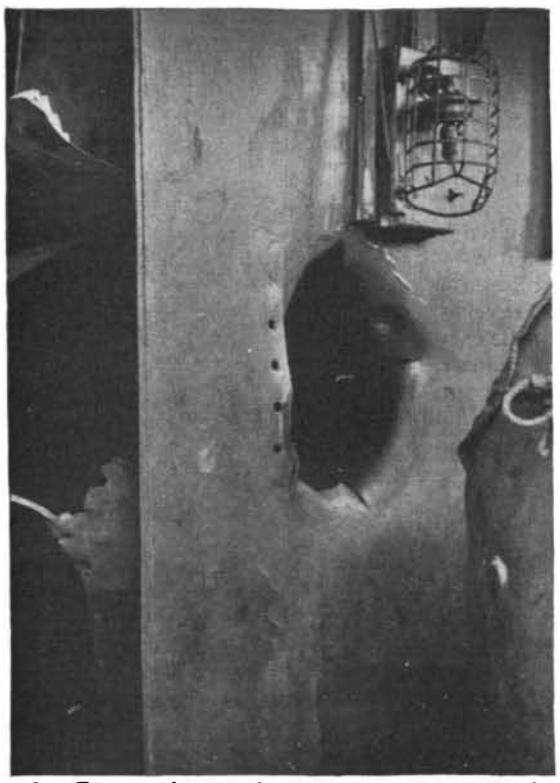
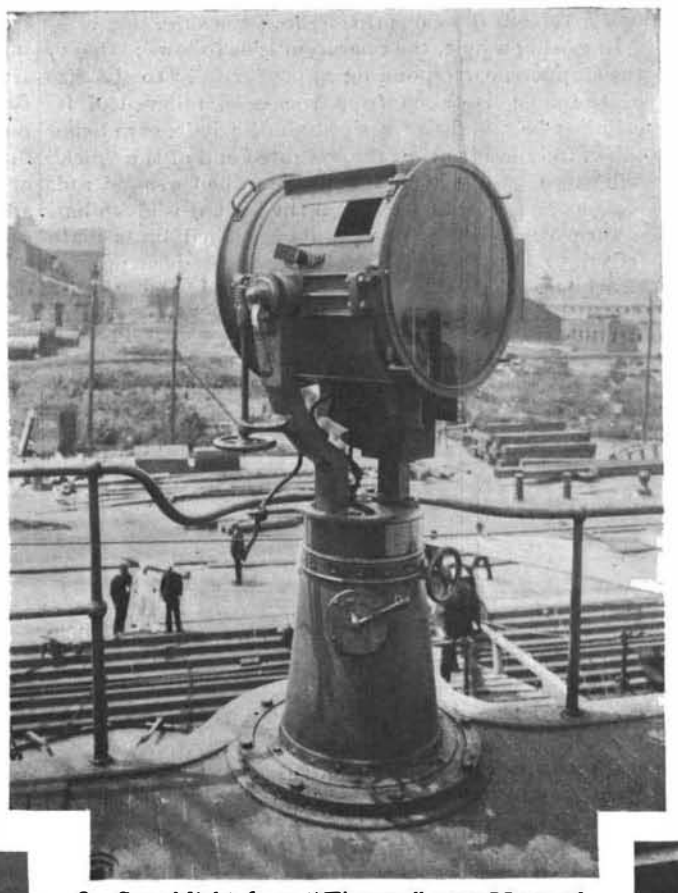
THE "TEXAS" IN ACTION.

The second-class battleship "Texas" as she rests in dry dock at the Brooklyn navy yard is a once maligned but now fully vindicated vessel.

There is, perhaps, no ship in our navy that has been more in the public eye since the day of her launch than the "Texas," and no ship, surely, ever experienced such a continuous run of bad luck as this unfortunate and greatly underrated ship. From the very hour of her conception she has been clouded by the disfavor which descends upon a vessel whose plans are of foreign origin (as were those of many of the earlier ships of the navy), and to this popular dislike has been added the distrust which is born of a frequent succession of accidents. Although she was authorized in 1886, the ship was not laid down until 1889. The work of construction, undertaken at the Norfolk navy yard, was very slow, the launch not taking place until 1892, and she was not commissioned until August 15, 1895, or nine years after the ship had been authorized by Congress. Her plans were drawn up by William John, an English naval architect of considerable reputation, and they were selected by the Navy Department from several designs which had been offered in competition. The delay in commencing construction was due to a lively discussion which ensued as to the merit of the accepted plans, and there is no doubt that the sub-

