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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.

BRIDGING THE HUDSON RIVER.

Since the failure of the Pennsylvania Railroad and other companies, that have their terminals in Jersey City, to build the great Hudson River bridge, of which so much was heard and written in the early nineties, the subject of bridging this river has dropped entirely out of sight. During the past year, however, the question of building a highway bridge across the Hudson has been the subject of consideration by a joint commission of the States of New York and New Jersey. This committee has recently completed its investigations, and will shortly present its report.

The original proposition for bridging the Hudson contemplated the construction of a colossal railroad bridge with a capacity for fourteen railroad tracks on two decks; and had this structure been built as originally planned, and at the original date proposed, it would have solved at a single stroke the problem of direct railroad communication between Manhattan Island and the West, and it would have done so for about one-fourth of what it will now cost to construct the same number of tracks in separate tunnels beneath the Hudson River.

It has never been generally understood how near this great enterprise came to being actually put through. Had it not been for the parsimony shown by the lesser railroads when it came to the final question of distribution of cost, the bridge would have been built. It was the endeavor of these roads to force the Pennsylvania Company to carry the burden of construction practically alone, that led the president to abandon at the last minute the scheme for the construction of a bridge and order the construction of tunnels exclusively for the use of the company. At that time real estate did not command the high prices which it does to-day; there was not so great a demand for structural steel; nor was labor so scarce or so highly paid. The combined railroads would have secured fourteen tracks into New York city for a cost, including terminals, which was estimated at $60,000,000, and certainly would not have exceeded $100,000,000. Two years from today, the Pennsylvania Railroad, after spending $100,000,000, will find itself limited to two tracks for communication with Manhattan and Long Island; and the other railroads will have no connecting tracks whatever.

Because of the great increase in the value of real estate, and in view of the very proper prejudice of the citizens of New York against the construction of viaducts and elevated railways within the city, it would be impossible either to secure the necessary permission for such a bridge, or interest the enormous capital that would be required for its construction. The city has wisely made up its mind to place all future railways and terminal stations as far as possible below ground, at least in the lower and business sections of Manhattan. On the other hand, if the site for a railroad bridge were found at the upper end of the island, where real estate would be cheaper and the objections to a great terminal station would not be so many, the station would be too far removed from the business centers to serve as a satisfactory city terminal.

The objections against a bridge over the Hudson designed for railway purposes disappear when the structure is designed simply as a connecting link between the highway systems of New York and New Jersey. The objections on the score of the excessive cost of the structure itself; of the enormous outlay for downtown real estate; and of the disfigurement of the city by the construction of elevated railways and terminal buildings, are no longer formidable. If the bridge were built primarily as a link between the public roads systems of the two States, there would be no necessity to locate it in the downtown district; and its Manhattan approach could very conveniently be made at street grade from the high level of the Washington Heights district. Here the bridge could be made to serve as a part of the fine system of boulevards and driveways which extends from Riverside Park into the Bronx and Westchester County; while on the New Jersey side connection would be easily made with that splendid system of roads for which New Jersey is justly famous.

The chairman of the joint commission of New York and New Jersey announced that they will not attempt definitely to fix any particular site for a bridge; but will merely suggest that it be built somewhere between 14th and 72d Streets. We are of the opinion that if the site of the first bridge is selected in the vicinity of 72d Street, its convenience and popularity would be such that there would be an early demand for a second bridge to accommodate the general vehicular traffic in the lower business section of the city.

SAFEGUARDS FOR THE PANAMA CANAL LOCKS.

The engineers of the Isthmian Canal Commission have recognized that the absolute safeguarding of the locks of the Panama Canal against destruction by steamship collision is one of the most vital problems in the whole of the canal enterprise. When the Commission announced its decision in favor of constructing a lock canal, in which the summit level was to consist of an inland sea held at an elevation of 85 feet and entered by three stupendous locks in flight, a storm of criticism was aroused against the plans on the ground that an accident might result in the carrying away of the locks, the emptying of the large high-level lake, and the wrecking of the whole enterprise. The most weighty criticism came from Mr. Hunter, the Chief Engineer of the Manchester Ship Canal, and a member of the consulting board, who drew attention to the fact that there had been several accidents on his own canal by collisions of steamships with lock gates which, for the time being, had tied up traffic on the whole canal.

During the past six months, or since the plans for a high-level lock canal were adopted, the Isthmian Canal Engineers have been giving very careful study to the question of safeguarding the locks, both against collision and against the disastrous effects which would ordinarily follow if one or more of the lock gates were carried away. Among the devices for preventing collision, which have been made the subject of study, the most promising is that calling for the provision in front of each pair of lock gates, and about 50 feet therefrom, of a pair of safety gates, which a vessel, entering the lock too quickly, would have to carry away before she could collide with the lock gates proper. The protection afforded by these gates would be twofold. In the first place, a vessel would exercise as great care to avoid hitting them, as if they were the actual gates that held the water in the lock, since collision with them would in any case result in serious damage to the ship itself. In the second place, these gates, because of their enormous structural strength and the great resistance which they would offer to an end-on blow, would suffice, even though they were carried away, to absorb the remaining momentum of the ship.

