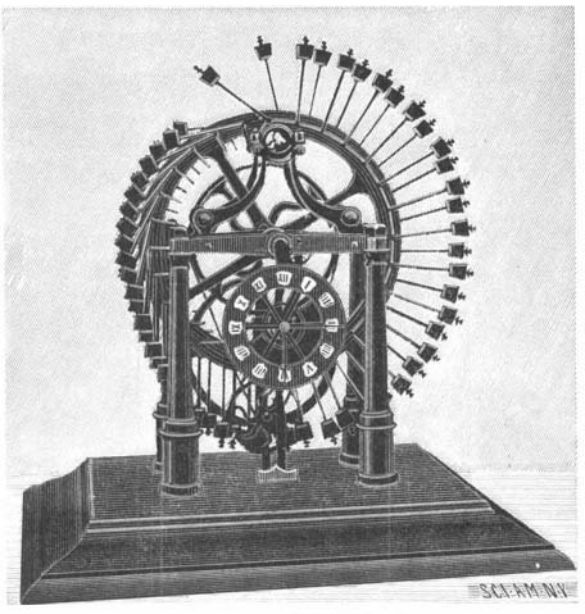
A PERPETUAL MOTION CLOCK.

At the Paris Exposition there was exhibited a clock which ran for two months without having to be wound up, therefore the makers were somewhat justified in calling it a "perpetual motion clock." The inventor obtained his result by combining a system of jointed levers or armatures with permanent magnets in order to permit the wheel to revolve indefinitely around its axis to coil a spring. The principle is based upon the fact that poles of the same name repel, while those of opposite names attract. Two series of movable levers are placed upon the faces of the rim of a large wheel. The two arms of such levers form between them an angle of forty-five degrees; the shorter one is provided at its extremity with a weight which acts as a counterpoise. The counterpoise most distant from the center has a preponderating action upon the side of the wheel. It makes four revolutions a minute, and actuates a regulating flywheel through the medium of an endless chain. The frame of the apparatus is constructed of magnetized steel. It supports the axle of the wheel and is surmounted by a roller that constitutes a pole. When in its motion the wheel brings the short arm of one of the levers opposite the roller, the phenomenon of repulsion is produced. We are indebted to La Vie Scientifique for our engraving.



A PERPETUAL MOTION CLOCK.

LAUNCH OF THE WHITE STAR LINER "CELTIC."

The launch at Belfast of the huge liner "Celtic" marks another great step of the rapid growth in size of the modern steamship. This truly gigantic vessel is easily the largest steamship ever constructed, for on her maximum draught of 36 feet 6 inches she will displace 37,700 tons, which is more than double that of the heaviest battleship afloat, and 10,300 tons more than that of the "Great Eastern." The next largest steamship is the "Oceanic." When they are completed, the big freighters under construction at New London, Conn., which, it is claimed, will be of 33,000 tons maximum displacement, will equal the "Oceanic" in size.

The "Celtic" is 700 feet long, her beam is 75 feet, and her depth 49 feet. She measures 20,880 tons gross, and 13,650 tons net. How these dimensions compare with those of other well-known liners is shown in the tabulated statement below. Gross tonnage is used in the table, and the lengths given are over all.

As will be observed, she is a few feet shorter than the "Oceanic," with, however, 7 feet more beam. She is, as the figures also show, the first vessel to exceed 20,000 tons. The task of building such a vessel was necessarily very heavy, and possibly there are not half a dozen shipbuilding yards in Great Britain which could have looked at it.