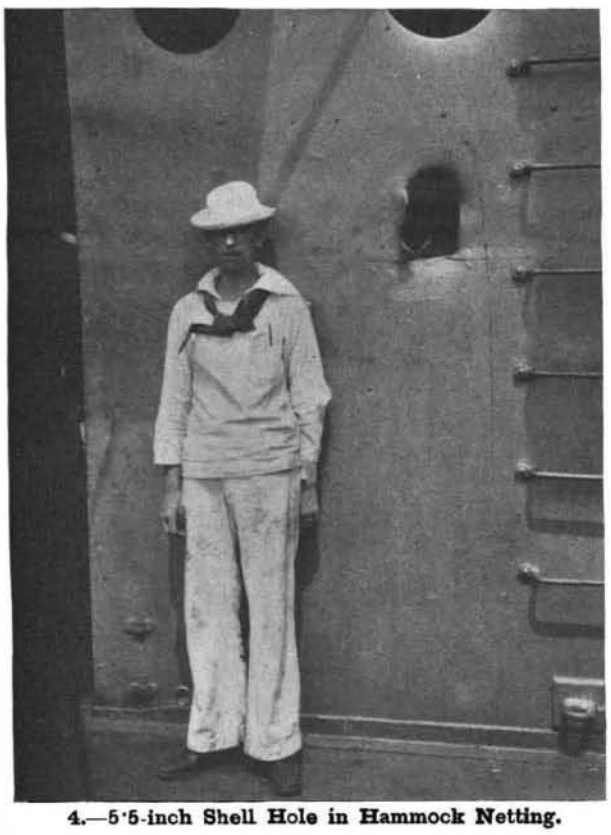


1.—Course of 5·5-inch Shell through Starboard Hammock Butting.



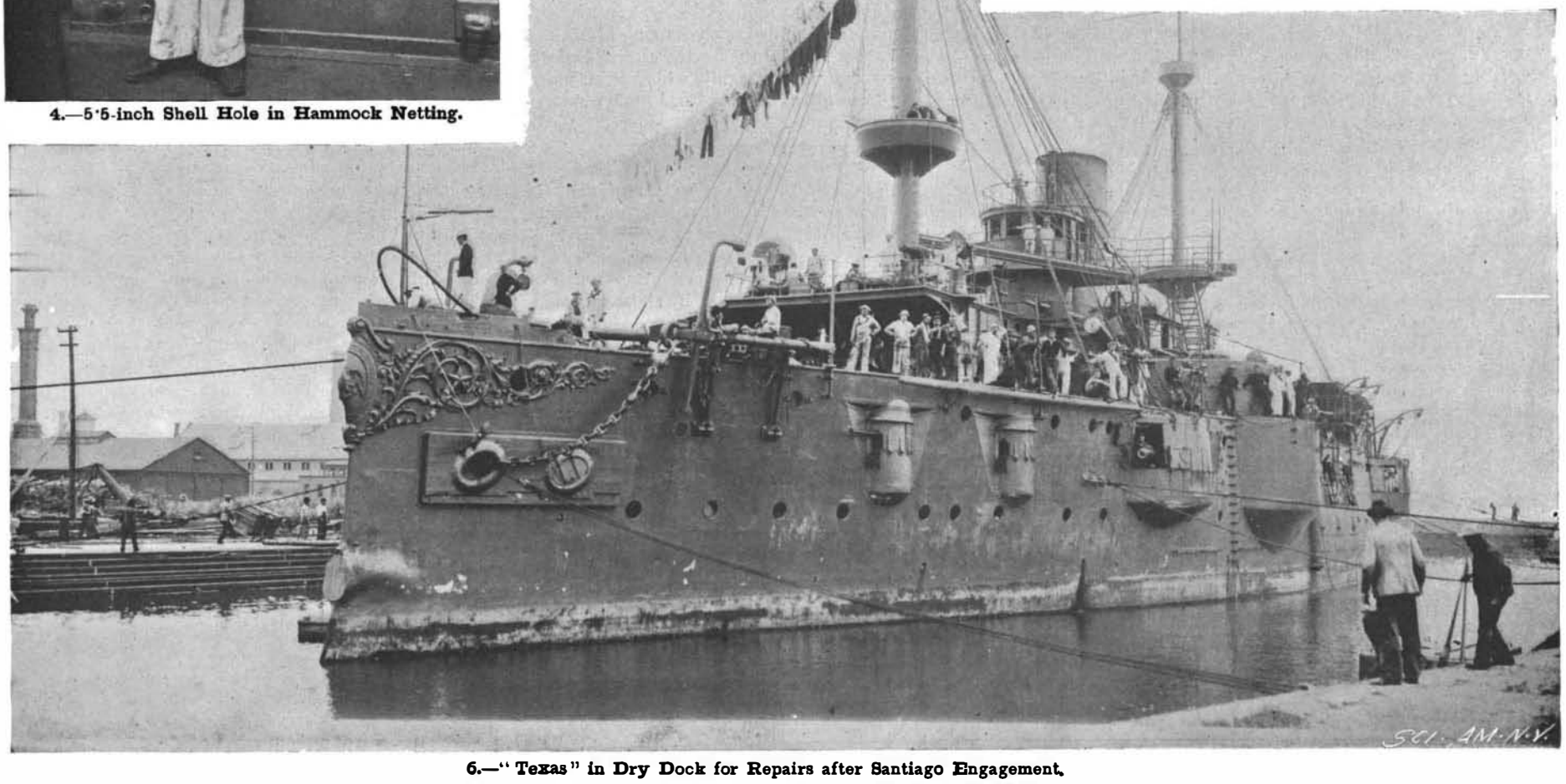
2.—Searchlight from "Vizcaya" now Mounted on "Texas."

