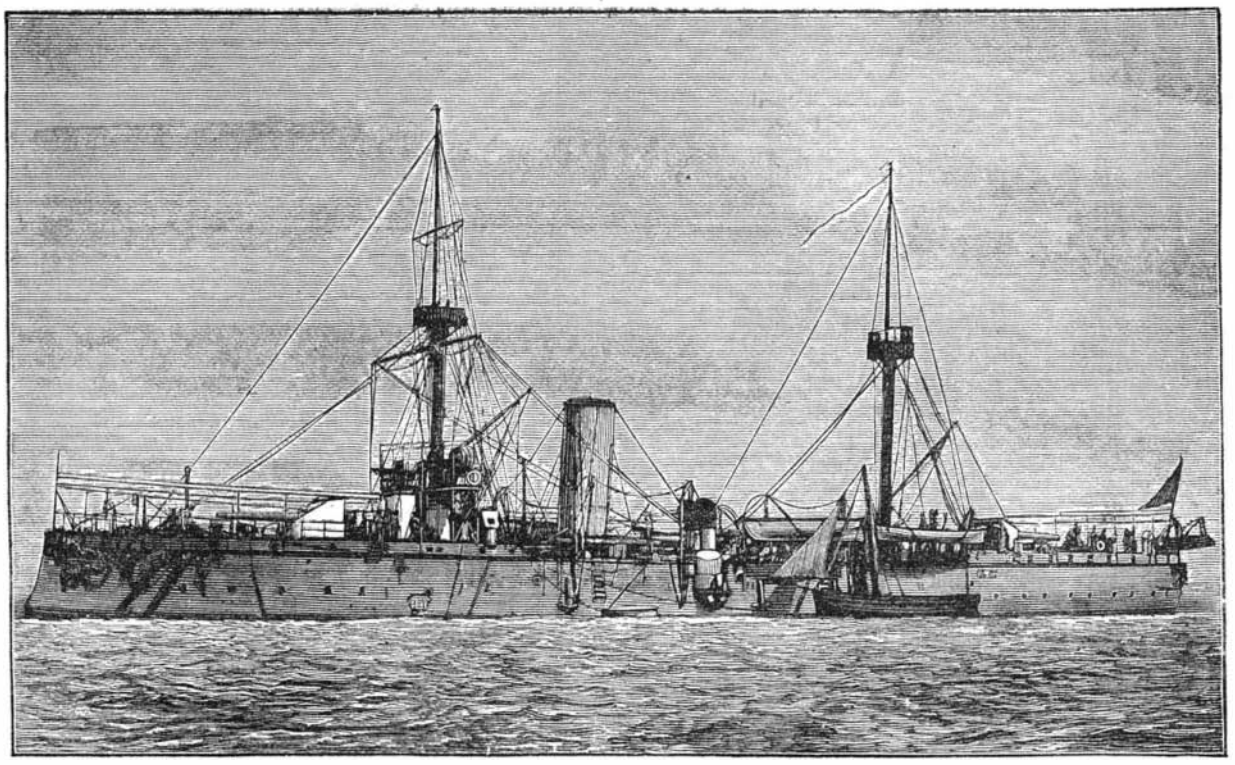
THE NEW CHINESE NAVAL SQUADRON.

A squadron of five new vessels of war constructed by British and German shipbuilders for the Chinese navy, and commanded by Admiral Lang, an officer of the royal navy holding the rank of captain in her Majesty's service, recently left Spithead for China. It consists of two swift "protected cruisers," the Chih Yuan and the Ching Yuan, built at Elswick, Newcastle-on-Tyne, from designs by Mr. W. H. White, of the firm of Sir William Armstrong, Mitchell & Co.; two armored cruisers, the King Yuan and the Lai Yuan, built at Stettin, on the Baltic, by the Vulcan Shipbuilding Company; and one torpedo boat, built by Messrs. Yarrow & Sons, of Poplar, under a contract with Messrs. John Birch & Co., of Liverpool.