In addition to the gates, a system of control by means of powerful warping and snubbing devices is being developed, these latter being installed upon the massive concrete masonry which forms the side walls both of the entrances and the locks themselves. One method under consideration contemplates the use of powerful friction drums, working on the same principle as the friction drums used to ease the strain in towing during heavy weather at sea. Cables led from these drums, which would be securely held in the masonry, would be made fast to the ship, and as they unwound, each cable would exert a retarding pull on the ship of from five to ten tons. This control would be positive, and sufficient cables could be made fast aboard to give absolute control of the largest vessel.

The carrying away of a lock gate would be a calamity, not because of the value of the gate itself, but because its destruction would cause a rush of water that might sweep out the whole flight of locks and result in the loss of the whole 37 miles of summit level. Consequently, in addition to making provision, in the way of safety gates and elaborate braking devices, to prevent collisions with the gates, the Commission engineers are making a careful study of various devices by which, should the gates be broken down, a barrier could be interposed back of the gates at the entrance to the locks, which would close the entrance and hold back the water. There are three principal methods under consideration. First, the use of huge caisson cylinders, which could be floated across the lock entrance and close it in much the same way as the caisson gate closes a drydock; second, the use of an emergency swing bridge carrying vertical gates; and third, the use of a special type of hinged swinging gates.

If cylindrical caissons were used, they would be placed either horizontally or vertically. In the horizontal system a cylinder 46 feet in diameter, which is the depth of the water in the lock entrance, and slightly longer through its axis than the width of the entrance, would normally lie in a transverse sunken pocket, built transversely to the axis of the lock, and sufficiently deep to allow the cylinder to lie submerged below the 45-foot level. Should a lock gate be carried away, this cylinder would be rolled up out of its pocket on an inclined plane, until it rested upon the bottom, with its ends bearing against suitable shoulders built for this purpose in the side walls of the entrance. As the cylinder would be built with a diameter slightly greater than the depth of water in the entrance, it would serve to effectually close the channel and hold up the lake level until repairs had been effected. The rolling of the cylinder, which would be water-ballasted sufficiently to give it a slight margin of submergence weight, would be done by means of heavy cables passed around the ends of the drum and operated by powerful winches suitably placed on the shore. Another plan under consideration contemplates the use of two vertical cylinders which normally would stand in vertical pockets formed in the side walls of the entrance. Each cylinder would be slightly smaller in diameter than the width of the entrance so as to secure a slight resultant horizontal pressure when they close, and provision is made for swinging them out of their pockets until they meet at the center of the entrance channel, where they would form a barrier to the flow of water.

Another method contemplates the use of two vertical sectors of cylinders, hung on heavy pintles at the side walls of the entrance and normally swung back into pockets out of the way of the traffic. Should a vessel collide with a gate and be sunk in the channel, these gates would be swung shut until they met or closed against the sides of the sunken vessel. The advantage of this type of gate is that, as the resulting thrust is normal to the curved upstream faces of the gates there would be no destructive impact as they swung together in the face of the rush of water.

Another most effective method of holding back the lake would be the provision of a swinging bridge, mounted on a turntable, and corresponding, in its construction and operation, to the ordinary swing bridge over a navigable waterway. In case of accident, one arm of the bridge would be swung across the 100-foot opening of the entrance, until it brought up against an abutment formed in the opposite side wall. From the bottom of the arm, which would be a steel truss of great strength and rigidity, would project a series of vertical steel guide pockets, reaching down the full 45-foot depth of the entrance, and bearing on a bottom sill. In case of accident this arm would be swung across the entrance, and a series of steel curtains would be lowered until the flow of water was entirely shut off.

It will be seen from this outline of the studies which have been made of this problem, that the destruction of the lock gates would not necessarily involve the washing away of the whole flight of locks and the emptying of the summit level lake. The devices which we have above described are, it is true, of gigantic size, and would involve some careful planning both as to their construction and subsequent operation; but with the modern materials and appliances which the engineer has at his disposal, there is no inherent difficulty in these plans to prevent the satisfactory realization of one or other of them in practice.

AIRSHIPS IN THE FRENCH ARMY.

The French army seems to have taken the lead in the way of practical use of airships for military work, and will soon have two airships in actual service. It will be remembered that the first one of these, the "Lebaudy 1905," which made such a fine run from Moisson to Chalons, and a set of maneuvers at Toul, was turned over to the government by Messrs. Lebaudy, and the Minister of War had it stationed first at the Toul fortress and afterward at the Meudon establishment near Paris. It is proposed to use it especially in order to train the aerostatic personnel, and it will remain there for the instruction of the officers and men who are to form the first crews of the airships. Commandant Bouttieaux and Capts. Voyer and Bois, who followed last year's tests, are charged with the instruction of the men. The personnel will thus be well trained by the time the second airship "Lebaudy 1906" is delivered to the army. The new airship presents a great interest. M. Etienne, the Minister of War, having seen the value of the former airship during last year's maneuvers, decided to have a new balloon of the same kind built by Messrs. Lebaudy, and the new "Lebaudy 1906" is the development of the principles already applied with success by Engineer Julliot. Modifications over the type we have already described are made in some of the details. The envelope, still of rubber-treated canvas, measures nearly 200 feet long with a large diameter of 35 feet as before, and a volume of 4,000 cubic yards. A Panhard-Levassor 70-horse-power petrol motor is used now, and it gives much better results than the 20-horse-power form used on the first airship. All the mechanical parts are calculated accordingly, and a higher speed is looked for. Some changes have been made in the planes and the steering apparatus. As it is somewhat longer and thus has a greater vol-