3.—Hole Made by 6-inch Shell in Port Bow on Gun Deck.



4.—5·5-inch Shell Hole in Hammock Netting.

5.—Stanchions Bent by Blast of 12-inch Gun on Deck Above.



6.—"Texas" in Dry Dock for Repairs after Santiago Engagement.

THE "TEXAS" IN ACTION.

sequent popular distrust of the ship was largely due to these hostile criticisms on the part of both official and amateur experts.

The career of the "Texas" was marked by reverses more than ordinarily fall to the lot of the warship in times of peace. She had accidents alow and aloft, from within and from without, at sea and in dock, and climaxed her performance by incontinently foundering one night as she lay at her moorings at the Brooklyn navy yard. On the face of it these mishaps seemed to justify the bad name which was given the ship at the time of her construction. As a matter of fact, however, they were all traceable to carelessness or unpreventable causes outside of the ship itself, and, in the opinion of the various officers who had tested the good qualities of the "Texas," were no reflection upon either her construction or her seagoing qualities.

Vindication, however, came at last, and the various engagements of the Spanish war have proved that the "Texas" is as stout a ship as any in the United States navy, and that she has qualities in which she is the best vessel of her class that we possess. Among the latter we may mention her steadiness as a gun platform—an invaluable quality in a battleship, and one to which no doubt the excellent gunnery displayed by this vessel in the war was largely due.