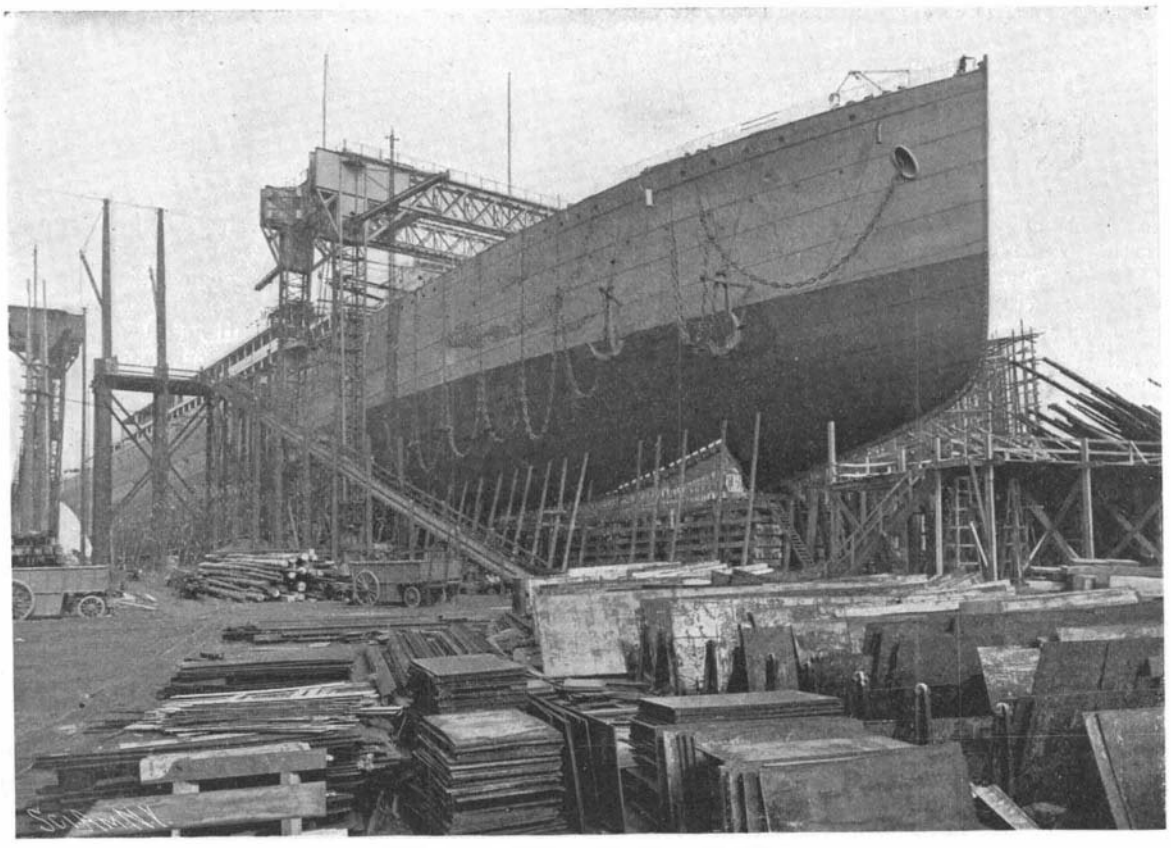
The shell plates of the "Celtic," of which there were 1,392, averaged 30 feet by 5 feet, were an inch and a quarter thick, and in some cases weighed as much as 4 tons. Machine riveting was adopted wherever possible in the keel, double bottom, hull, and stringers; 167,095 inch and quarter rivets were driven in this way.

There are altogether nine decks, and as their arrangement in some way facilitates the task of describing the vessel, the names may be given. They are—lower orlop, orlop, lower, middle, upper, bridge, upper bridge, boat, and sun decks. With obvious exceptions they are all real plated decks and of full length. The greatest care has been taken to secure her against the alternate hogging and sagging stresses she will experience. She has a flat bar keel riveted onto the skin plating and through riveted to the angle bars of the vertical inner keel. The rigidity is further increased by bilge keels which extend for about 250 feet, and for a considerable distance the bilge strake is doubled. The sheer strake and the next but one lower are also doubled and the upper deck stringers have been treated similarly except at the extreme ends. Strength fore and aft is further secured by six longitudinals worked intercostally, three on each side of the inner keel; with the thwartship vertical divisions these make the cellular double bottom, which is bounded by margin plates and covered by the inner skip plating. At the sides the frame brackets are attached to the margin plates by double angles, and the floor plates have been similarly treated. And to further increase the longitudinal stiffness there are two intercostal keelsons running fore and aft. At the decks, too, there is a beam to every frame, so that care could, to no greater extent, ensure a stoutly built ship. The arrangement for carrying the propellers is exactly that of the "Oceanic," and the rudder is of cast steel sections bolted together. The engines are of Harland & Wolff's quadruple expansion "balanced" type, with cylinders of 33, 47½, 68½, and 98 inches diameter. The stroke is 5 feet 3 inches. Steam will be supplied at a pressure of 210 pounds by eight double-ended boilers, each 15 feet 9 inches by 19 feet 6 inches. The vessel is not intended to be a record-breaker.

