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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

SANITATION AND SUBSISTENCE AT PANAMA.

President Roosevelt has likened the stragglers that have drifted home from Panama, with their mouths full of censure and complaint, to the few faint-hearted and garrulous soldiers that fall back to the rear when the battle is on in good earnest. Nobody supposes that the Isthmus of Panama is just now either a health or a pleasure resort; but that affairs down there are as bad as they are represented to be by a few disappointed adventurers, no one whose judgment is entitled to respect believes for one moment. At the same time, it does begin to look as though we had entered upon active construction without making that special preparation for the reception, housing, subsistence of the working force, which the very trying conditions at the Isthmus render necessary.

In a recent article we dwelt upon the necessity of regarding the construction of the canal, at least as far as its engineering features are concerned, as a one-man job; but the success of the engineer will be dependent, other things being equal, upon effective organization for insuring the complete sanitation of the Isthmus and the comfortable subsistence of the large body of men employed. It is gratifying to note that the War Department has intrusted to the Medical Department of the army the care of the health of the employes in the canal zone. It is too early yet to judge of the efficiency with which this department is carrying on its work; but we have an earnest of what will be done at Panama, in the great success that has attended our efforts to stamp out yellow fever in the West Indies. When a modern system of drainage and water supply has been built at Panama and Colon; when the swamps have been drained, and the mosquito pest brought under control, white labor, if it is careful to observe the rules of hygiene laid down by the Medical Department, will be able to live and work at Panama, with a rate of disease and mortality that will compare favorably with any other place in the tropics.

Second only in importance to sanitation is that of subsistence, and in this connection we notice that our esteemed contemporary, the Army and Navy Journal, makes the very sensible suggestion that the next logical step to turning over to the Medical Department of the army the matter of sanitation, would be to hand over to the Subsistence Department the equally important work of feeding and housing the large body of workingmen engaged at Panama. Our experience in the Philippines, where this department has been very successful in taking care of large bodies of men who hitherto have never lived in any but a temperate zone, will be invaluable in caring for the veritable army of employes that will be gathered at Panama by the time the work is in full swing. By all means, let the army have charge of this work. It would be courting disaster to farm out the privilege of housing and feeding the employes to professional boarding-house keepers, most of whom in all probability will have had no experience of tropical life, and will be ignorant as to the proper kind of food for the severe conditions of the climate. The Subsistence Department has succeeded in the Philippines in providing a ration which combines sufficient variety and nutriment to meet all the demands of the men and minimize grounds for complaint, and, according to our contemporary, the army ration used there is equal, and probably superior, to that of any other army in the world. Another consideration that indicates the necessity for army control of food and quarters is, that under such control the health of the employes and not the mere profit of the caterer will be the first consideration. With sanitation and subsistence in the hands of the army, and the work of construction under the absolute control of a chief engineer, the people of the United States may rest perfectly satisfied that the Panama Canal will be built expeditiously, economically, and at a very small cost of life.

THE FIRST AND LAST OF ITS TYPE.

Several years ago, when the 16-inch army gun, the most powerful weapon in the world, was in the initial stage of its construction, the SCIENTIFIC AMERICAN predicted that as it was the first, so it would be the last, of its type to be built. The prediction was made at the time when the then new smokeless powders were beginning to demonstrate their remarkable ballistic powers. At that time our guns were using brown powder, and they were built in lengths of not over 30 or 35 calibers; muzzle velocities were low, not exceeding 2,000 or 2,100 feet per second; and a gun of large caliber using a projectile of great weight was necessary, in order to insure penetration of the heaviest armor at what was then considered to be the extreme ranges at which the guns of a fortification would open on the enemy. At the time that its dimensions were decided upon, the 16-inch gun was by far the most powerful weapon in existence, a distinction, indeed, which it carries at the present day. With the development of smokeless powders, and the corresponding increase in the length of the guns to enable the powder to exercise its full effect, the velocities rose at a truly astonishing rate; and as the energy of the projectile increases as the square of the velocity and only directly as the weight, it can be seen that the advantages of weight in gun and projectile became relatively less pronounced. Guns with a muzzle velocity of 2400, 2600, and 2800 feet per second were built in rapid succession by foreign gunmakers. Ultimately, guns of moderate caliber but of great length were produced, whose penetrating power was equal to, and even greater than, that of the huge and unwieldy guns of 16 and 17-inch caliber which had been constructed by the British and the Italian governments. When the 16-inch gun was fired under test at Sandy Hook, some two or three years ago, it developed a muzzle velocity of 2300 feet per second, and a muzzle energy of about 88,000 foot-tons. This rendered it, at once, the most powerful gun in existence, the Armstrong 16¼-inch gun having an energy of only about 54,000 foot-tons. The great object aimed at in armor-piercing guns is penetration. If a 12-inch gun can be built which will give sufficient velocity to its 850-pound projectile to carry it through the heaviest ship's armor at from 3,000 to 5,000 feet range and explode the shell within the ship, it is sufficient. The present 40-caliber 12-inch gun of the navy has a muzzle velocity of 2800 foot-seconds and a muzzle energy of over 46,000 foot-tons. Vickers-Maxim build a 12-inch 45-caliber gun, with a muzzle velocity of 3,000 foot-seconds and a muzzle energy of 53,000 foot-tons. Its projectile is capable of penetrating 52 inches of wrought-iron plate at the muzzle, or 40 inches of mild steel, while at 3,000 yards range it will pass through 19.6 inches of hard steel. With a 12-inch gun weighing only 57 tons, capable of doing such work as this, a 130-ton, 16-inch gun becomes superfluously heavy and cumbersome, to say nothing of its weight, cost, and slowness of fire. The 16-inch gun will be mounted at Sandy Hook, and form part of the defenses there. Historically, it will ever be of interest as marking a turning point in the development of modern high-power ordnance.

