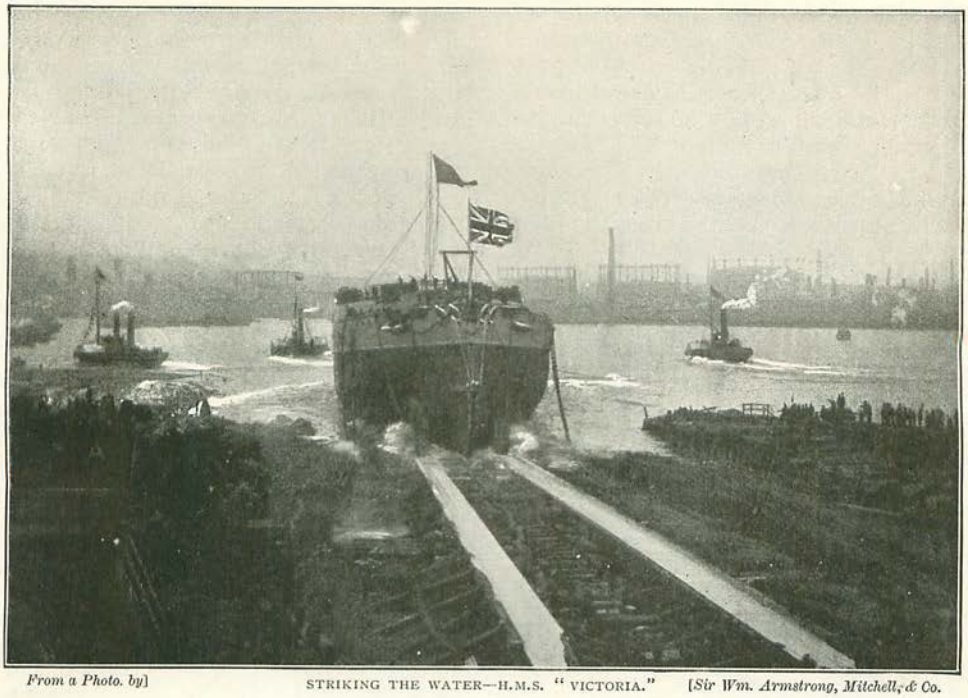
There is a very generally entertained notion that when one gets to understand how certain things, wonderful and almost inexplicable at first sight, are performed, the charm of seeing them vanishes. However warranted this may be by actual facts in other departments of human endeavour, it does not apply in the case of the launching of modern ships, naval or mercantile. Even to those whose daily work it is to build and launch typical modern ships, the spectacle of a huge structure — weighing 8,000 tons in recent battleships — which has been laboriously raised piece by piece, being swiftly consigned to her "native element," loses little of its interest by repetition.

A "launch-day" is still a day of note in a modern shipyard, from which, it may be, a dozen or more large vessels emanate in a



From a Photo. by] READY FOR THE LAUNCH—H.M.S. "REVENGE." *[W. Parry, South Shields.*

(From the works of Messrs. The Palmer Co., Jarrow-on-Tyne.)



From a Photo. by] STRIKING THE WATER—H.M.S. "VICTORIA." *[Sir Wm. Armstrong, Mitchell, & Co.*

year. And the occasion is marked by symptoms of commotion and mild excitement which are foreign, for most part, to the ordinary routine of daily work. A definite and critical stage has been reached in the work of producing a ship; and all sections of artisans seem to regard it as their natural right to be actual eye-witnesses of the crowning act in the productive work in which they have all had a share.

Cessation of labour, therefore, becomes the order of the hour; and not until the vessel is freely afloat, and the newly-born battleship or ocean liner is under the charge of the busy and staunch little steam tugs, is the strain of excitement relaxed and a return made to the ordinary avocations of the shipyard.