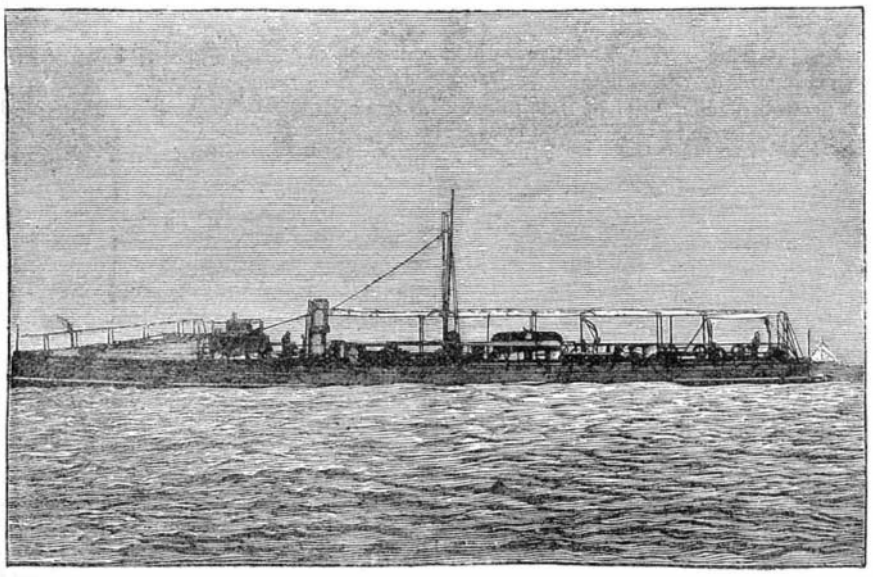


THE CHIH YUAN.

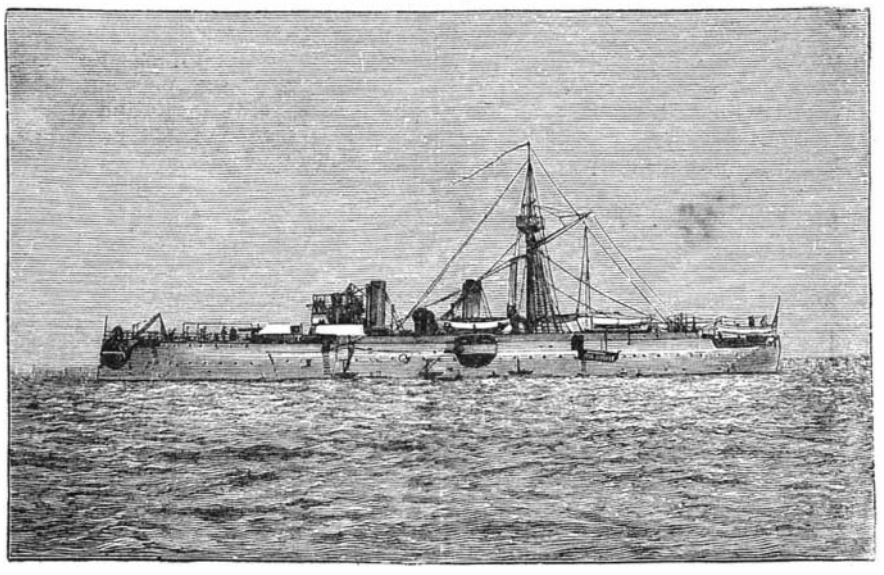
The Chih Yuan and the Ching Yuan have been constructed under the superintendence of Liu Ta jen, the present Chinese minister. Their displacement is 2,300 tons, the length is 268 feet, breadth 38 feet, and depth from the main deck to the keel moulded 21 feet. The draught forward is 14 feet, and aft 16 feet. Each vessel has two pairs of triple expansion engines, constructed by the firm of Messrs. Humphrys, Tennant & Co. Both the engine and boiler rooms are divided into water tight compartments by transverse and longitudinal bulkheads, and the machinery is so arranged that either boiler can work on either engine or on both, and the change can be carried out while the vessel is in motion. On the four trial trips, two with and two against the tide, with all their weights, armament, and Chinese crews on board, they attained an average speed of 18·536 knots. The material of each vessel is steel. There are two decks, the lower one being of the turtle back form, consisting of 4 in. steel plates rising in the middle above the water line, and inclined at the sides so as to dip some feet below it. The engines, magazines, rudder head, steering gear, and all the important parts of the vessel are protected by this deck. The openings in the deck are encircled by cofferdams, protected by steel plates, inclined so as to deflect the shot. The bows are formed and strengthened for ramming purposes. On the turtle deck, running parallel to the sides of the vessel, is a partition, inclosing a space between itself and the side. This space is subdivided into a great number of water tight compartments for the reception of coal or patent fuel. An additional protection of a layer of coal, about 8 ft. in thickness all round, is thus given to the vessels. The bunker accommodation is 450 tons. Both ships have double bottoms.

