AMERICAN RAILWAY SLAUGHTERS AND BRITISH RAILWAY SAFETY.

BY FREDERICK MOORE.

On the railways of the United States in a recent three months there happened 1,481 collisions and 877 derailments. In these 51 passengers were killed and 751 injured, 35 mortally. Adding to this list the number of pedestrians run over at crossings—in which America has a specialty—and the employes killed and injured, the figures reach 274 and 2,089 respectively. The record of the United Kingdom averages one-sixth that of the United States, but 1901—a high-figure year in the States—is boasted of in England; not a single passenger was killed.

American has 200,000 miles of railway; the United Kingdom 23,000.

The British roads cost to construct $200,000 per mile, more than three times the investment in America. Sixty per cent of Great Britain's railways are double-tracked, about five times the percentage that exists in the United States. The older country has about fifteen times as much block system, considerably more interlocking switches and signals, and far less of the violent forces of nature with which to contend. Had the high English standard been maintained in America, however, half or three-quarters of the roads could never have been built. Investors have been allowed to build railroads when and where and how they would, and the result is that the United States has a transportation system as extensive as the rest of the world together. The vastness of the country and the thinness of its settlement, compared with Great Britain, make it too expensive to build with English safety.

More than half the roads in America pay little or no dividends, and the payments on the total debt—stock, bonds, floating debts, etc.—are only a trifle over four per cent per annum.

THE WRECK AT LITTLE BYTHAM. THE TRAIN LEFT THE VIADUCT BECAUSE OF THE SPREADING OF THE RAILS.

On the poor lines the freight trains are side-tracked to let the passengers fly by. Interlocking switches and signals are too expensive, and the swing of the switches back to a straight course after the siding has been taken is left to the brakeman of the freight. A freight train will generally slow down while passing—it has no schedule to run on—but when a "double header," heavily loaded, has speed up on a slippery track, the precaution is sometimes dispensed with.

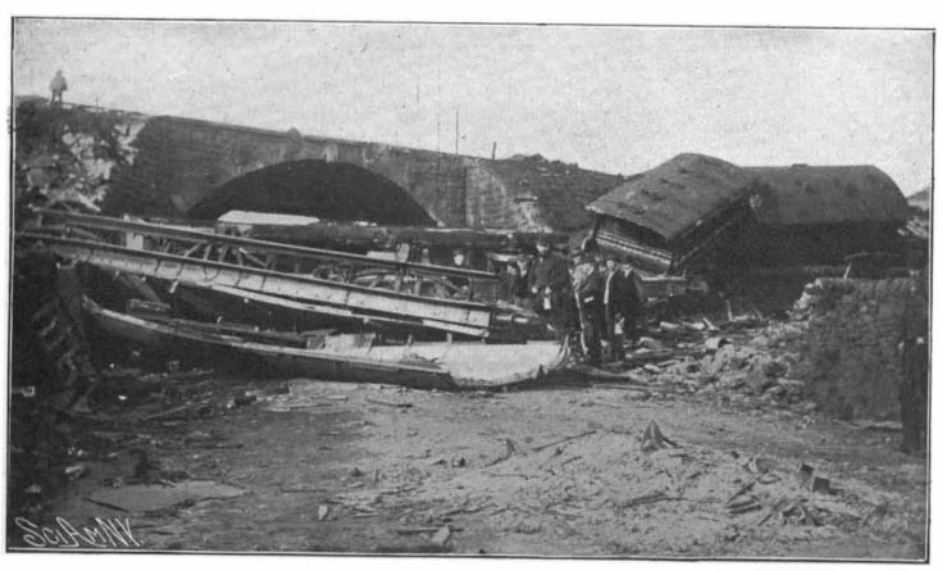
Safety devices and automatic apparatus, as they are adopted, lessen the liability of accidents, but the iron horse can never be taken entirely out of the hands of fallible man. With wet face and sweating body, sitting hour after hour watching, it is a wonder the driver of the steel steed makes as few mistakes as he does. He has often to keep his vigil with open window and with rain or snow or fog driving at him at the rate of a cyclone. Accustomed day after day to seeing his signal the same, he grows careless, mechanically glances at it and dashes on. Just that way at Essendine a freight train on the perfectly equipped Great Northern of England took a siding which ended abruptly. At full speed the train ran up the hill at the side of the roadway until an incline so steep was reached that the engine was hurled back in the mud, turned over on the tracks below.