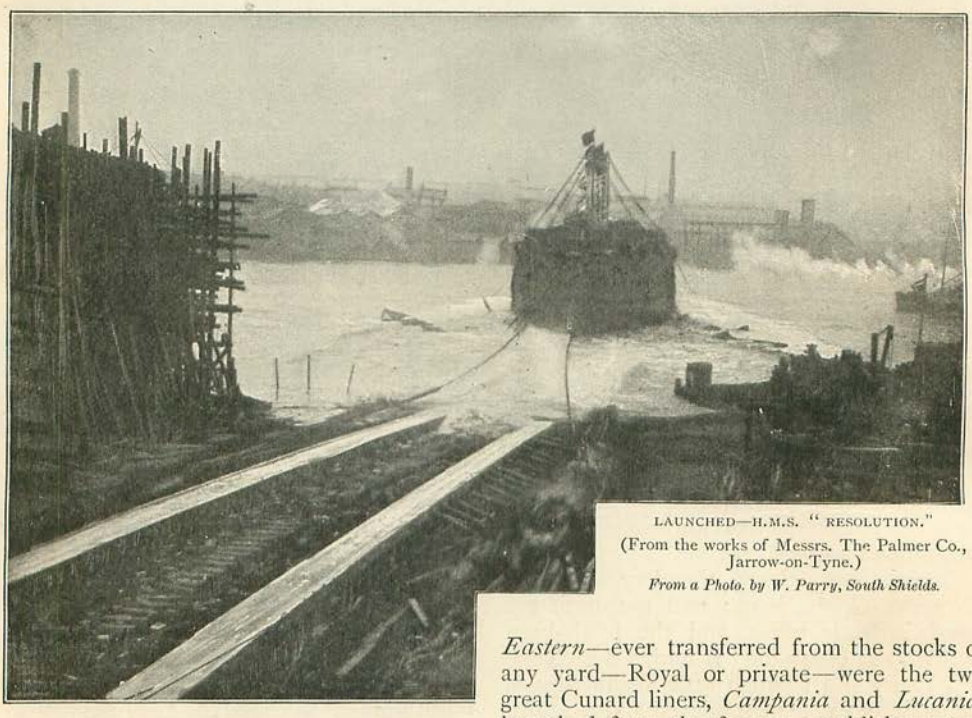
Battleships, and ships of war generally, excite, on the whole, more interest and enthusiasm than large merchant ships or even great ocean liners. This is probably because warships are the nation's property, are intended to fight our battles, maintain our supremacy, and protect our commerce on the seas, and to guard our shores from hostile invasion. For these reasons each and all conceive a more direct and personal interest in ships of the Navy; their building, launching, and future service.

While it is well that this feeling of personal interest, or of individual proprietorship, should exist, perhaps that degree of it—or rather the aggressive form which it assumed—in the case of one British taxpayer, is scarcely to be admired. At all events, it was the cause of a pretty severe snub being administered, when, under proper conditions, it would have deserved and obtained nothing but commendation.

The individual in question, on the occasion of the Channel Squadron visiting the Clyde, rowed out to one of the newest of our great battleships and insisted on seeing through the ship, although he was informed, both by notice-board and by the officer on guard, that this was against orders for the day. "But I insist," declared the man, pompously; "I'm a *part-owner* of the ship," to which came the immediate and crushing rejoinder, accompanied by a small particle whittled by the officer from the bulwark rail of the great vessel, "Here, sir! that's *your* part of the ship; so kindly sheer off!"

Though simple in principle, launching a ship has always been a perilous operation, and the task has grown in arduousness and responsibility as vessels have grown in size and weight of structure. None appreciate the latent power for harm which exists in launching ponderous modern vessels, or admire the skill with which it is controlled, so keenly as those professionally initiated. Referring to the hitch which occurred in

connection with the launch of H.M.S. *Ramillies* in August, 1892, from the famous yard of Messrs. Thomson, Clydebank, Sir W. H. White, chief naval constructor, said that with all respect to his colleagues, the civil engineers responsible for the great Forth Bridge, the naval architects and shipbuilders who undertook to produce floating structures like the *Ramillies* faced a task of even greater difficulty and of a more arduous character. When people saw ships gliding into the water, they were prone to take it as a matter of course, but when such incidents were witnessed as had taken place in connection with the progress



LAUNCHED—H.M.S. "RESOLUTION."
(From the works of Messrs. The Palmer Co., Jarrow-on-Tyne.)
From a Photo. by W. Parry, South Shields.

of the *Ramillies* down the ways (a hitch which was due mainly to the hardening of the grease on the ways), where, when all that human skill and foresight could do had been done, there was still possible risk in lowering a stupendous mass weighing 7,000 tons a depth of 20ft. to 30ft., the difficult nature of the performance was better realized. Ships were built which, to get into the water, was, to say the least, no easy task, and when once they were safely there they had, instead of the solid earth as a foundation, the moving and tumultuous ocean.

By the term "launching," of course, is meant the transfer of ships bodily from the berth or slipway on which they have been built, as distinguished from the "floating-out" of vessels built in a dry-dock. In the latter case the responsibility of the work involved is not nearly so great. The vessel simply rests on the blocks on which she has been constructed until the inflow of the sea into the dock is such as to float her. Most of the heavy battleships produced in the Royal Dockyards are built and floated out in this manner, the recently added battleships, *Magnificent* and *Majestic*, being examples. To this aspect of the subject we will return.

The longest and heaviest ships—with the single and memorable exception of the *Great Eastern*—ever transferred from the stocks of any yard—Royal or private—were the two great Cunard liners, *Campania* and *Lucania*, launched from the famous establishment of Fairfield, on the Clyde, in September, 1892, and February, 1893, respectively. Unlike the case of the *Great Eastern*, the launching of each of these later "leviathans" was an immediate and unqualified success. Their transfer from the stocks was witnessed by enormous concourses of enthusiastic spectators, and never, perhaps, in the whole history of shipbuilding were hearty congratulations on the success of a launch more freely bestowed upon the responsible performers in such an undertaking than were showered upon the head officials at Fairfield.