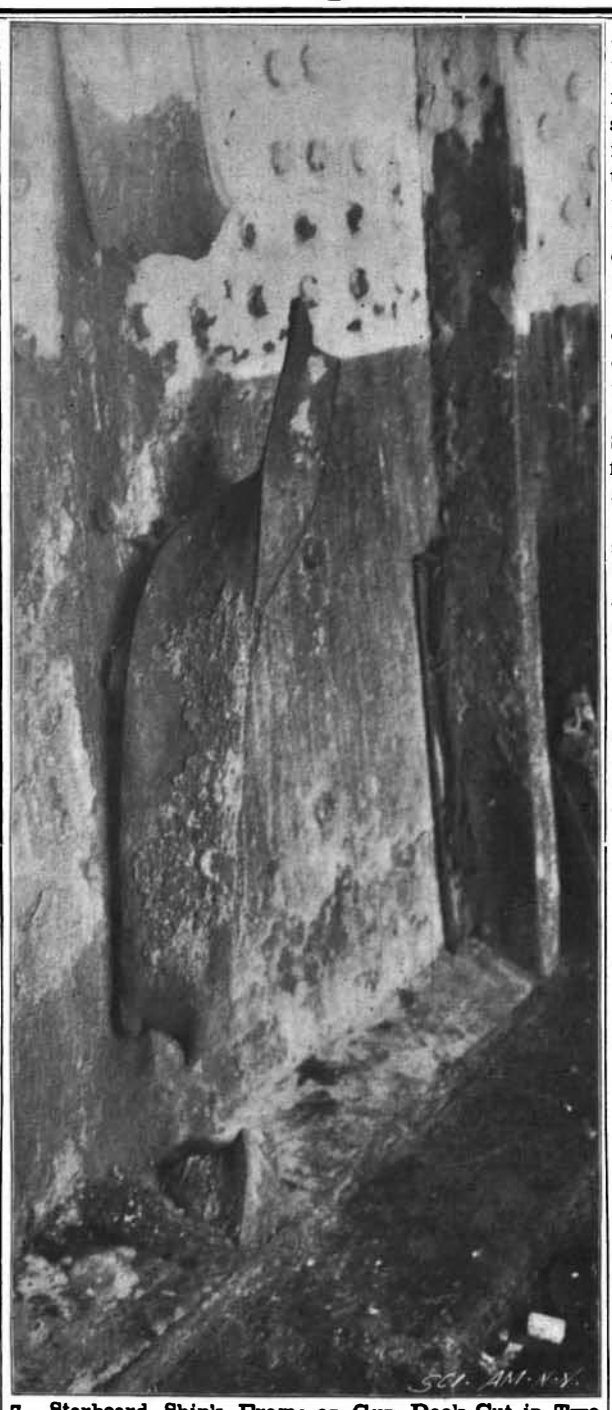
In the various regular and special publications of the SCIENTIFIC AMERICAN our readers have been made familiar with the offensive and defensive material with which a warship is armed and protected. In the present article we are enabled, by the courtesy of Capt. Philip, to present a series of views of the actual destruction wrought by Spanish shells on the hull of a modern warship. Cuts 1 and 7 illustrate the destructive effects of a 6-inch shell fired from La Socapa battery, and the rents shown in Cuts 1 and 4 were made by a 5·5-inch shell, which landed during the running fight at Santiago.

The 6-inch shell came aboard at the close of a duel which took place between the "Texas" and La Socapa battery, which is located at the western side of the entrance to Santiago Harbor. It was the last shot fired by the battery and the only one that reached the ship. The shell entered the port side at a point just below the lower end of the anchor stock (see Cut 6), where the plating is 1¼ inches thick, and tore a jagged circular hole, an inside view of which is shown in Cut 3. It passed diagonally through the compartment and struck a heavy steel stanchion, cutting a piece a foot in length entirely out of it. The shell burst at this point and two of the larger fragments struck the starboard side, bulging the stout plating to the depth of several inches. The fragments swept along the side of the ship and cut entirely through one of the heavy channel irons (massive as a railroad rail) which form the framing of the ship. This effect is shown in Fig. 7. In addition to these larger pieces, the shell burst into a shower of lesser fragments, which landed all over the starboard side of the compartment, cutting off rivet heads, scoring the deck and plating, and wounding the crew.

The fatalities and execution among the crew in this compartment, caused by a single shell, enable us to form a vivid idea of the havoc that would be wrought on unprotected gun positions by a well directed fire in which shells were searching the ship through and through. A man who was standing behind the stanchion, in the path of the shell, was literally blown to pieces, and the flying fragments wounded eight other men, one gunner being struck no fewer than fifteen times. The dense smoke produced by the explosion added to the confusion, and for some minutes the whole battery of four 6-pounder guns was practically out of action. The smoke poured down the ammunition hoists and rolled in dense volumes into the forward compartments of the ship, giving the impression that a fire must have been started.

If this much confusion and destruction can be wrought by a single 6-inch shell, weighing 100 pounds, what, one asks, would be the effect of a 13-inch projectile, weighing over half a ton? Moreover, this was a common shell, filled with brown powder. A shell filled with high explosive would be vastly more destructive, and one sickens at the thought of such diabolical missiles bursting in the thickly crowded between-decks of a modern ship. Nothing but the very highest courage, backed up by perfect discipline, would save a ship's company from panic under such scenes of horror as would ensue.

The damage shown in Figs. 1 and 4 represents only a part of the rending effect of a 5·5-inch shell which struck the "Texas" in the amidship hammock netting during the Santiago fight. The hammock netting forms part of the deck structure which surrounds the smokestack. The shell struck the ship on the starboard side, the first point of contact being at the point shown in Fig. 4. It passed through the steel plating and apparently turned partly over, passing through the next obstruction (the hammock butting, Fig. 1) apparently sidewise, or on end, if we may judge from the shape of the hole. It next struck a heavy steel door, tearing off the upper half of it, and burst in the adjoining ash-hoist. The fragments passed on through another (the fourth) wall of steel plating and tore their way into the smokestack. The larger fragments passed entirely through the stack, and the others, rebounding from the further side of the stack, fell in a shower down the uptake.