Accidents due absolutely to man bear exactly the same proportion to the whole—about fifty-five per cent—in both countries. Other than severe fogs, the British trainman has not to contend with the severities of nature which his American contemporary must face. Torrential streams that swell from placid brooks in a night annually carry away hundreds of bridges, and, without warning, weaken the support of others to such an extent that they will no longer hold the weight of a train. In Great Britain there is not the fearful fall of snow in the winter that banks in the "cuts" of the roads of the North, East, and Northwest. Nor does Great Britain suffer from the other extreme, excessive heat. While our temperature, even in the North, runs as high as 100 degrees Fahrenheit, England's seldom reaches 90. More room for expansion of rails has, therefore, to be left in America. The everlasting click as the wheels of a car pass from one rail to another with which we are so familiar is almost unnoticeable in England.

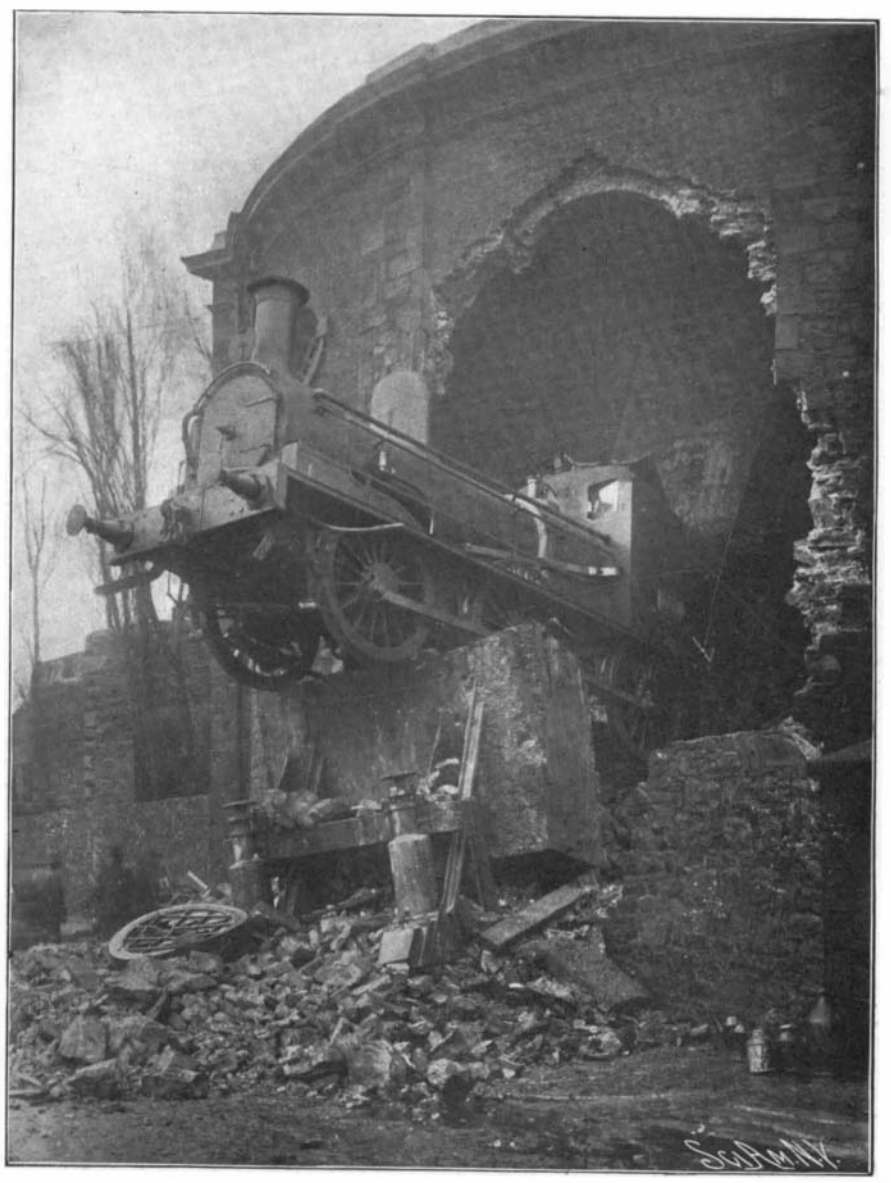
The illustrations will not uphold my statement, but it is a fact that our heavy coaches, weighing sometimes sixty tons, do not go to pieces as readily as the British cars in collisions. Against their strength, however, is the enormous momentum of the heavier trains.