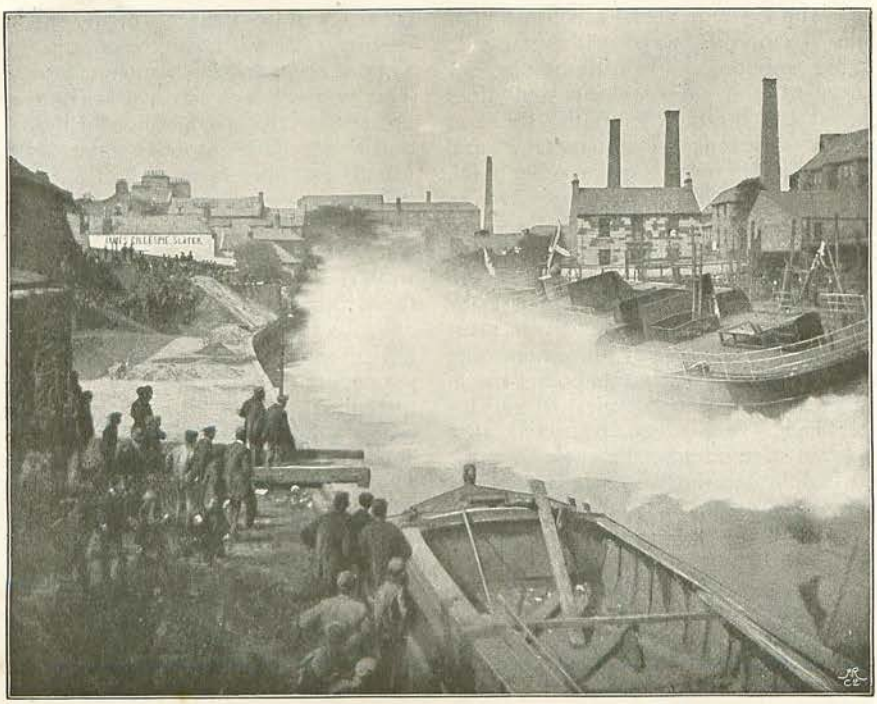
The *Campania's* and *Lucania's* weight, as each sat on the ways ready to "take the

plunge," was approaching 9,000 tons. The launching weights of many of the battleships since turned out from Governmental and private yards have ranged from 6,000 to 7,950 tons. The latter figure represents the weight of H.M.S. *Hannibal*, launched from Pembroke Dockyard in April this year. The *Resolution*, of which a view is given on page 320, as she left the ways of the Palmer Company's yard at Jarrow-on-Tyne, in May, 1892, weighed 7,270 tons. The *Ramillies*, already referred to, and the *Terrible* and *Jupiter*, also launched from the stocks at Clydebank last year, as well as the *Powerful*, produced at Barrow, all weighed something like 7,000 tons each. From these general facts alone it will be easily understood, as claimed by Sir W. H. White, that the launching of large modern ships is a task of no ordinary magnitude, involving labour and skill of a kind which dwarfs into comparative insignificance the building of large structures on *terra-firma*.

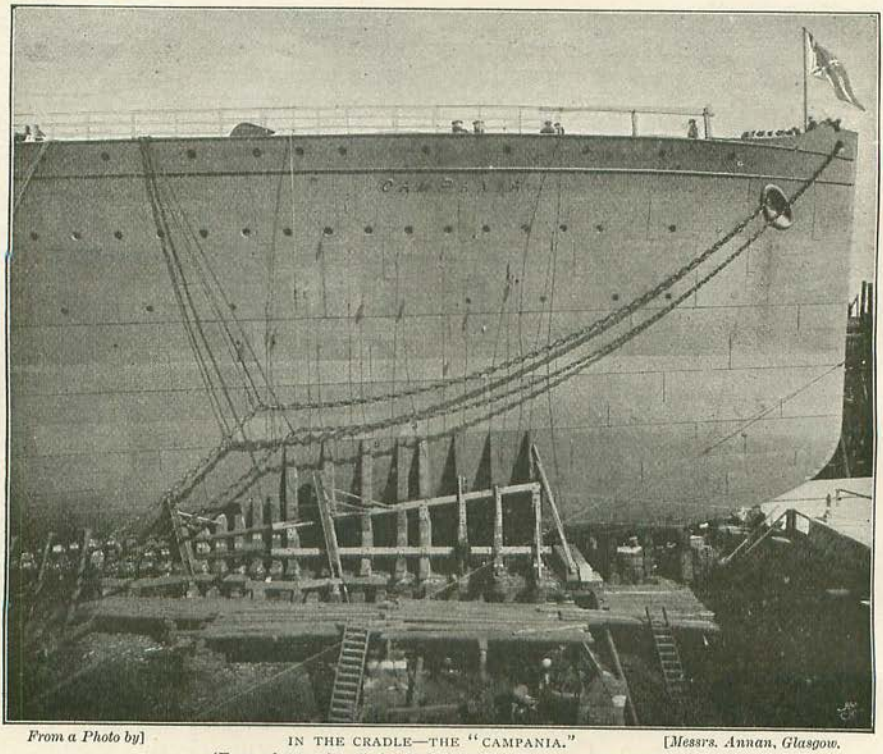
The forethought and concern, if not the actual work, connected with the launching of a ship, begin almost with her inception: in other words, with the commission to build her. The prudent shipbuilder, indeed, unlike Defoe's Robinson Crusoe, who couldn't launch his boat after he had built it, predetermines how a given vessel shall be launched, or floated, before he places the blocks upon which her keel is to be laid and her structure raised. Want of precaution and forethought may often tend towards, and actually sometimes result in, hitch and disaster.