7.—Starboard Ship's Frame on Gun Deck Cut in Two Places by Fragments of 6-inch Shell.

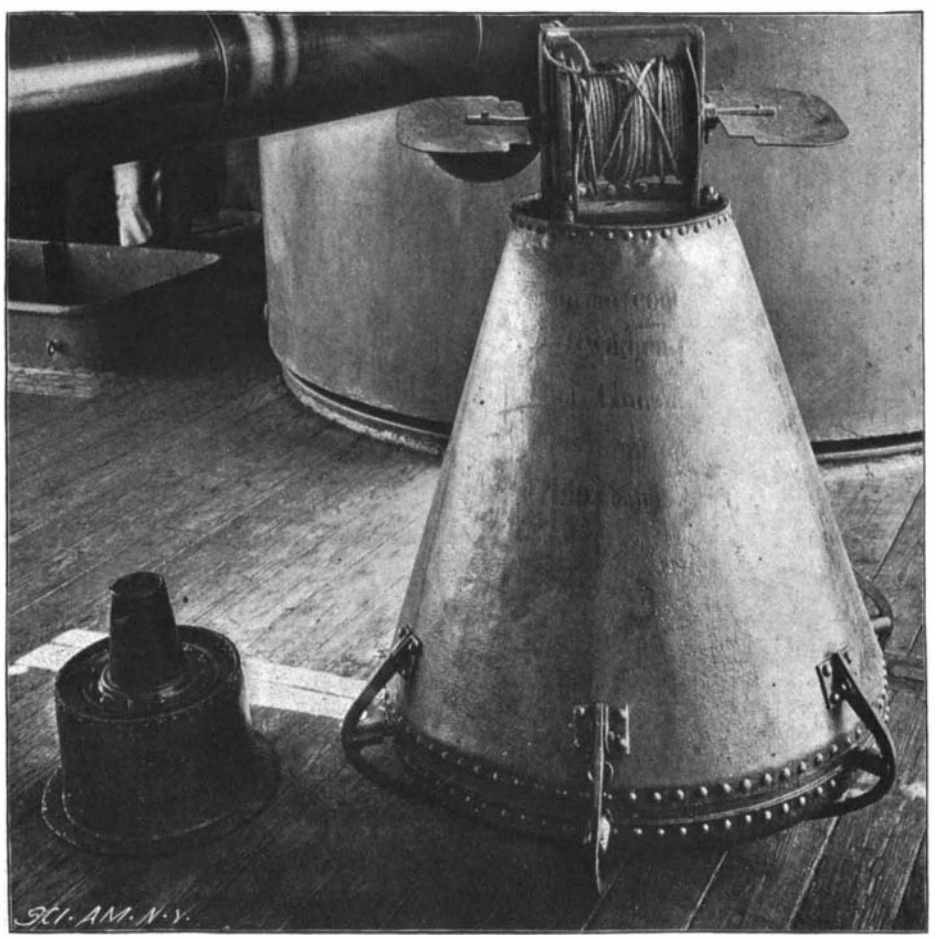
The shock and explosion drove the smoke and fire of the furnaces into the boiler room and caused an enormous cloud of smoke and ashes to ascend from the "Texas." As this occurred early in the action, when the "Texas" was hotly engaged with the leading Spanish ships, it caused much anxiety throughout the fleet lest she had been badly crippled. As it was, not a man was hurt by this shell.

Next to the Spanish shells, the chief damage to the ship came from the blast of her own 12-inch guns. There are two of these, one forward of amidships, sponsoned out on the port beam and the other somewhat aft of amidships on the starboard beam. There are no deck structures abreast of these guns that would interfere with their fire athwartships; so that it is possible to fire the port gun across the deck to starboard and the starboard gun similarly to port. During the action the port gun was swung over and fired at the Spanish fleet. The terrific blast of the gases forced down the main deck, twisting the deck beams, and forcing the heavy stanchions out of line, as shown in Fig. 5. At the same time the rush of gas, aided by grains of unburnt powder, splintered the wood deck and cut deep scores in the planking.