THE TURBINE STEAMERS ON THE CANADIAN ROUTE.

Naval designers and the manufacturers of marine engines are following with close observation the performance of the two turbine-driven steamships of the Allan Line, both of which are now running regularly in the service of the company. This is the first application of the new motive power to large ocean liners, and it is realized that upon the results obtained with these ships will depend, very largely, the future of turbine propulsion, at least for this type of service. The first voyage of the "Victorian" gave only rather indifferent results, although it was understood that the low speed was due largely to unfavorable weather and fog. In her later trips, however, this ship has shown excellent results, better than any achieved by earlier ships of this line using reciprocating engines.

The second vessel, the "Virginian," has done even better than the "Victorian," and is steadily reducing the record across the ocean, over the route which she follows. On a recent trip to Montreal, she left Moville at 2:45 P. M. on June 9, and arrived at Rimouski at 4:15 P. M. (local time) June 15, the total time of the passage being only six days, six hours, and thirty minutes. Allowing for a detention by fog of three hours and thirty minutes off Cape Race, the net time of the passage figures out as six days and three hours, and the average speed as 17.05 knots an hour. The advantage of this faster service is shown by the fact that the Montreal mail, which left Ireland twenty-six hours ahead of the "Virginian," on board the "Baltic" for New York, was distributed in Montreal nine hours later than the mail carried by the "Virginian." On both new steamers the passengers and the officers of the ship have testified to the remarkable smoothness of the turbine, the absence of vibration reminding the latter of the smooth motion of a sailing ship.

THE FUTURE OF THE GAS-PRODUCER ENGINE.

In explanation of the fact that gas-producer power plants have received less attention in America than abroad, Mr. S. S. Wyatt, in a paper read before the American Institution of Mining Engineers, offered the following causes: Lack of general knowledge of the subject, and a certain measure of prejudice; the novelty of the work; the inadaptability of the gas engine to certain classes of work; the comparative cheapness of fuel, rendering economy a less urgent question; and lastly, the fact that the smoke nuisance has not made itself so felt as to call for serious attention. The author, however, believes that we are within measurable distance of the time when the gas-producer locomotive, portable engine, and marine engine will be in general use. In the issue of the SCIENTIFIC AMERICAN SUPPLEMENT of February 4, 1905, we gave illustrations of the application of the gas producer to the locomotive and to the marine engine. The arguments adduced in that article are indorsed in the paper above referred to. The advantages of the gas-producer locomotive would be that both trains and stations might be kept cleaner; that the locomotives, being cinderless, the danger of fire due to sparks would be eliminated, and insurance rates would be proportionately reduced. Mr. Wyatt estimates that the amount of fuel used for a given amount of work would be less than 50 per cent of that now required on steam locomotives, and that the amount of water used would be less than one-eighth. This would have the incidental advantage of saving the time now required in loading up with fuel and water, besides effecting a reduction in the number of fuel and water stations that would be required. The danger of boiler explosions would also be eliminated. In the portable engine similar advantages would accrue, particularly as regards the reduction of fire losses and the decrease in insurance rates. In the marine engine the gas-producer plant would confer equal, if not greater, advantages, particularly as to cleanliness, for the absence of smoke and cinders would make it possible to keep the ships cleaner, and the comfort of passengers would be proportionately increased. Greater economy in fuel and water would mean a saving of time in replenishing bunkers and water tanks, and, what is even more important, there would be a considerable reduction of the bunker space with a proportionate increase in the cargo space, or of the accommodation for passengers, as the case might be. Moreover, the author of the paper argues that as no condensing machinery would be required, there would be a reduction in the engine-room floor space.

To the above considerations we may add that for naval service, a successful marine gas-engine plant would offer many advantages. In the first place, from the point of view of strategy and tactics, the elimination of smokestacks and the telltale smoke would be a most valuable feature. Moreover, the lessened air resistance of ships (and this applies with particular force to fast passenger steamers) due to the absence of smokestacks would add not a little to the speed. The fuel economy of a well-designed gas-producer plant would enable a warship to steam further on a given supply of coal than she could do with steam boilers. The most important element in the problem is that of getting rid of the by-products, and delivering a gas to the engines that is of the requisite purity and cleanliness. If the highest grade of fuels were at all times available, the problem of providing a gas-producer engine for transportation purposes, that is for locomotives, portable engines, and marine engines, might be considered as pretty well solved. Unfortunately, the bulk of the fuel that would have to be used is of an inferior quality, unsuitable for gas-producer engine work. When someone shall have designed a plant that can furnish satisfactory gas to its engines, no matter what quality of coal is offered for its consumption, the gas-producer engine will become the great prime mover of the world.

A contrast between the price of coal gas for lighting and power purposes as compared with this country and Great Britain, and incidentally the benefit bestowed upon the community at large by municipal control of this necessity, is afforded by the recently published 1903-4 annual report of the Corporation of Widnes. The price of gas in this district is 33 cents and 29 cents per 1,000 cubic feet respectively. The latter price is charged for gas acquired for motive purposes. Although low prices prevail, the quality of the illuminant is not reduced, as the standard is controlled by the government. Yet notwithstanding the above low prices, a profit for the year of $3,000 resulted. The total cost of manufacturing the gas was 22.2 cents per 1,000 cubic feet, so that if necessary the price to the consumer can still be further reduced to an appreciable degree. In London the gas can be obtained over a great area for the price of 50 cents per 1,000 cubic feet, although the supply is carried out by a private company. The reason of this low tariff is that the dividends payable to the shareholders are limited by the government, and the operations of the company are rigorously controlled by the authorities.