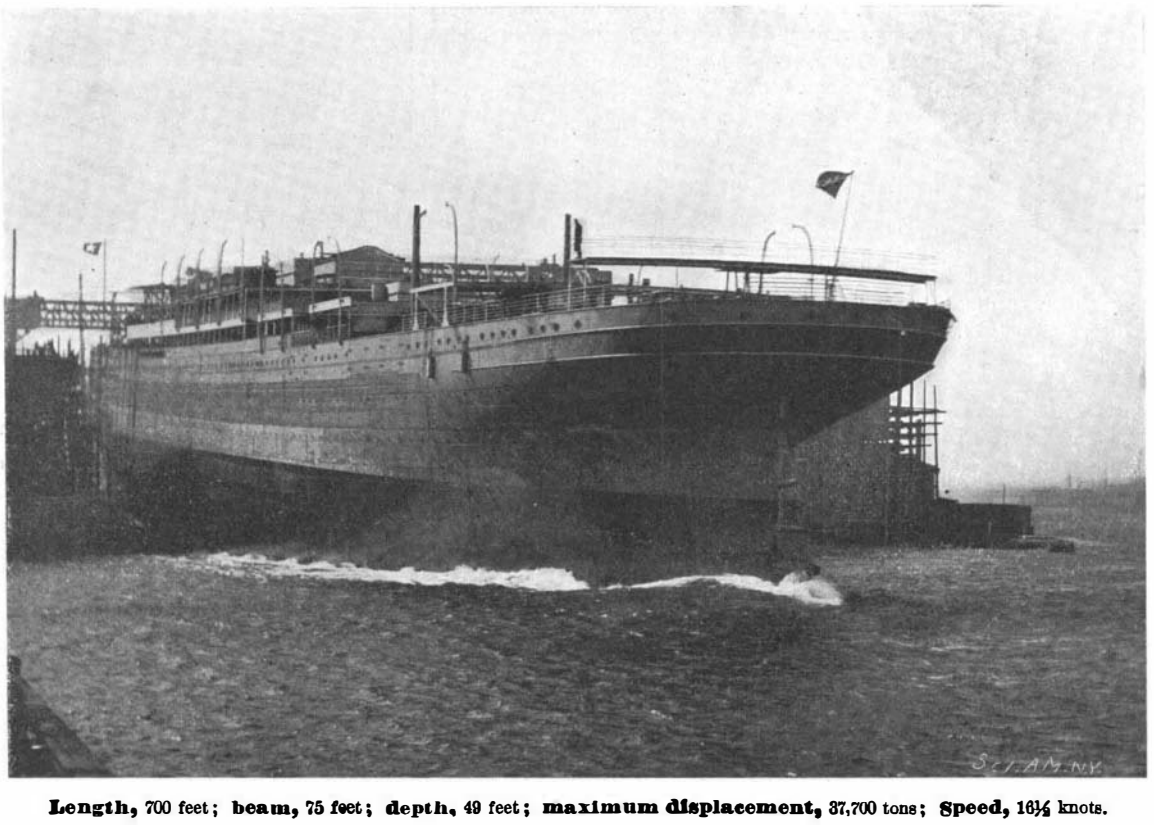
Vessel.	Length. Ft. In.	Breadth. Ft. In.	Depth. Ft. In.	Tons.
Great Eastern	691 0	82 8	48 2	18,915
Britannic	468 0	45 2	33 7	5,004
City of Rome	500 0	52 3	37 0	8,144
Alaska	520 0	50 0	38 0	6,400
Etruria	520 0	57 3	38 2	7,718
Paris	560 0	63 2	39 2	10,500
Teutonic	582 0	57 8	39 2	9,984
Fürst Bismarck	520 0	57 6	38 0	8,874
La Touraine	540 0	56 0	34 6	9,209
Campania	620 0	65 0	43 0	12,950
Kaiser Wilhelm der Grosse	648 0	66 0	43 0	14,349
Oceanic	705 6	68 0	49 0	17,274
Deutschland	686 0	67 0	40 4	15,500
Celtic	700 0	75 0	49 0	20,880

There are quarters for, altogether, 2,859 passengers and a crew of 335. The first class accommodation is on the upper, the bridge, the upper bridge, and the boat decks, and corresponds to that of the "Cymric." The number of first-class passengers provided for is 347. Aft on the upper and bridge decks there are quarters for 160 second-class passengers. Third-class passengers to the number of 2,352 are provided for on the upper, middle, and lower decks, some in staterooms and others in open berths.