Every division of a railway is equipped with a wrecking train which, for swift movement, beats the work of the fire engine. On a special siding at a convenient divisional point stands a powerful steam crane car, the fire of its engines always ready, its chains, ropes,

TRAIN WRECKED AT ESSENDINE AND COMPLETELY OVERTURNED.



THE WRECK AT LITTLE BYTHAM, SHOWING HOW THE LIGHT ENGLISH CARS CRUMBLE TO PIECES.



A WRECK AT BELFAST. ON A SLIPPERY DAY THE TRAIN WENT THROUGH THE DEPOT.

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and gears in constant, well-greased readiness. In another car of the train are stored jacks of various capacities, from an ordinary affair that may lift a few hundred pounds to one capable of raising thirty or forty tons. On a third car may be found the trucks and wheels to carry any car that may be in need of new ones. Then there is the living car, equipped with berths in which the men may rest on their way home after the wreck is cleared, and containing a cook stove and a constantly supplied larder. The engine and crew? There is generally one of the former with steam up in the yard, but should there not be, the next freight or passenger that comes by is robbed. From the telegraph operator's office to the homes of the wrecking crew—always located near the station—wires run that sound deafening gongs at the touch of a telegraph instrument. Before the brakeman, arriving on foot at the nearest station, can tell the whole of his story, wrecking men are on the way to their train. Orders are ready when they arrive. They are to stop at the next station and pick up a doctor and a telegraph operator. The operator will attach an instrument to the wire immediately upon arriving at the wreck, the doctor and his force will get into action at once, the wreckers will spare no expense in clearing the way. "Economy" and "save" are words not in their vocabularies. Cars are lifted by the huge crane—whose fires have been fanned by the rapid run until the safety valves on the boilers are lifting—and thrown over on their sides clear of the tracks. Cars that cannot be immediately righted are pitched aside until there is time to build a side track and mount them on it. Only heavy washouts on the great rivers or similar catastrophes block the roads for more than a few hours.

A NEW SIGHTING GEAR FOR NAVAL GUNS AND GUNNERY SIGNALING APPARATUS.

BY OUR LONDON CORRESPONDENT.

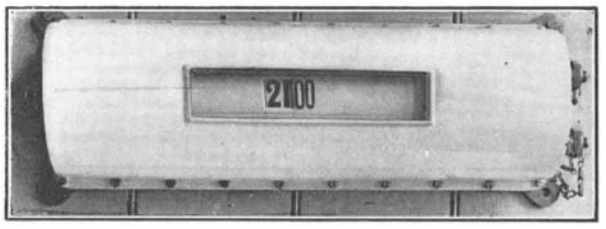
Although by constant gunnery practice and severe drill the training of expert naval gunners is carried to a high standard of efficiency with regard to the handling and firing of naval ordnance under conditions similar to actual warfare, it is an indisputable fact that the success of a naval engagement will, to a very appreciable extent, depend upon the perfection of the mechanism employed to bring the guns to bear upon the antagonist, and the means for rapidly and correctly meeting the ever varying circumstances that will arise.

The fact that naval artillery is fired upon the high seas introduces the most difficult conditions for successful practice conceivable, owing to the motion of the ship due to the action of the waves, and the extreme mobility of the target. Moreover, as the issue of an engagement, other things being equal, will almost certainly be determined by the establishment of a superiority of effective fire during the first few minutes after the commencement of hostilities, it is imperative that the handling of the gun should be rapid and accurate under all conditions.

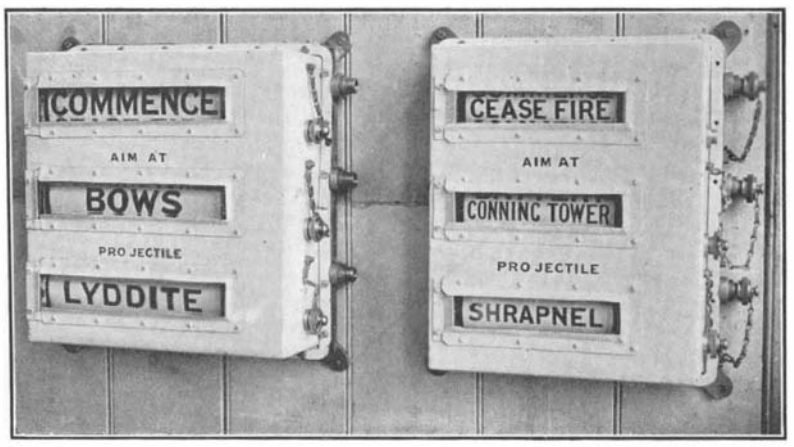
To attempt to overcome the difficulties which from the nature of the case beset the gunner in his duty of laying a naval gun upon a target, it is necessary first to define clearly the separate elements which are comprised in the art of gunnery itself; then to study their relation to the conditions under which the art is practised, and finally to so devise the necessary mechanism that it shall eliminate as far as possible any adverse effects the field of operations may create. Further, means must be provided for the most effective employment of the artillery as a whole, with prompt response to the varying and incalculable conditions of the fight.