The armament consists of three 21 centimeter Krupp guns, two 6 inch Armstrongs, eight 6 pounder rapid firing Hotchkiss guns, and six Gatlings. Of the Krupps, two, which are placed in the bows, are mounted on Vavasseur carriages, on revolving platforms, protected by splinter proof shields, and one, which is in the stern, is also placed on a Vavasseur carriage revolving on a center pivot. In both cases the guns are moved by means of hydraulic machinery. The Armstrongs likewise move on center pivot Vavasseur carriages, and are placed on sponsons at the side of the vessel, so as to allow of the training of the guns over a very large arc, about 160°. These likewise are protected by 2 inch steel plate splinter proof shields. The torpedo armament consists of four above-water torpedo guns, one, fixed in the bow, firing right ahead, one right astern, and two training guns are fixed in each broadside forward. There are two electric search lights for each vessel, of a nominal power of 25,000 candles. Each has a conning tower of 3 in. steel plates, from which the working of the ships, guns, and torpedoes can be directed. An important addition is an armor plated tower, for the protection of the signalman, which was suggested by Admiral Lang. The guns are provided with converging fire apparatus, so that they can be fired singly or simultaneously.

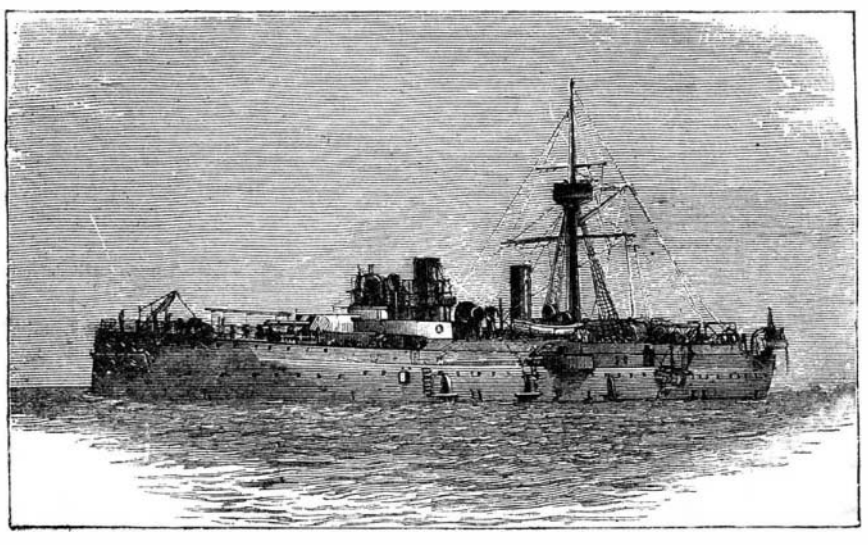
The torpedo boat, built by Messrs. Yarrow, is said to be the fastest of its size that has ever been launched. It has reached the great speed of about twenty-eight



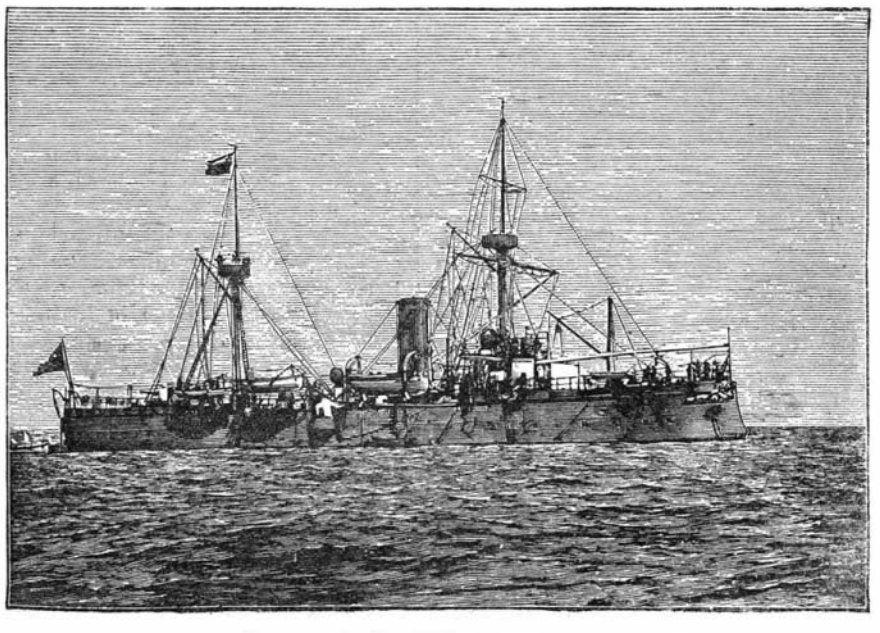
THE YARROW TORPEDO BOAT.