The gravest peril through which the "Texas" passed is commemorated by a 100-pound Spanish mine which now stands, bereft of its guncotton charge, on her quarter deck. The following inscription painted around the shell tells the story: "Spanish submarine mine, broken adrift by the 'Texas' June 15, 1898, when passing through a narrow channel to destroy forts at Guantanamo, Cuba. Providentially, it did not explode. Fourteen of these mines were afterward recovered from this channel. Each contained about 100 pounds of guncotton." That was a close call for the "Texas," and if a material cause for her escape is sought, it is found in the fact that barnacles had grown over the contact fingers, clearly seen in the illustration, and prevented the plungers from closing and striking the fulminate within the case.

The admirable work done by the "Texas" in the battle of Santiago has received ample credit, both official and otherwise. Her shooting, both from the 12 and 6-inch guns and from her 6-pounders, was very effective, and she contributed as much as any other ship to the early disablement of three of the Spanish cruisers and the two destroyers. There is reason to believe that the few large shells of 12 inch caliber that reached the Spanish vessels were fired by this ship. The rapidity of fire of the 12-inch guns is due to the improvements made in them by Lieutenant Haeseler. Originally they were capable of being fired only once in 7½ minutes—a woefully slow rate—but since the improvements they have been fired at an interval of 1 minute 29 seconds between rounds. In the old system the gun could only be loaded in two positions, and it had to be rotated back to these positions to receive the shells. Lieutenant Haeseler placed a circular track on the top of the turret redoubt and designed a little trolley for carrying the projectile around from the ammunition hoist to the breech of the gun, wherever the breech might happen to be. By the new arrangement it is not necessary to take the gun off the target for loading.

The 12-inch guns were in charge of Lieuts. Haeseler and Bristol, and to the latter gentleman we are indebted for some interesting facts regarding the battle. He informs us that the smoke of battle was so dense as to render it impossible at times for the contestants to locate each other. The light breeze that prevailed carried the Spanish smoke (only the "Colon" used smokeless powder) in huge volumes toward the American ships, and the smoke of our own ships was caught by the breeze and rolled back upon them. It is also interesting to learn that the sinking of the two destroyers was accomplished by the concentrated fire of four battleships and the converted yacht "Gloucester." As soon as the destroyers appeared, the ships instinctively turned loose upon them—some with all guns. As seen by Lieutenant Bristol, from his 12-inch gun station, the concentration of fire was as follows: "Indiana," 20 guns, including her 13-



8.—100-pound, Contact, Buoyant Mine, Cut Adrift by Propeller of U. S. S. "Texas" in Guantanamo Harbor.

THE "TEXAS" IN ACTION.

inch, at 4,000 yards; the "Iowa," 14 guns, at 2,500 yards; the "Texas," 13 guns, at 2,700 yards; and the "Oregon," 12 guns, at about the same range. The "Gloucester" was using five light rapid-fire guns. All of these, except the 13-inch guns of the "Indiana," were rapid-fire weapons, and the sea was being churned into a mass of foam about the doomed vessels. This being the case, it is certain that the value of the destroyer is not determined one way or the other by their destruction in the Santiago fight.

Chained Libraries.