The careful and successful shipbuilder first of all has to consider whether the berth or slip upon which the particular ship is to be erected is sufficiently solid and strong. Any subsequent sagging or drooping in the foundation of the building slip, and consequent change in the ship's structure, may occasion trouble at the critical moment of launching. Thus, in private establishments the ground on which heavy ships are to be constructed frequently requires considerable preparation, on account, possibly, of its loose or yielding nature, and piling or some other kindred provision is made to prevent the sinking of the structure which has to be raised over it. In laying the keel or foundation blocks, it is needful to take account of the degree of declivity required for launching, on account of the rise and fall of the tide, and the necessity or otherwise of providing means of checking the ship, as may be determined by the width of water clearly available.

On broad waters such as Milford Haven,



From a Photo. by] A BROADSIDE LAUNCH AT PAISLEY. *[T. N. Armstrong, Shettleston.*



From a Photo by] IN THE CRADLE—THE "CAMPANIA." *[Messrs. Annan, Glasgow.*
(From the works of the Fairfield Co., Govan, Glasgow.)

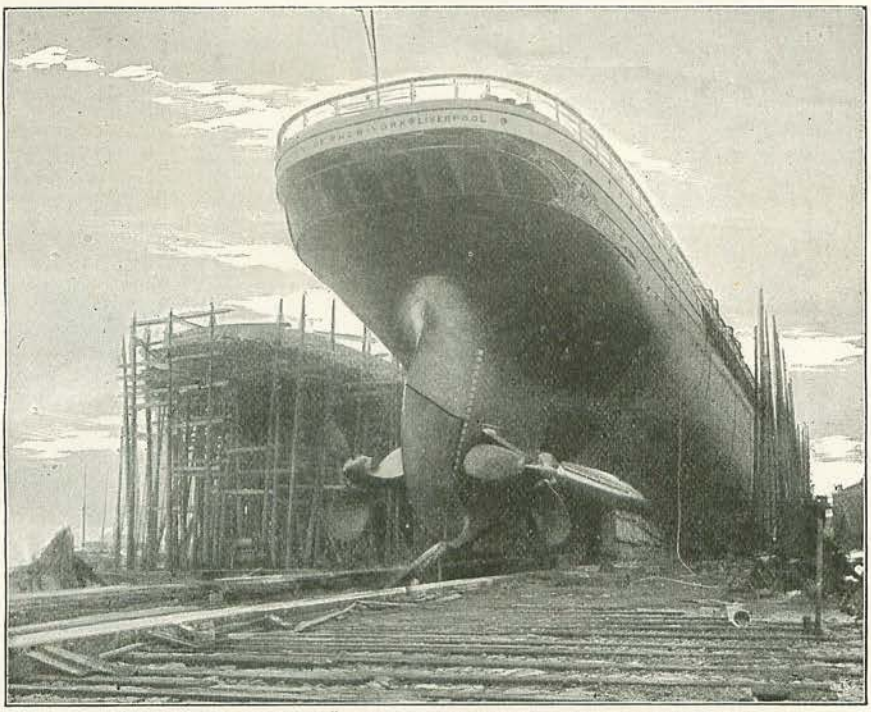
and in lesser degree such as the lower reaches of the Clyde, a vessel can be allowed to glide down the ways with gradually accelerated motion, and without let or hindrance, as the velocity involved does not exceed the distance from the shore at which fluid resistance counteracts it and brings the vessel to rest. On the other hand, in waters so restricted in width as the Clyde in its upper reaches, the Cart at Paisley—see page 321—the upper parts of the Tyne, or the Wear at Sunderland, the conditions are entirely different. The available width for launching is limited, and ships, as a rule, must be pulled up as soon as they are water-borne or completely afloat. At certain points, moreover, in these and other districts, the width of water is so very much restricted that vessels, even of moderate dimensions, must be launched broadside on to the water, even as the *Great Eastern*—though certainly not of moderate dimensions—was committed, ultimately, to the bosom of Father Thames. The means employed to successfully accomplish the launch and floating of vessels in these circumstances impart into the problem of launching additional elements of difficulty and danger, which will be afterwards referred to.

When once the vessel is completed, in so far as the water-tightness of her shell and the coating of it with paint are concerned, the work of preparing the launching gear is begun. This primarily consists in "laying the ways," or rails, so to speak, on which the ship is destined to glide into the water. There are usually two lines of ways, laid parallel to the keel of the vessel, and at equal distances on each side of it; the total distance, usually from a third to a half of the vessel's breadth, varying according to circumstances—such as the width, the form, and the weight of the hull, the nature of the foundation, etc. Each line of ways comprises two main items: the permanent or "standing way," and, on top of this, the "sliding way," both consisting of heavy, solid lengths of timber, usually oak or elm. The standing ways are securely stapled to heavy cross-blocks of timber, somewhat equivalent to the sleepers of ordinary railways, and these, in their turn, are fastened to massive timber balks, running lengthwise, their top surface flush with the ground level. The sliding ways are usually of about the same width and thickness as the standing ways, but along their inner lower edge is a feather, which projects down past the edge of the standing ways, much in the same way as

railway carriage wheels, and with much the same object: to prevent the sliding ways and their superincumbent burden from "leaving the rails" or permanent ways.