THE KING YUAN.



THE LAI YUAN.



THE CHING YUAN.

SQUADRON OF NEW CHINESE WAR VESSELS.

miles an hour. It is armed with two fixed 14 in. torpedo guns in the bows and one 14 in. training gun on deck abaft the funnel. It is also supplied with a powerful armament of Hotchkiss and Gatling guns and a strong electric search light.

The two vessels built in Germany are of the class of armored cruisers. Their speed is under sixteen knots. They are armed with two 21 centimeter Krupp guns and two small guns.—*Illustrated London News.*

Atlantic Steam Navigation.

The following is an abstract from a paper lately read at the American Exhibition, London, "On Atlantic Steam Navigation," by Mr. B. Martell, chief surveyor of Lloyd's Register of Shipping.

As regards cylinders, in the earlier days of the Cunard service, when steam was not employed at a higher pressure than two atmospheres, cylinders were cast at five to six tons tensile, with this consequence—that Sandy Hook was made in from 14 to 16 days. Later on, say in the Scotia period of the Cunard service, there was still no greater cylinder strength than five to six tons tensile, nor any use of steam beyond two atmospheres. But by economies in the use of steam, Sandy Hook was made in from 12 to 14 days. Then, all of a sudden, we come upon the period of Atlantic racers, the cylinders of the Umbria and Etruria, and other ships, being cast from the foundry cupola up to fifteen tons tensile, and steam used up to nearly six atmospheres, on the average of the cylinders of triple expansion, with Sandy Hook made in say six days. Then there is a Glasgow secret process, which has been in operation for twenty-five years, which recently cast the torpedoes for harbor defense, which has cast propellers for the Dundee whalers for fourteen years, and which has been largely intrusted with the castings for British lighthouses. That system makes castings, of all sections, from the foundry cupola up to twenty-eight tons tensile. Query: What would be the Sandy Hook time with twenty-eight tons tensile cylinders?

It was not until the paddle steamers Sirius and Great Western had crossed the Atlantic, the former in 15 days and the latter in 17 days, that the marine engineer had a chance. Since 1838, steady progress has been made in the steam propulsion of vessels, and now, instead of 15 to 17 days to perform the voyage, it is accomplished in little more than 6 days. Need I add that it is confidently hoped that within a very short period even the 6 days will be diminished? Taking something like the chronological order of development, in 1840 the Britannia, belonging to the Cunard company, made her first voyage at a speed of about 8½ knots. Other paddle steamers of the same class were built by the Cunard company, their length being little more than 200 feet, and their tonnage about 1,100 tons.

Then came the Inman line, the first steamer of which, the City of Glasgow, with a tonnage of 1,600, was fitted with the first screw propeller which crossed the Atlantic. That was as recently as 1850. In 1874 the White Star line gave the greatest impetus to transatlantic navigation, Messrs. Harland & Wolff launching the Britannic and the Germanic. These vessels were far in advance of all their predecessors, and were of the following dimensions:

Length, 455 ft.; breadth, 45 ft. 2 in.; depth, 33 ft. 7 in.; tonnage, gross, 5,004; and 760 H. P.

The average time occupied by these vessels was a little over 8 days, and it was not until the construction of the Arizona, five years later, that the time was sensibly diminished. Since then a strong feeling of competition has prevailed among the companies, resulting, as a commencement, in the construction of the sister ships the Umbria and Etruria by Messrs. John Elder & Co. The length of each of those ships is 501 ft. 6 in.; breadth, 57 ft. 2 in.; depth, 38 ft. 2 in.; tonnage, gross, 7,718. The greatest speed attained by either of those vessels is somewhat in excess of 17 knots, or 20 miles an hour, which is the ordinary speed of trains upon our railways. This is a time of little more than 6 days, against the early times of 15 and 17 days.