The launching arrangements were those which worked so successfully in the floating of the "Oceanic," with the necessary difference for the greater weight that the chain was an eighth-of-an-inch thicker. The displacement of the hull was, it may be noted, no less than 13,500 tons. A massive steel casting, containing a hydraulic cylinder and ram, and a trigger half let in to a steel-shod niche in the sliding ways, was fixed in the standing ways. The lower half of the trigger was held in position by the ram until all was clear, and with the release of the pressure the upper half dropped flush with the ways. As the hull was water-borne its progress was checked by the dropping, pair after pair, of three pairs of anchors.



THE "CELTIC" ON THE STOCKS.



Length, 700 feet; **beam,** 75 feet; **depth,** 49 feet; **maximum displacement,** 37,700 tons; **Speed,** 16½ knots.

THE LAUNCH OF THE "CELTIC," THE LARGEST SHIP EVER CONSTRUCTED.

The official laboratory at Hamburg has discovered that the sand which fell during the recent snowstorm in southwestern Germany came from the African Sahara.

French Wine Production of 1900.

The wine production of France for the year 1900 is 1,721,000,000 gallons, a yield that has only been exceeded three times in the past century. The promise of a large yield was so great in August that sales were made at less than a dollar per barrel for a good table wine. Of course, the high-grade wines brought large prices. Since early in the seventies up to 1900 there has been a great demand for American plants for grafting upon French vines. In 1881 the total area replanted with American vines was 21,262 acres; in 1889 it was 471,000 acres, and to-day it is 2,414,495 acres. The old vineyards which were destroyed by the phylloxera have been "reconstituted," as the French say, by graftings from the United States, and it is believed that they are now phylloxera-proof. The acreage planted in vines in France has been steadily increasing during the last twenty years, but there are reasons for believing that it has come to a standstill. The organs of the wine growers advise that attention be paid now to quality and not quantity. It is probable that the octroi tax will be abolished within a few months, and wine will enter the gates of all the cities of France duty free. It is hoped that this will have the effect of increasing the sale of wine and decreasing the consumption of alcoholic liquor. If the production of wine remains stationary more land will be devoted to the raising of early fruits and vegetables. The planting of mulberry trees and the raising of the silkworm will receive more attention. Wine is now produced more cheaply in California than in France, and the efforts to introduce French wines into Japan have not been effectual on account of Californian competition, the Japanese declaring they can buy wine cheaper in San Francisco than in France. The grape growers of France expect an absolute immunity from losses by hail by the use of cannon, and a newspaper which is the organ of the hail destroyers has just made its appearance.

Experiments have been carried on at Cape Town in which motors are used for transporting Maxim guns. The gun was mounted on a platform and occupied the front seat of a quadricycle.

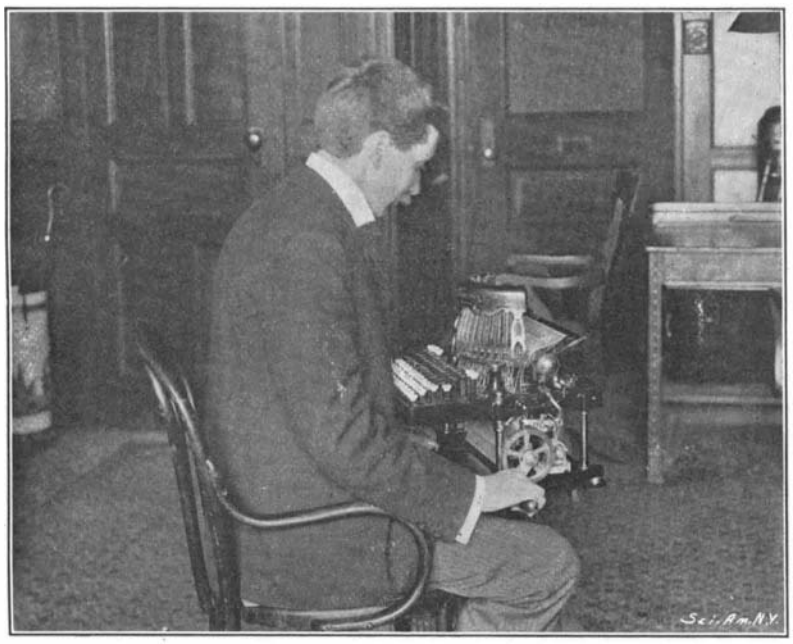
THE MURRAY PAGE-PRINTING TELEGRAPH.