Rising from the sliding ways is the assemblage of heavy vertical timbers of pine—termed "poppets" in naval yards—forming the "cradle" in which the vessel's hull is directly supported, and in which, with the sliding ways, the ship is borne down the appointed pathway. The timbers forming the cradle are closely spaced, and have their top ends bevelled to fit closely in upon the shape of the vessel's hull. It is chiefly, of course, at the fore-end and at the aft-end of the vessel where the cradle is required, although throughout her whole length she rests on wedges and packing laid upon the sliding ways. The cradle on each side is secured and kept from falling away from supporting the ship by means of strong cable or other ties passing from side to side underneath the keel.

In some districts, and in the case of heavy vessels, a third line of ways is laid down, directly under the vessel's keel, but this is becoming less and less the practice. The number, and more especially the width, of the ways employed are points regulated by considerations of weight of hull to be launched, character of foundation, declivity of ways, etc.; the main object being to distribute the total weight over an amount of surface at once suited to the needs of stable support and presenting the minimum of surface friction, compatible with a safe speed of travel. In general practice, it is found that for each square foot of surface of ways the superimposed weight should not be more than from two to two and a half tons. Taking the renowned *Campania* and *Lucania* as examples: the two lines of ways employed in their case were each 4ft. in width, and this with the length of sliding ways adopted yielded a weight distribution of somewhere between the two and two and a half tons per square foot just spoken of.



"THE CITY OF NEW YORK"—SHOWING TWIN SCREWS AND LAUNCHING CRADLE.
From a Photo. by the Builders, Messrs. J. & G. Thomson, Clydebank.

Prior to finally fitting the cradle, a comparatively simple, but very essential, part of the work is gone through. This is the greasing of the ways with tallow or other suitable substance to impart the necessary lubrication to the rubbing surfaces. In the case of the *Campania* this was done about a fortnight before the launch, the layer of unguent being about 3/8in. thick. The

lubricating of the ways, and maintaining the greased surface in proper condition until the fateful moment of the launch, form, perhaps, the most fruitful source of trouble that the shipbuilder has to contend with. Hitches not infrequently occur in this connection which necessitate the raising or "shoring-up" of the vessel from the cradle, removing cradle and sliding ways, coating the ways anew, and then re-fitting the whole before the vessel can be got off. Such hitches are due often to the solidifying of the unguent, through frost, or to its exuding from between the ways from excessive pressure and frictional heat, while not infrequently it is due to the bad quality of the substance employed.

From a Photo. by the Builders] "THE CITY OF NEW YORK"—BOW VIEW. *[Messrs. J. & G. Thomson, Clydebank.*

With the greasing of the launching ways, and the final fitting and securing of the cradle complete, the only other arduous preparatory work remaining is "setting-up" the vessel, or transferring its weight from the original supporting stationary blocks and props on to the movable cradle and ways. This part of the work of the modern shipwright is accomplished quickly, immediately preceding the launch, and consists in driving wedges all along the vessel's length into the joint between the upper surface of the sliding ways and the packing pieces on which the vessel directly rests. In this way the original supporting blocks are relieved sufficiently of pressure to enable them to be drawn out or battered down from under the keel and bilges. This work proceeds smartly and simultaneously all along the line, until when there is nothing of the original support left, save perhaps a few of the blocks under the bow or "fore-foot," the vessel is at last cradle-borne.

Thus situated, and when the signal "All clear" has been given, the vessel is ready for the "send-off." Here, however, the masterful skill of the shipwright interposes a small but effectual barrier to too precipitate motion. This obstacle, known variously as the "trigger," "dagger," or "dog-shore," is usually a short length of hard-wood interposed—in a sloping direction, and in such a way as to promptly yield to a smart downward blow—between fixed projections on the side of the standing ways and of the sliding ways. "Knocking down the