Notwithstanding this great progress, British progress still asserts itself. At the present time there are in course of construction for the Atlantic trade, steamers approximating to the enormous size of 9,000 tons. The I. H. P. of these newer steamers will be correspondingly increased, so that it is not too much to anticipate that the voyage will be accomplished in less than six days. The principal requirements for steamers to be engaged in the Atlantic service appear to be: (1) great strength, (2) speed, (3) safety by transverse and longitudinal bulkheads, and (4) comfort. For strength, the naval architect can now provide against all possible strains, even in the worst weather of the Atlantic. For speed, this can now be pretty nearly calculated, particularly where economy of space and consumption of fuel are of minor importance. The new steamers in course of construction will be fitted with triple expansion engines, and will be run with much fuel economy. For safety, there is the provision of watertight bulkheads in such number that the filling of one—or even two—will not destroy flotation. The practical difficulty hitherto has been the large space required for the engines and boilers, but by transverse bulkheads with the engines and boiler rooms placed longitudinally the difficulty is overcome. Facility is also afforded by the adoption of twin screws. As regards the comfort provided on board the recently constructed Atlantic steamers, it is lavish. At the same time, it is deserving of consideration whether the time has not come when separate cabins should be provided. This would add immeasurably to the comfort of a numerous class who dislike sleeping in the same room with strangers. This, doubtless, will be done eventually, and why not on board such enormous steamers as are now being constructed?

Finally, when we consider the advantages which may arise from forced draught and the general adoption of triple steam expansion, it is not giving expression to an over-sanguine feeling when it is asserted that steamers may yet be constructed for the Atlantic trade which will be much faster than those at present in existence. The passenger trade to America is of a magnitude which is a sufficient inducement to the designer to gain this end, as it may be stated that during 1885 no fewer than 15,160 saloon passengers and 281,270 steerage passengers were landed at New York. Moreover, this great trade is on the increase, and, naturally, with new expectations of speed and personal privacy as the highest form of personal comfort.

The Effects of Gas upon Books.

The communication of Mr. C. J. Woodward to the Association of Librarians, upon the effect of gas on the bindings of books, is an important contribution toward the settlement of a question that has for a long time vaguely vexed the minds of gas engineers and others. Gas has often been accused of rotting the bindings of books exposed to its heat and fumes on the upper shelves of libraries; but the impeachment has as often been repelled. As Mr. Woodward states, direct experimental evidence upon the point has not been obtained, although the pages of the *Journal* contain many observations on the subject. Now, however, thanks to Mr. Woodward's appointment upon the Birmingham Library Committee, we have something like definite information, though it is admitted that a good deal remains to be done to complete the investigation. So far as Mr. Woodward's experiments have extended, they appear to be trustworthy enough. They show that brown calf leather when exposed for 1,000 hours in a close chamber filled with the fumes of burning gas, and kept by these at a temperature varying from 130° to 162° Fah., is seriously deteriorated; its power of stretching being reduced by one-half, and its breaking strength in about the same proportion. It is also shown that heat alone is not the cause of these effects; for the same kind of leather when heated over steam pipes to an average temperature of 196° Fah., for 1,000 hours only, suffered a diminution of stretching power from 13 to 9 per cent, while its breaking strength was reduced in the ratio of 36 to 23. Even when kept at an average temperature of 142° Fah., or about the same heat as the atmosphere of the close gas chamber, leather does not, according to Mr. Woodward, sustain any appreciable injury so long as the air is tolerably pure. All this is very strong against the use of open gas flames in close apartments containing books bound in calf leather. It is almost too strong. Nor does Mr. Woodward leave it in doubt as to the cause of the deterioration of the leather under the influence of the products of combustion of coal gas. It is nothing more or less than our old enemy sulphuric acid, round the hypothetical presence of which in the atmosphere of gas-lit rooms so much controversy has raged. Now, it is with no desire to find fault with Mr. Woodward's method of experiment that we take the opportunity for pointing out that he has left a distinct opening for objection with regard to this matter of free sulphuric acid. It may be urged, with much force, that he made sulphuric acid in his fume chamber when it could not be made under the ordinary conditions of a library lighted by gas, even if badly ventilated. In the confined atmosphere of his fume chamber, kept as it was at a temperature that must be regarded as extreme for the upper region even of a gas-lit apartment, did he not obtain the necessary conditions for the oxidation of sulphurous into sulphuric acid—heat and moisture—in a degree that would be unattainable in an ordinary apartment? It is only fair to Mr. Woodward to point out that this objection has been raised upon previous occasions, and has never been clearly removed. We are, therefore, prepared to admit that Mr. Woodward has proved his case, so far as his conditions can be accepted as generally applicable; but this latter qualification practically reserves the whole question in its actual bearing. Hence, while agreeing that gas in libraries should for choice be burnt in some one or other of the new order of ventilating lamps, of the existence of which the associated librarians seem to require to be reminded, we refuse to accept Mr. Woodward's unventilated gas stove as faithfully representing the conditions of a library lighted by means of exposed gas flames.—*Jour. of Gas Lighting.*

The Telegraph Situation.

