

the leakage from doors in No. 99 bulkhead, filling the starboard tank and the provision rooms, no means being provided of pumping those parts out except by flowing over the shaft passage to the midship provision room. The tank room would not drain over the shaft passage.

David Tiddy, carpenter of the *Vanguard*, was of opinion that the inner skin of the ship was started by the collision, and that this caused the great flow of water that had taken place in so short a time.

Valentine Horne, engineer of the *Vanguard*, stated that in his opinion the cause of the foundering was the large quantity of water that had entered the ship before the doors were properly closed, and the leakage which took place, and caused the water to flow over the engine room hatch into the order compartment.

On Thursday Lieutenant Thompson, of the *Iron Duke*, who went on board the *Vanguard* to assist after she was struck, inferentially deprecated the speed with which hope was abandoned. When the men had been working the pumps only ten minutes, the order came for them to leave. He went on deck and asked Captain Dawkins if it was true that he had ordered them to leave the pumps, and he replied affirmatively. Lieutenant Thompson said that after the men had been ordered from the pumps, he, with a lantern, explored the sick bay and store room and other parts of the ship, finding all quite dry. On the provision room flat, however, water was coming through crevices in the water tight bulkheads, and he remarked to Lieutenant Noble how useless bulkheads were when water poured through crevices like that. The provision room flat had half an inch of water on it. This was three minutes before he left the ship, having been hailed to come up from below, and he was ordered into the galley by Captain Dawkins, who left in the same boat. The sick bay watertight doors were not closed.

Mr. Moore, Chief Constructor, then gave evidence as to the construction of the ship. Probably one of the bulkheads (No. 85) was injured by the collision. Looking at the prow plan, which was based on the reports of the divers, the witness thus stated the nature of injuries received by the *Vanguard*:—The two lower armour plates are driven into the ship about fifteen inches at the lower streak of armour, carrying before it the wood backing and the iron frame of the ship, together with a portion of the recess plate on the inside of the ship, in addition to the bottom plating being cut down to within a few inches of the watertight longitudinal.

The President: Does it appear to be the fact that the prow point never pierced or even touched the inner skin of the vessel at all?

Mr. Moore: From the evidence given by the shipwright divers it does not appear that the prow either touched or pierced the inner bottom at that part.

The President: So that so far as the prow is concerned, the construction of the double bottom secured the vessel from any bad result?

Mr. Moore: Yes; so far as that particular part of the ship is concerned.

Captain Lethbridge: The roof of the double side being secured to the top of the inner skin of the ship's side, are you of opinion that the inner skin of the ship may have been materially injured by it being so, observing, also, that the roof is about two feet six inches below the load line?

Mr. Moore: Assuming that the part called the roof is the recess plate on which the armour and all its fittings are built up, and

which is about six feet below the load line, I am of opinion that when this recess plate was driven in with the armour it carried before it a considerable portion of the inner skin at that particular part, together with the lower deck, which is about two feet above the recess.

Captain Ward: Are there means of transferring at will to any part that may be necessary the suction of the steam fire engine? or is it a rigid fixture?

The President ordered the Court to be cleared, and on being reopened, Lord John Hay stated that the last question was withdrawn.

Two shipwright divers were then examined, and both stated that the fracture in the side of the *Vanguard* was between 87 and 89 instead of between 85 and 87, as shown in the profile plan, and one of them said that the foremost part of the fracture was 6 feet from the watertight bulkhead.

Lieutenant Thompson recalled, said that the water in the provision room flat while he was there was only sufficient to wet his socks a little, and that he attached no importance whatever to such imperfections as he noticed in 99 bulkhead and its doors, as affecting the case of the ship foundering.

Captain Dawkins stated that when the collision took place he did not order the bugle call as a signal for closing the watertight doors, because it was so clear to him from his orders that on anything happening the doors would be at once closed; this he knew was being done almost before his orders were heard, and the doors were reported to him as closed in about five minutes.

(To be Continued.)