In a paper on the "Libraries of the Middle Ages," recently read by Mr. T. G. Jackson before the Royal Institute of British Architects, the lecturer said that buildings specially to hold their libraries were first erected by the universities and colleges. The oldest structure of the kind in England, perhaps in Europe, is the old library of the University of Oxford, which still retains many features of its original form. This structure, rarely seen by visitors and even unknown to the majority of Oxford men, is a two-storied building situated on the north side of the choir of St. Mary's Church, adjoining the tower at one end, and separated from the body of the church by a narrow courtyard. Having glanced at the way books were kept, used, and lent at Oxford prior to the erection of this building, the lecturer gave a sketch of its foundation by Cobham, Bishop of Worcester, about 1320, and some incidents in its early history, following with a description of the interior, furniture, and general arrangements. Long desks were placed at regular intervals at right angles to the walls, on which the volumes lay on their sides. A bench was fixed in front for the reader, and a window came between each pair of desks to light that pew or cell. Every volume had a metal clip riveted to the front edge of the board forming one cover, to which was attached a light iron chain of the requisite length, having at the other end a ring. This ring ran upon an iron rod which was carried along the top of the desk, and was secured at the end by a hasp and a padlock to prevent the ring being drawn off. The foundation of Bishop Cobham's library was succeeded shortly afterward by that of the library of Durham College, Oxford, by Richard de Bury, Bishop of Durham (1335–45). The books bequeathed by De Bury to the college were kept for many years in chests, under the custody of scholars deputed for the purpose. At the beginning of the fifteenth century a library was built, and regularly furnished with bookcases or settles inciosing pews or studies between them where the books were chained. When Durham College came to an end at the Dissolution, its old buildings were utilized by its successor, the present Trinity, and the old library of Durham College still serves as the library of Trinity College. William of Wykeham's New College at Oxford set the fashion for all future collegiate buildings at either university in provision being made for every department, and thenceforward every college had its library as an essential part of its plan. Though books were few, the rooms devoted to them had to be very large, the chaining of the books to the desks making it possible to have only very few on each desk. Soon, as books increased, shelves were formed behind the desks, tier by tier, until at last, in the seventeenth or eighteenth century, they reached the ceiling. The appearance of the fittings before that time could be well seen in the old library of Merton College. Of chained libraries there were at least three extant in England, that belonging to Hereford Cathedral being the most ancient and perfect. Old chains, hasps, and staples belonging to Hereford — specimens of the actual fittings of a medieval chained library — were exhibited by Mr. Jackson, and the method of fixation explained. All Saints Church, Hereford, and Wimborne Minster also possess chained libraries. But the finest in the world is that of San Lorenzo, Florence, the great hall of which was designed by Michael Angelo in 1524, to contain the collection formed by several generations of the Medici. The lecturer then touched on the difficulties of consulting books in the old chained libraries. Shelves for the ever-increasing number of books had been provided, but desk accommodation remained as before. One student occupied on a volume prevented three or four others getting access to the books. This led to the library rooms being enlarged. Chains were bought for the Bodleian Library as late as 1751; it was not till 1757 that this method of securing the books was abolished.

Bog Iron Ore in Canada.

Bog iron ore is worked in the province of Quebec, and arrangements are being made to extract manganese from bog ore deposits in the province of New Brunswick. The ore is a soft, wet stuff, containing 50 per cent of water, and is covered by a thin coating of vegetable earth. The depth of ore varies from 5 feet to 30 feet. When dried the residuum is a fine black powder, too fine to be treated in the blast furnace, and this has therefore to be made into briquettes, as is done with the fine dust from blast furnaces and the finely divided iron produced from low grade ores by the Edison electrical process. The cementing material used is kept secret. An analysis of the dried ore at 212° F. is given as follows:

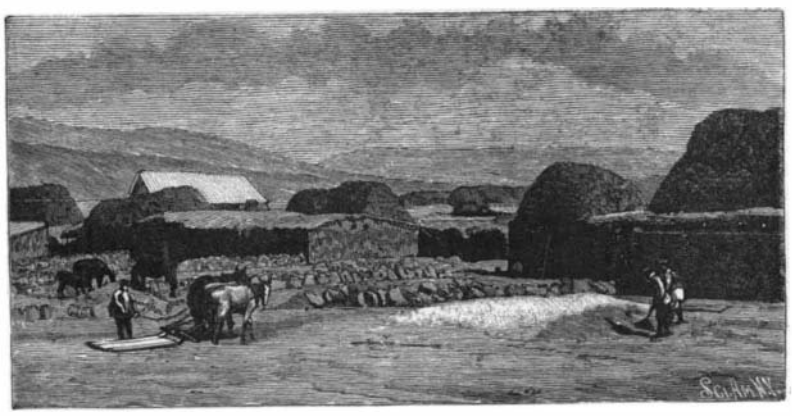
Metallic manganese	48·240 per cent.
Metallic iron	5·700 "
Sulphur	0·096 "
Phosphorus, trace.	
Silica	1·88 "

A Flemish "Smoker."

According to L'Illustration, the nineteenth century citizens of Bruges amuse themselves much after the fashion of the contemporaries of Van Maerlant and Van Artevelde, those great drinkers and smokers of the thirteenth and fourteenth centuries. In this quaint old Flemish city there exists the "Brugsche Rookersclub" or Smoking Club of Bruges, the members of which assemble to enjoy one another's society, to smoke their long clay pipes, and to drink their flagons of beer.