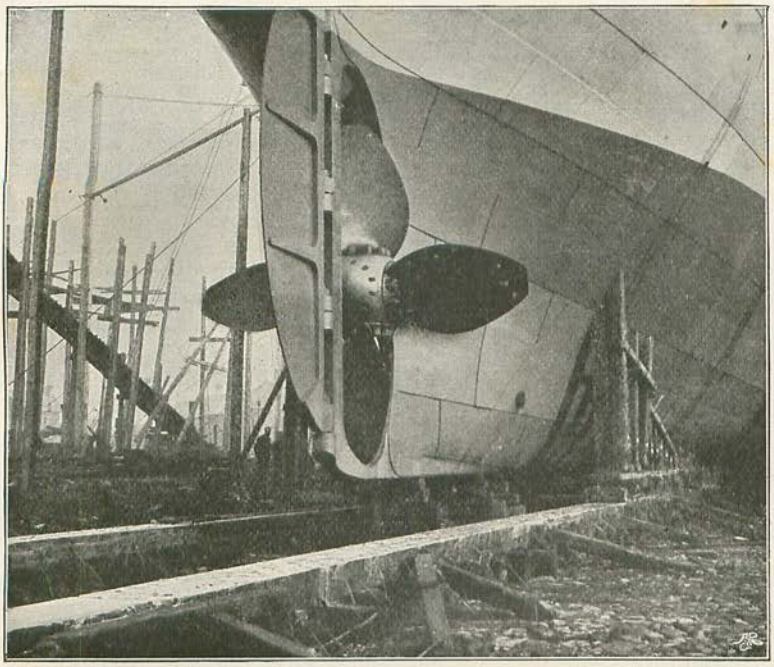
daggers," or dog-shores, as the crowning act in the process of launching a vessel—or "slipping the leash," so to speak, of the "Atlantic greyhound"—has, from time immemorial, been regarded as an honour to which the youngest shipwright apprentice could lay claim. This only now obtains, however, in yards, or in connection with small ships, where the act is performed by hammer-blows by hand. It is merely a tradition in yards where the larger steamships are built, mechanical and automatic devices being in their case now invariably resorted to. Two, and sometimes three, daggers are employed, suspended above which are heavy weights. Being simultaneously released by mechanical means, these weights instantly fall, and, in doing so, bring down the daggers, thus removing all obstacle to the passage of the ship down the ways. Motion, in most cases, at once sets in through natural gravity, while in others a gentle persuasive push from hydraulic jacks placed against the ends of the sliding ways or the round of the stem is necessary. Once fairly on the move, the sliding ways, cradle, and ship gather impetus and glide down the appointed pathway with accelerated velocity until retarded on entering the water, and finally brought to rest by check-chains or wire-ropes connecting ship and shore. Immediately the duty of supporting the hull of the vessel is assumed by the water, the cradle and ways float away from the vessel's sides in pieces, but are loosely connected by cordage to facilitate recovery.

It is, of course, well known to everyone that all British ships, and almost all the ships built in foreign countries, receive, previous to being consigned to their native element, spirituous baptism. In other words, a bottle of wine is broken on their bows and their name pronounced by some fair lady or other. In the case of British warships, and even of many foreign merchant ships, a religious service also forms part of the ceremony engaged in. Modern scientific methods, though now so much enlisted, do not supplant but supplement and enhance the romance and sentiment attaching to such proceedings. Not only the ceremonial naming or "christening" of vessels, but the actual touch which sends them gliding down the ways, is now managed by the fair sex. In the hands of a lady, a mallet and chisel sever the cord supporting or communicating with the weights above the daggers, causing them to fall; or wizard electricity does what little work is thus involved, if only a button be pressed. This latter was the mode of managing matters in the case of the *Royal Sovereign*, named and launched by Her Gracious Majesty the Queen; and of other battleships since.

So perfect, and so magical indeed, is the system sometimes made, that the finger-touch of a baby may launch a battleship. In the case, at least, of the torpedo-boat destroyer *Ardent*, launched from the renowned yard of Messrs. J. L. Thornycroft and Co., Chiswick, the release of the vessel was accomplished by Miss Esther Cornish, granddaughter of the builder, and of the grandly mature age of six months!

In this same connection of launching customs, here and abroad, it is of interest to refer to one of the "pretty ways" long followed, and possibly not yet forgotten, by

APPARATUS USED BY HER MAJESTY IN LAUNCHING THE "ROYAL SOVEREIGN."
From a Photo. by West & Son, Southsea.



THE "HARLECH CASTLE"—SHOWING SINGLE SCREW.
From a Photo. by Maclure & Macdonald, Glasgow.

the Japanese, whose recent great triumph over the sleepy Celestials has seemingly inspired them with a still greater desire for copying our Western ways of doing things. Taking the place of the gaily decorated bottle of wine, hanging from the bow of our vessels, the Japanese have a large pasteboard cage full of strong-winged and mellow-throated birds. The moment the ship is afloat a string is pulled by some hand on board ship, the cage collapses, and out fly the covey of birds, making the air alive with music and the whirr of wings. The circumstance is supposed to be symbolic of the chorus of welcome with which the good ship will be hailed as a thing of life and movement, and of beneficent service on the "mighty ocean."

The means employed to accomplish the checking of vessels, as has already been stated, imparts into the problem of launching additional elements of difficulty and danger. Here again, however, the skill and experience of ship-builders are invariably found equal to the task of safely carrying matters through to a successful issue. The method of checking launches on waters of restricted width, like the Clyde and Tyne and Wear in their upper reaches, follow one generally approved practice, although in individual instances deviations in detail are common. For example, in place of chain-cable some firms prefer to use wire-rope as the agent in "reining-in" the floating steed, and in the case of the launch of the battleship *Jupiter* from Clydebank in November last, two wire-rope checks were employed aside, in addition to the two chain-cables usually employed. The wire-rope, equally strong, is lighter and more easily handled than the cumbersome chain-cable, and it is also felt to be safer, in that it gives better indication of any undue wear taking place, or of any latent defect.