### Breechloading Small Arms.

On Monday evening, at the Royal United Service Institution, Whitehall Yard—under the presidency of General Boileau—Mr. John Latham (of the firm of Wilkinson and Sons) read a paper on "The Progress of Breechloading Small Arms." He said the two competing breechloading plans were now the "bolt" system, which was generally adopted on the Continent, "block" system, which was most in favour in England and America. The Prussian needle gun belonged to the first system, and it was the parent of the Chassepot, the Beaumont, the Manser, the Vetterlin, and a host of other plans, and the most questionable part of its mechanism—the spiral mainspring—has been adopted in the Martini-Henry. In accuracy of shooting it was of necessity defective, but at the time of its introduction its accuracy was far beyond any of the military arms then in use, and for ease of loading and simplicity of manufacture it was still unsurpassed. As a type of the block system he would take a breechloader (Sharp's) which was submitted to the Board of Ordnance at Washington in 1850. It had a sliding block moved by the action of the trigger guard. Some of these guns were used in the Crimea, but it was a breech "firing" gun and was condemned through the defects of the cartridge. At the present time, as improved and adapted for the metallic cartridges in the "Henry" breechloader, it was one of the best of the modern systems. He then passed to the Snider, which was selected some years ago by the English Government. The mechanism of the Snider was precisely that of the earliest known breechloading small arm of which a specimen could be seen at the Tower of London, dated 1537. The success of the Snider was

chiefly attributable to the Boxer metallic cartridges, but its defect was that it was a "six motion" arm, and took so long to load, fire, and throw out the cartridges. But for that defect the Snider action would hold its own against any of the latter systems, and there was a patent (Hunt's) spring extractor adapted to the Snider which would make it a five motion gun. The French Chassepot was an improvement on the Prussian needle gun, but inferior to the Snider. The next plan of breech action which came into notice was invented by Mr. Peabody, of Boston (Mass.), which met the difficulty of extracting the empty cartridge. It was generally known as "the falling block" system, and was of great strength, simplicity, and handiness. In the year 1868 a select committee considered the question of breechloading small arms with a view to replace the Snider by a rifle embodying the smaller bore and quicker twist, which Whitworth had proved to be so much superior. In the trials which then took place the "bolt" principle was rejected altogether as dangerous. The further competition was therefore restricted to the block systems, and the two best weapons were those of Henry (sliding block) and Martini (falling block). They were equal in safety and strength, and the Henry far surpassed the accuracy, but the Martini was a self loading arm, and required one motion less to load than the Henry. The committee took the Henry barrel and the Martini breech action, and proceeded to adapt them to each other; but the cartridge, as usual, was the difficulty. That was partially overcome, and the weight of the gun reduced to 8 lb. 12 oz. The mechanism of the Martini breech action was in substance the Peabody, but a very high ingenuity had been employed to make it a self loading arm, with the lock contained in the falling block. This action, however, was easily deranged, and he had known a variation in the pull off of more than 5 lb. occur in a day's practice. The Martini had a very unpleasant recoil, and the cause of it was that the gun was an engineers' gun, or simply a machine for receiving firing, and ejecting a cartridge, and whether it was to be screwed in a vice or fired from a man's shoulder did not appear to have been considered at all. But the excellence of its shooting was incontestable, and as far as he could learn the soldiers liked their new weapon. Another excellent plan of falling block rifle was the Swinbourne, and its internal arrangement was far superior to the Martini. The Soper, which had recently come into use, combined a high degree of simplicity and accuracy with the greatest of any breechloading arm yet introduced. In any further competitive trials this rifle was sure to take a very good place. With regard to the continental guns, considerable improvement had taken place in the bolt system, and the Manser was the latest modification. The Manser resembled in appearance both the Prussian needle gun and the Chassepot. It was a self cocking arm, having four motions—opened, loaded, closed and fired. It had a strong, sound movement, which was instantly understood by a soldier accustomed to the needle gun, but it was a mistake to suppose that it was either a better arm than the Martini or that it was perfectly free from the sources of danger which existed in all bolt guns. After alluding at some length to the trials made in America of many known breechloaders and the preference being given to the Springfield, Mr. Latham referred to the trowel bayonets which had occupied the attention of the board at Washington. These trowel bayonets were highly spoken of as most valuable to enable troops to throw up