Every evening, it seems, the Rookersclub has a smoking contest, each member endeavoring to consume not the greatest quantity of tobacco in a given time, but to smoke the least quantity in the longest possible time. Before the contest begins, the vice-president and steward of the club seat themselves before a table on which are placed a balance, a tobacco box, and a number of long-stemmed pipes, not forgetting sundry indispensable tankards. The steward carefully weighs out two grammes and a half of tobacco, and methodically the vice-president stuffs each pipe with its allotted quantity. The pipes are then distributed among the contesting members. At a given signal, each contestant lights his pipe and begins to smoke, very slowly and very deliberately, endeavoring to keep alive the fire in his bowl as long as possible and to consume the smallest possible amount of tobacco. A member whose pipe goes out drops out from the contest, and only his more fortunate or more skillful rivals are allowed to continue. When pipe after pipe goes out, or the tobacco is consumed, the contest becomes more and more interesting; and when only two contestants are left, the most intense excitement is aroused.

So expert have the members of the Rookersclub become, that they have been known to keep alive the flame in three grammes of tobacco for a period of an hour and a half. W. B. K.



THRASHING AND WINNOWING GRAIN AT JELENOVKA, RUSSIAN ARMENIA.

PRIMITIVE METHODS OF RAISING WHEAT AND BAKING BREAD IN TRANSCAUCASIA AND ARMENIA.

BY E. O. HOVEY.

As soon as the average traveler passes from European Russia over the Caucasus Mountains into the provinces of Georgia and Armenia, which have been parts of the Russian empire for only a comparatively short time, he feels that he has entered a strange part of the world, the manners and customs are so different from those which prevail in western Europe and America. Nowhere is this more clearly brought out than in the methods pertaining to agriculture and bread making. The farmer still uses the implements which his ancestors used and he handles them in the same manner. In the spring the ground is scratched up by means of a clumsy wooden plow drawn by buffaloes or oxen, very rarely by horses, and the grain is scattered over it by hand. The writer was in Transcaucasia and Russian Armenia during the harvest season last year, and had the opportunity of making the photographs accompanying this article, which illustrate the methods of thrashing and drying grain. At the little hamlet of Parakai, near Erivan, the capital of Russian Armenia, we saw the wheat spread out two or three feet deep over a small area of specially prepared ground. Cattle, both oxen and buffaloes, were driven around and around on the grain until the kernels were all broken out of the heads. The biblical injunction is not obeyed here, for the photograph shows that the driver has "muzzled the ox which is treading out the grain."

A more common manner of thrashing is that shown in the picture from Jélénovka, on the shores of beautiful Lake Goktchai. Here there was a very large thrashing floor and an instrument like one of our stone sledges was dragged about over the grain by means of a team of horses. The bottom of the sledge was armed with numerous small pieces of rock, set so as to present a sharp edge for the cutting and mangling of the grain heads and straw as the sledge was driven about. The use of horses for this work, however, is not common, buffaloes and oxen being much more often employed. When the grain has been broken out of the heads, the straw is shaken up with two-tined wooden forks to permit the kernels to fall to the ground. Then the straw is removed, to be mixed with cow dung and dried to form the national fuel, and the winnowing process begins. A day with a gentle breeze is chosen, and the grain and chaff are thrown up into the air by means of long-handled wooden paddles. The wind blows away the chaff, while the wheat falls back to the ground. In Sémenovka, as is shown in our engraving, we saw the grain spread out on skins kept for the purpose, where it is stirred and turned until it is well dried. There seem to be no steam engines in Armenia and windmills are unknown, but the scanty water power is well utilized for the grinding of the grain, and there are numerous mills at Tiflis, Erivan, and elsewhere. Those at Tiflis are an interesting feature of the view from the principal bridge over the swift Koorà. They are worked by means of great undershot wheels, and the whole mill is moored out in the stream at the best place for getting the full effect of the current with safety.

A BREAD BAKERY IN RUSSIAN ARMENIA.

The baking of the bread furnishes another point of wide difference from the methods in use in America. The oven is usually (at least outside of the cities) a hole in the ground three or four feet deep and as many in diameter, narrowing toward the opening in the top. It is lined with pottery or even with nothing but hardened clay, and a wood or charcoal fire is built in the bottom to heat it. The dough is mixed in a trough, formed then into balls with the hands and afterward rolled out on a circular or oval stone or board, until it becomes a sheet about three feet long, fifteen inches wide, and one-eighth of an inch thick. This sheet is carefully spread out over a form like a pillow of the proper shape. The pillow is dexterously seized underneath by the baker, who then bends down into the oven and spats the dough against the wall,