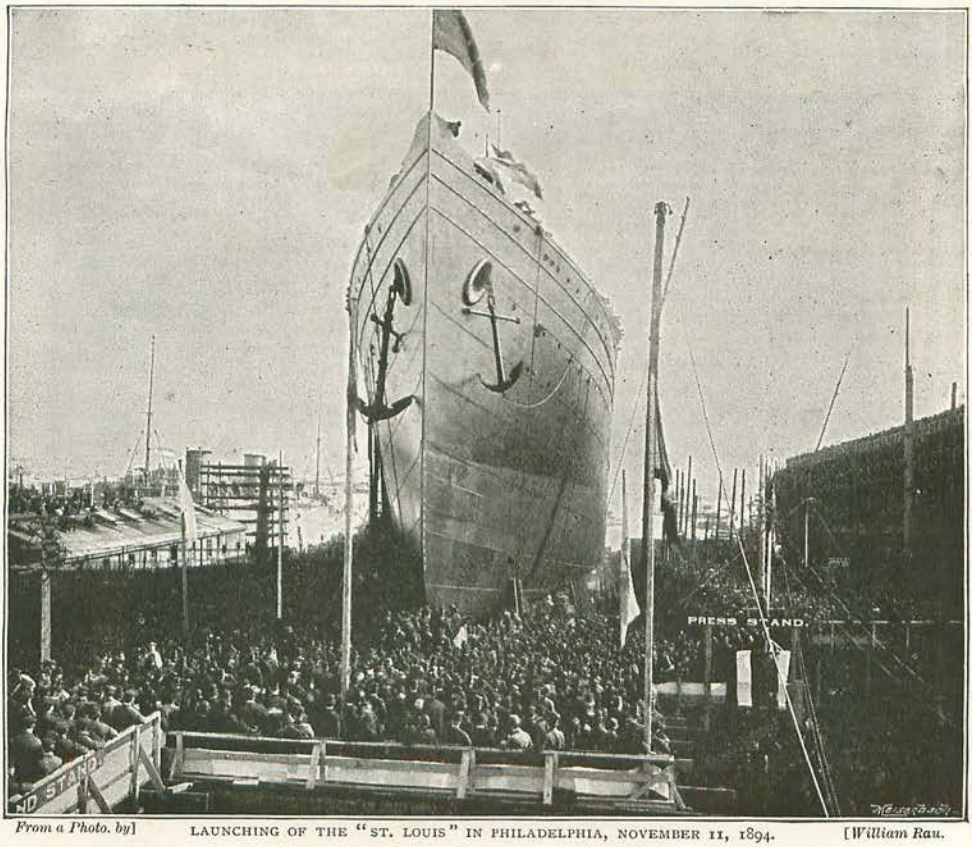
As representative of the practice obtaining on the Clyde and Tyne, the arrangements of check-chains and drags employed in the cases of H.M.S. *Terrible* and H.M.S. *Resolution* may be briefly outlined. The view given of the latter vessel on page 320 helps to make our remarks clearer. To projecting eye-pieces on the upper works of the *Terrible* on each side four check-chains were attached—one at a point well aft of the mid-length of the vessel, another amidships, and the remaining two close to each other near the bow. The shore ends of these chains were piled in heavy masses or folds on the ground alongside the vessel, and so arranged that the several piles would be brought into play gradually as the huge vessel moved off the ways into the water, the whole aggregation of drags amounting roughly to some 500 tons. Almost as soon as the stern of the vessel floated the checking action began, on each side simultaneously, of course, and by the time 600ft. had been traversed, a little more than her own length, the system of check-chains and drags had effectually stopped "way" on the vessel and she was safely brought to rest. In the case of the *Resolution*, launched from the celebrated Palmer yard at Jarrow-on-Tyne, the total launching weight was 7,270 tons, or 270 tons greater than the corresponding weight of

H.M.S. *Terrible*, but her length was only 380ft. as against the *Terrible's* 500ft. The "free run" in her case amounted simply to the width of the river in the line projecting from her launching berth, viz., about 880ft. The *Resolution* was brought up after having travelled 260ft. clear of the end of the ways; the velocity attained while on the ways being 22ft. per second. The means of checking employed in this case consisted of four 2⅛in. chain-cables, and one 6in. steel-wire hawser on each side of the vessel, attached to the hull and disposed in drag-groups in a somewhat similar manner to those connected with the *Terrible*.

As a rule, in connection with all but the heaviest of ships, the check-chains and pendant-drags, which are arranged farthest aft, are first brought into action, but in long and heavy vessels, such as the *Terrible* and the more recently-launched battleship *Jupiter*, built upon and ushered from the same berth, the two check-chains and pendant-drags nearest the bow were first brought into play: the two farther aft being arranged so as to serve mainly as supplementary or "emergency" agents in the work of bringing the stupendous mass to a state of rest in the new and untried medium of support.

