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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.

THE REBUILDING OF THE QUEBEC BRIDGE.

In view of the widespread regret which was expressed at the fall of the Quebec bridge, the decision of the Canadian government to undertake the rebuilding of this monumental structure will cause general satisfaction. Following the report of the Royal Commission of Engineers, another body known as the Parliamentary Committee, which was appointed to look into the financial and political aspects of the situation, reported in favor of reconstruction. At its last session, it was decided by the Canadian government to assume all the assets and liabilities of the Quebec Bridge and Railroad Company, and proceed with the work of rebuilding.

It is safe to say that, outside of the foundations and masonry piers, no part of the old structure will enter into the new bridge. The cantilever which fell is to-day a mass of broken and badly-twisted steel. The other half of the bridge was so far advanced at the time of the disaster, that the whole of the material had been manufactured at the shops, and the greater part of it stored at or near the site. It is not likely that any of this material, amounting probably to about 20,000 tons, can be used. It is rumored that the work of designing and rebuilding will be placed in the hands of three leading bridge engineers, representing Canada, the United States, and Great Britain. Whether this be so or not, it will be a matter of great interest to observe how far, both in the outline and details of the new design, the lessons of the great disaster have been incorporated.

IMPROVED RAILS BY THE DRY-BLAST SYSTEM.

During the investigation of the methods of steel-rail manufacture which followed the frequent breakages of poor rails throughout the country, it was pointed out that one of the causes of imperfect ingots and rails was the moisture in the furnace air-blast. In the course of the discussion it was suggested that ingots of a better quality, free from pitmarks and blowholes, could be secured if dry air were used at the furnaces. Not long ago, the Illinois Steel Company, which has adopted the dry-blast system, turned out an order for 100-pound rails for the Lake Shore and Michigan Southern Railroad. The advantages of maintaining a constant and small degree of moisture in the blast were shown in the ingots, which, after being sawn in two longitudinally, were found to be comparatively free from pitmarks and showed marked solidity throughout. Surface blowholes were visible only at the top of the ingot, and what blowholes existed in the body of the ingot were free from surface oxidation. The improved ingots secure two great advantages in the process of rolling: a more uniform grade of steel being obtained in the finished rail, and the amount of cropping required being considerably less, under the same specifications, than that which is necessary when the ordinary air-blast is used.

PROGRESS IN THE GAS-DRIVEN SHIP PROBLEM.

Recent advices from Great Britain speak in optimistic terms of the results which have been obtained on the Clyde by the Beardmore Company, a powerful corporation which is investigating with great thoroughness the problem of driving ships by the producer-gas engine. As part of its experimental work it has installed a modified 500-horse-power Capitaine producer-gas engine and auxiliary plant in the obsolete warship "Rattler," a vessel of 715 tons displacement. The engine is of the vertical type, with five cylinders working on the Otto cycle. It is noteworthy that the gas-producing plant is arranged to work with bituminous coal. The gas is cooled and cleaned by passing it through a scrubber, and is drawn off by the engine in proportion to the work that is being done. The exhaust gases are utilized in a boiler for raising the steam necessary in the operation of the producer. Power is transmitted to the propeller shaft through a special type of hydraulic clutch, the speed of the engine, when it is disconnected, being controlled by a suitable governor. For reversing, the power is transmitted to the propeller shaft through a train of wheels operating in combination with the clutch. The economy of weight in this installation is shown by the fact that whereas the original steam machinery weighed 150 tons, the complete gas-producer plant with its auxiliaries weighs in the total only 94 tons. During a series of trials the vessel covered 31 miles at a speed which, after tide corrections had been made, worked out at 12.8 knots per hour. The coal consumption, as compared with that of a steam engine of the same power, showed an economy of fifty per cent. We understand that the next experimental engines will be of 1,000 horse-power.

MORE POWERFUL EXPRESS LOCOMOTIVES.

The continued increase in the weight of express passenger trains, and the consequent demand for locomotives of greater hauling power, have been met by locomotive builders in the production of express locomotives of a weight and power considerably greater than are to be found in the railroad systems of Europe. The limit of hauling power is determined by the load which can be carried upon the driving wheels, and this, in the case of the heaviest express locomotives, had been increased to the high figure of about 90 tons. The maximum number of driving wheels among which such a load can be distributed under the present type of locomotives is six. Any larger number of drivers would involve too rigid a wheel base. Designers are, therefore, confronted in passenger service with the same difficult conditions which, in freight service, led to the introduction of the Mallet system, in which the total load on the drivers can be greatly increased without increasing the maximum loading on any single pair of wheels. Designs have lately been drawn for an express passenger engine to be built on the Mallet system, in which the total weight on the driving wheels will be nearly 120 tons, distributed among eight 73-inch driving wheels. Four of these are placed beneath the firebox of the locomotive, and are driven by two high-pressure cylinders; the other four are carried in a forward truck, and driven by a pair of low-pressure cylinders. It will thus be seen that the introduction of this type for fast passenger service has increased the adhesive weight over thirty per cent. If the new type satisfies the various other requirements of an express locomotive, this departure will mark one of the most important advances yet made in the express service of this country. The greater hauling power may be used either in the acceleration of existing trains, or in the increase of the number of cars hauled. Many trains which are now run in two sections may be made up as a single train, a change which will afford much-needed relief on heavily congested lines.

FUTURE SPEED OF CRUISERS.