The absorption of the system of telegraph which had been erected under the auspices and control of the Baltimore & Ohio Railroad Company by the Western Union Company closes another of the attempts which have been made from time to time to maintain a successful and permanent opposition to the latter organization. In no country of the civilized world has telegraphy made greater strides in point of scientific and mechanical perfection than in the United States, and in none does its use enter more intimately into the fabric of the business and social life of the people. At the same time, the history of telegraphy in the United States for years past has been that of this gigantic corporation and of the steps by which it has absorbed its competitors.

The most striking feature in connection with the formation of the Western Union Company is the immense addition to its capitalization which has followed each successive consolidation, resulting before this last event in its having a share capital of $80,000,000, a bonded debt of over $7,000,000, and outstanding guarantees upon the stock and bonds of other cable and telegraph companies amounting to say $25,000,000, or in all a capitalization of some $115,000,000. Apart from the notorious fact of the extent to which what is known as water entered into these additions to its capital, it may well be doubted whether the company's existing plant represents anything like such a valuation. Forming, as it does, according to the last report, a system of 156,000 miles of poles, with 525,000 miles of wires, 15,000 offices, transmitting over 47,000,000 messages in a year, and having gross receipts of $17,000,000, it constitutes a concern of the greatest magnitude; and reaching, as it does, almost every railroad station or hamlet in the country, as well as all the important centers of population, its influence is more widespread than any other corporation in the country.

The Baltimore & Ohio telegraph system was an outgrowth of that aggressive spirit which characterized the management of the railroad company under the Garretts—father and son—and which, carried to extremes, has resulted in the present situation of that property. Declining as a settled principle to turn over the telegraph lines of the road to the Western Union Company, and entertaining, it would seem, a personal antagonism to the individual most prominent in the management of the latter, the idea of forming an extensive system of telegraph in opposition to it seems to have been a cherished idea of the elder Garrett which his son and successor carried into effect. The telegraph lines owned by the Baltimore & Ohio Railroad, extending from Baltimore to Chicago, furnished the nucleus, and the building of new lines to important cities resulted by 1885 in the formation of a system which was able to inaugurate an effective competition with the Western Union in telegraphy between nearly all the important Northern centers of population.

At the present time, the Baltimore & Ohio wires extend from Portland, Me., in the North to South Carolina, and reach their extreme limit in St. Paul in the Northwest and Texas points in the Southwest. Approximately, it owns or controls about 7,500 miles of lines, including some 55,000 miles of wires and about 1,100 offices. Exact reports of the telegraph organization's operations have never been published, and while the indebtedness of the telegraph to the railroad company is stated at about $3,875,000, reports indicate that the entire advances made by the railroad amount to perhaps $7,000,000, though this is possibly exaggerated. Similarly little is known of the results of its operations. The statement has been made that even at the low competitive rates it was self-sustaining, but this is open to some question, and there is little doubt that the continued necessity of extension and the consequent further advances it involved formed a serious element among the burdens under which the Baltimore & Ohio Railroad property labored.

The policy of the Western Union Company throughout the contest has been shaped with a view to such an outcome. The competition of the Baltimore & Ohio, as well as that of the Postal Telegraph and other minor competitors, was met at all points, although the lowering of rates on business between the largest cities of the country, in conjunction with the cable rate war which has also been in progress for some time past, has seriously affected the Western Union's revenues, resulting in the abandonment of dividends upon its stock for nearly a year. To some extent, therefore, this policy may have been effectual in adding to the embarrassments of the Baltimore & Ohio. And so well was its object understood that, from the time it became known that Mr. Garrett was ready to dispose of the control of the railroad property, little doubt existed in any quarter as to the ultimate disposition of the telegraph. The bargain between the Western Union and the syndicate is not unduly onerous for the former, and the agreed price, namely, $5,000,000 of its stock in return for the railroad company's control of the Baltimore & Ohio Telegraph organization, though a tangible increase of the Western Union's share capital, is no such addition of water as has been witnessed in former consolidations.—*Bradstreet's.*