The elements of successful gunnery irrespective of the nature of the circumstances under which it is carried out, are that the opponents should be hit frequently, and hit effectively every time.

To achieve this desideratum, two distinct operations are involved; First, that the sights should be accurately aligned upon the opponent and the gun discharged; secondly, that the angle between the axis of the gun and line of sight should be correct for the distance of the opponent. To hit the antagonist with the best advantage demands that he should be struck in the right place, with the correct projectile, and with concentrated effect.



THE SIGNAL APPARATUS INDICATING THE RANGE.



ELECTRICAL INDICATORS FOR ORDERS AND SIGNALS.

In considering these fundamental functions in the light of the conditions and requirements of an engagement at sea, it will be observed that such conditions and requirements necessitate very special adaptations of the operations involved in these functions.

These conditions and requirements may be enumerated as follows:

(1) The gun is mounted upon an unstable platform.

(2) The target is extremely mobile both in position and distance.

(3) It is of the utmost importance to establish the initial superiority of fire.

(4) The varying phases of the fight, each demanding special treatment, must be met with promptness.

(5) The superiority of fire must be maintained under all conditions until the opponent hauls down his flag or goes to the bottom.

Concerning the problem of adapting to the needs of sea work the method and means of carrying out the elementary operations of gunnery, the first process, that of aligning the sight and firing (the duties of the gun captain), is a task of extreme difficulty. Not only is the opponent constantly on the move, but the ship itself is in motion, and these together are combined with and aggravated by the roll of the ship. It may be laid down that the perfection of this operation is to maintain the sight constantly upon the opponent, giving instant readiness to fire and eliminating personal error. To attempt this the gun and sight have to be kept constantly on the move; and this is such a difficult and delicate task, that it requires the whole and concentrated attention of the gun captain, notwithstanding the common practice of assisting him by intrusting one component of the laying (the training) to another gun member.

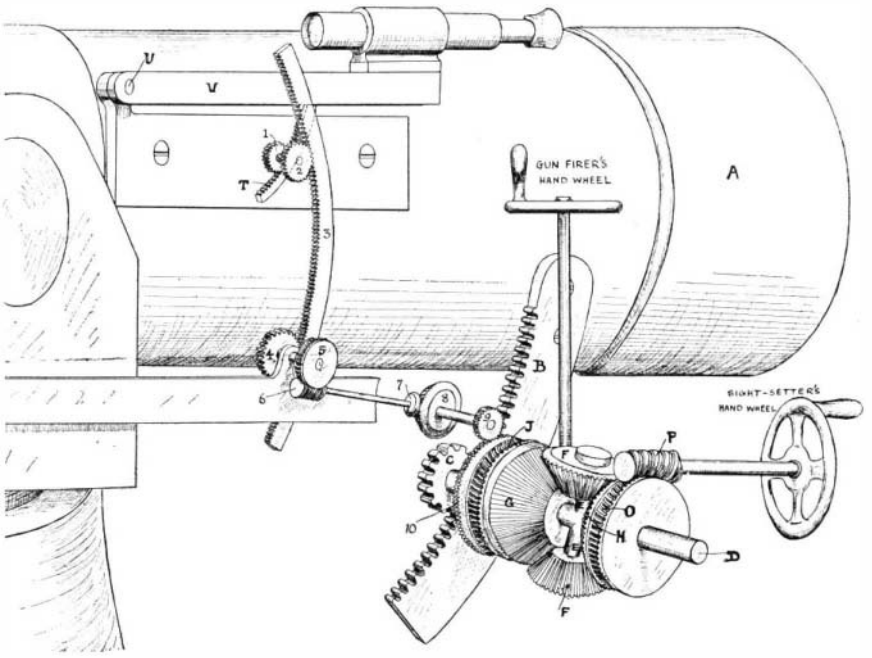
It may be confidently affirmed that the work of these two men must be simplified to the utmost, so that their whole attention may be directed to its performance. This necessitates that the mechanism in their hands must maneuver the gun with speed, and yet be simple and easy to work, and moreover that it involves the performance of that operation completely, and of that operation alone. But what of the adjustment of the angle between the axis of the gun and line of sight for the range of the antagonist? Unless this is correct the work of the gun captain will be nullified. Therefore, since it is clear that he cannot assume this duty himself without detriment to his own peculiar operation, it follows that it must be intrusted to another man, commonly called the sight setter.