The transatlantic speed of the "Indomitable" on her return trip from Quebec, which is stated officially to have been 24.8 knots from land to land, and 25.13 knots for three consecutive days of ocean steaming, has set a mark which is certain to have a powerful influence upon the design of future warships. Had this speed been shown by a cruiser scout crammed with coal, boilers, and machinery, and armed with only a few light rapid-fire guns, the speed, though notable in itself, would have exercised no controlling influence on fighting-ship design; but when we bear in mind that the ship which made this 25-knot run carried from 7 to 10 inches of Krupp armor and mounted eight of the most powerful 12-inch guns afloat, the speed takes on tremendous significance. The presence of the "Indomitable" on the high seas has upset all existing calculations as to the value of the armored cruiser, just as the appearance of the armored cruiser in its day relegated the protected cruiser to a subordinate position, and ultimately to the scrap heap. For it is certain that a single "Indomitable," able to carry its 12-inch guns for such great distances at such high speed, could catch and destroy the most powerful existing armored cruisers of the day. For the future, 25 knots must be the mark of all the warships which, by virtue of their carrying medium armor, will belong to the armored-cruiser class. One effect of this will be to increase enormously the cost of the cruiser and, to no little degree, her size. In fact, the "Indomitable" has raised the cost of cruiser construction, as the "Dreadnought" did that of the battleships.

THE MAKING OF AEROPLANE HISTORY.

Hardly had Delagrange made record flights of 29 minutes and 54 4/5 seconds on September 5 and 31 minutes on September 7, when Orville Wright outdid him. In four of the most daring aeroplane flights of our time, Mr. Wright gave not only a wonderful exhibition of personal skill in handling a sensitive aerial craft, but also considerable assurance that the day of the military scouting aeroplane is not far off. On September 9 he flew for 57½ minutes in the morning and 1 hour and 2¼ minutes in the afternoon, concluding his day of records by making a flight lasting 6 minutes and 26 seconds with Lieut. Lahm on board. On September 10 he made a flight lasting 65 minutes and 52 seconds in a 12-mile wind; and on September 11 he remained in the air 1 hour, 10 minutes and 32 seconds at a height of 200 feet, alighting only because of increasing darkness. During all these flights the machine responded admirably to the touch of Mr. Wright.

In the face of these remarkable achievements, Mr. Wilbur Wright's flights in France, startling though they would have been only a few months ago, seem completely eclipsed. Yet on September 5 he flew for 19¾ minutes at an average speed of 37 miles in a four-mile wind, which is his best performance in France.

That either of the Wright brothers can fulfill the government's requirements seems indisputable in the face of these historic flights.

DOUBTFUL CASES OF RADIOACTIVITY.

Recently Cosmos published an article on "the radioactivity of leaves of conifers," in which allusion was made to the experiments of Dr. Russel, who obtained in total darkness impressions on photographic plates placed near or in contact with various parts of conifers. Dr. Russel has since obtained similar impressions from leaves, flowers, seeds, stems, and tubers of many plants. No effect, however, is produced by starch, cellulose, gum, sugar, pith, or pollen. The exposure varies from a few minutes to more than 18 hours. The action is accelerated by heat but the temperature should not exceed 130 deg. F. As moisture injures the gelatine film, the leaves, etc., should be partially dried by laying them between sheets of blotting paper and subjecting them to a pressure of from 5 to 25 ounces per square inch. This method has the advantage of furnishing two images, one taken from the dried leaf and the other from the blotting paper impregnated with the expressed sap, which also possesses power to affect the photographic plate.

Most leaves give well-marked images, the strongest being produced by leaves full of sap. Complete desiccation greatly diminishes or entirely destroys the effect. The action is distributed irregularly over the surface of the leaf. Faint impressions have been obtained from leaves that had been pressed between blotting paper for three years. In such cases the effect is increased by moistening the dried leaf. An incision made in a dried leaf shows very conspicuously in the image, as if a peculiarly active emanation had flowed from the cut edges.

Petals of various flowers also produce strong impressions. They should be partially dried between blotting paper, which gives a second image, as in the case of leaves. The color of the petal has no influence on the result. White and red rose leaves, yellow, blue and purple petals of pansies, appear to possess equal powers of impressing the plate. Petals appear to be more active than leaves of the same plant.

The pistils and stamens of several plants produce strong impressions but the extracted pollen exerts no appreciable action.

The cotyledons of beans are inactive, both before and after germination. The plumule and radicle, on the contrary, become active when they have grown about an inch. The outer coat of the skin is inactive but the inner coat strongly affects the photographic plate. The expressed juice of young bean plants about 7 inches high is very active. Grains of wheat become active after remaining two days in moist sand. It appears probable that the sap of young plants of all grains, even when they have sprouted and grown in complete darkness, possesses great activity. Similar results have been obtained with acorns, almonds, peas, and various nuts. The oil of nuts, however, becomes very active on oxidation. Paper saturated with the oil by pressure and exposed to the air soon acquires a marked power to impress photographic plates. Oil extracted from nuts with ether is also very active. Castor oil, on the contrary, remains inactive after months of exposure to the air.

In bulbs, the fleshy parts are active but the nucleus is inactive until it has begun to grow. The expressed juice of potatoes is very active, that of Jerusalem artichokes slightly active. The activity of bulbs and tubers is destroyed by drying.

The activity of rhizomes, or root-stocks, varies greatly with the species, and probably also with the season. It is slight in the iris and well marked in ferns. Roots possess considerable activity.

The woody envelope of some fruits appears to con-