In the United States the building and launching of the modern battleship or American liner is a matter of tremendous public interest, possibly because the construction in that country of immense vessels, such as are yearly built upon the Clyde, is a growth of recent years. Indeed, it was not until the decline of the "clipper" ship, owing to the progress made in steam navigation, and the rapid construction of modern ships of war by European Governments, that the United States woke to a realization of its dependence upon English-built steamships for its mercantile relations with Europe, and its defencelessness in case of a naval war.

A speedy change, however, has taken place. The "White Squadron," of which the American people are pardonably proud, and the beautiful twin steamships of the American line—the *St. Louis* and *St. Paul*—are the product of the Cramp Yard, in Philadelphia, and the periodical launchings of the new American Navy have attracted the attention



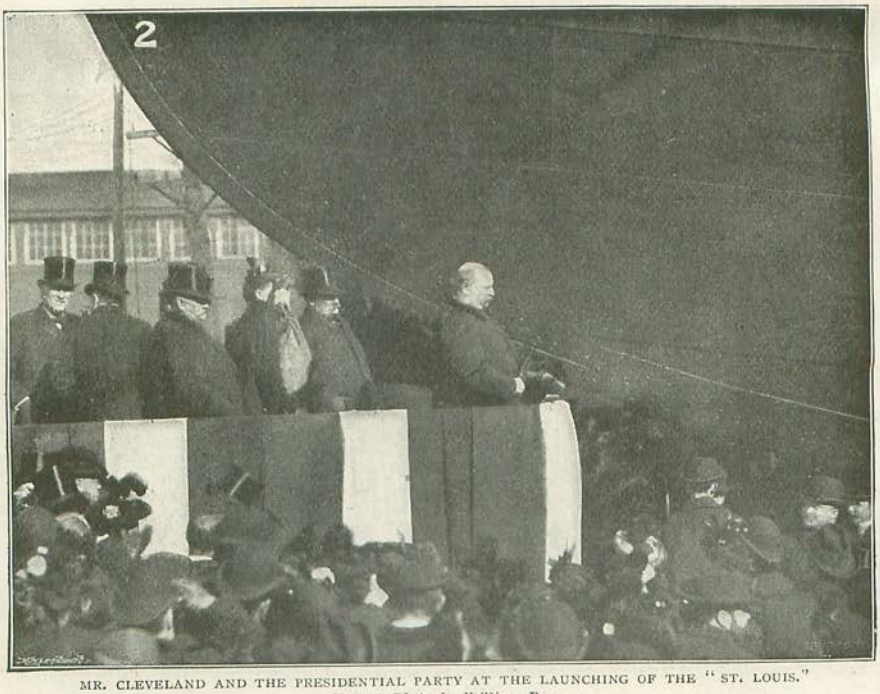
From a Photo. by] LAUNCHING OF THE "ST. LOUIS" IN PHILADELPHIA, NOVEMBER 11, 1894. *[William Rau.*

of the United States, from Maine to the Golden Gate. Preparations for the great day are widely heralded in the Press, and when the different vessels glide swiftly down the ways, the news is quickly telegraphed to every part of the land.

The launching of the *St. Louis* on November 11th, 1894, illustrated this enormous interest. Nearly forty thousand people were gathered in the Philadelphia Yard to watch Mrs. Cleveland break a bottle of champagne across the graceful bow of the largest steamship ever launched in the United States. The President and his Cabinet had come from Washington to witness the ceremony. The public platform held ten thousand people, and the unfinished decks of the *St. Paul*, which stood near by, were black with the eager crowd. For an hour or more hundreds of workmen were employed driving in the wedges which lift the vessel from her bilge-blocks.

Meantime the band was playing popular airs to distract the attention of the impatient crowd, and when at last the great ship was launched, the babel of whistles, horns, and cheers was almost deafening. It was a great event, and the celebration of it was characteristic of an enthusiastic people.

In view of the popular acclaim and warm official recognition of the success attending the output of naval vessels from the Royal dockyards, it is worth while adding that the many-sidedness of the problem with which private builders, as a rule, have to deal in building and launching heavy vessels from ordinary merchant slip-ways is in striking contrast to the simplicity characterizing the state of things obtaining in Royal dockyards, or where properly constructed building docks, in place of inclined slip-ways, are available. These docks are of substantial masonry, and for this reason the responsibility of providing a stable foundation is obviated; the work of construction is simplified and facilitated, as all heavy weights are simply lowered into place; economy is rendered possible in various ways; and above all, the great risk and expense of launching the vessel down an inclined slip-way are entirely avoided. The vessel simply rests on the blocks on which she has been constructed until the inflow of water into the dock is such as to lift her; when, amidst cheers, as hearty and prolonged as attend the "send-off" of the warship from inclined ways, she is floated out into the world of waters, where duty, and mayhap glory, awaits her.



MR. CLEVELAND AND THE PRESIDENTIAL PARTY AT THE LAUNCHING OF THE "ST. LOUIS."
From a Photo. by William Rau.