The main requirement in this operation is that at the instant of discharge the angle between the axis of the gun and line of sight should be correct for the range of the opponent. The controlling conditions are the continual alterations of the range; the extreme difficulty of determining it with anything approaching to accuracy; and the vital importance of ranging upon the opponent before he ranges upon you, and subsequently maintaining an accurate fire under all conditions of change of range.

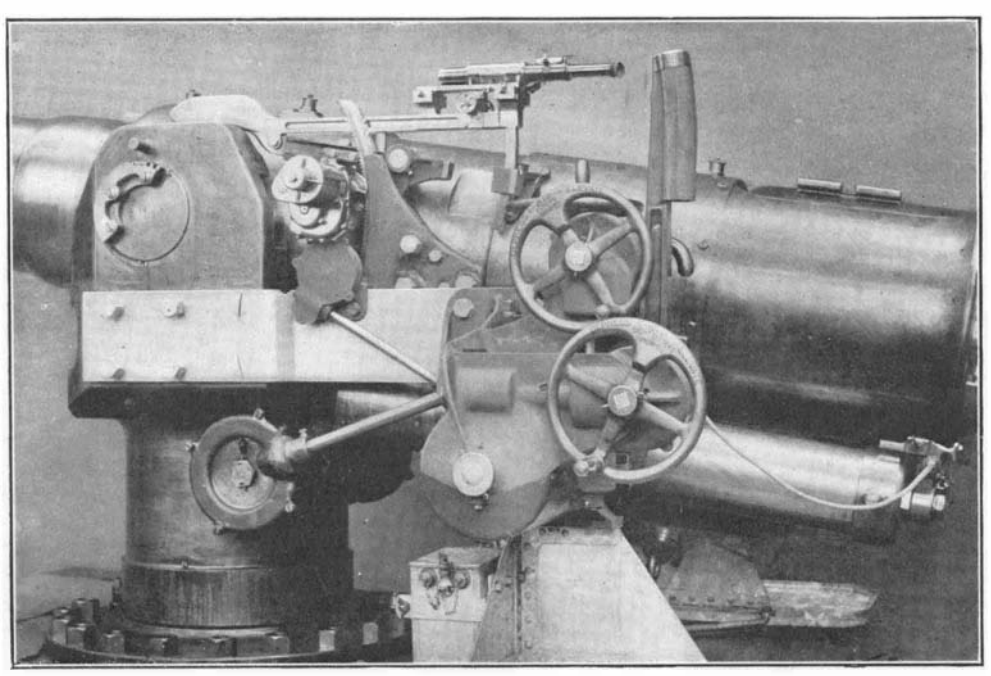
The continual alteration in the range of the opponent necessitates that the angle between the gun and sight should also be continually altering, in order to insure that at any instant the gun may be discharged with the adjustment correct. A combined aggregate closing speed between the two antagonists of 30 knots would not be excessive, and as this would give a decrease in range of 100 yards every six seconds it will be seen that this alteration may be very substantial.

The present method of adjusting the angle is to move the sight with relation to the gun and then to move the gun and sight together to align the latter. It will be observed that the gun captain has to perform the last named operation. The movement of the sight to or from the gun to effect the adjustment must, if the sight is aligned upon the target, necessarily throw the line of sight off the target, and if a telescope is employed it may possibly carry the target out of the field of the telescope altogether—in any case disturbing the aim of the gunner, who has to perform a subsidiary operation to that for counteracting the roll of the ship and movement of the target. Moreover, this disturbance of the line of sight, if effected at the moment of firing will cause either inaccurate shooting, or a delay necessary for a new alignment; and the accompanying uncertainty of the gun captain and consequent distraction of his attention are highly prejudicial to accurate shooting.

With the gear designed by Captain Hubert Grenfell of the British navy, by whose courteous permission we are enabled to publish the accompanying illustrations of the fitting on board the British cruiser



DETAILS OF THE OPERATING MECHANISM.



THE GRENFELL GUN-SIGHTING MECHANISM, SHOWING DIFFERENTIAL GEARS OPERATED BY THE GUN-SETTER.

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