The valuable invention which forms the subject of the present article is the work of a young Australian journalist; and it takes on particular interest from the fact that its author at the time he entered upon the investigation which has resulted so successfully was absolutely without knowledge of telegraphy. The earlier experiments were carried on in Sydney, and as soon as Mr. Murray had satisfied himself that his system was mechanically and operatively practical, he left at once for the United States for the purpose of securing his patents and introducing his system. His success has been thorough and rapid, for while his many applications for foreign patents were still pending, he made arrangements with the Postal Telegraph Company for the exclusive telegraphic rights to his invention in the United States.

Among the problems connected with telegraphy which have commanded the earnest efforts of inventors is that of automatically printing messages in the Roman characters. From time to time we have illustrated, either in the SCIENTIFIC AMERICAN or the SUPPLEMENT, the most successful inventions in this difficult but fascinating field of investigation. The demands of telegraphy are so various that it is not to be expected that any single printing telegraph can be produced that will answer for every class of telegraphic work, and all the machines of the kind that are in use, or proposed, belong to one or other of three or four types.

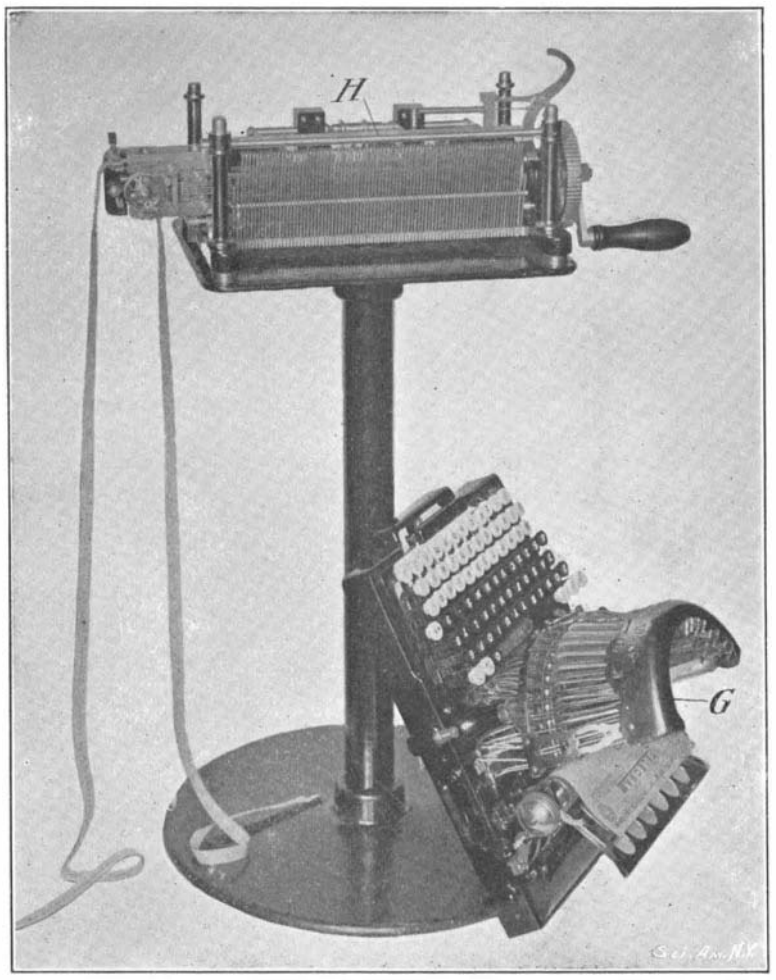
The simplest form of printing telegraph is the well-known "stock-ticker," the perfected form of which is found in the Burry page-printing telegraph, which was illustrated in the SCIENTIFIC AMERICAN of March 23, 1901. These machines, although they might be used in long-distance telegraphy, are designed more particularly for city use in the disseminating of news from a central station to a large number of separate private offices. Another class of printing telegraphs is that which is devoted mainly to long-distance telegraphy, as represented by the vast business of the leading telegraph companies, where speed and accuracy become of prime importance. It is only within the last year or two that efficient machines of this class have been perfected. One of these, invented by Donald Murray, is in use by the Postal Telegraph Company, and another, invented by Charles L. Buckingham, is being operated by the Western Union Company. In the same class are Rowland's and Baudot's multiplex-printing systems. Another class of telegraphy, to which belong the Delaney, the Squier and Crehore, and the Pollak-Virag, has not as yet established itself commercially; for with its speed of over a thousand words a minute, it is perhaps ahead of its time, since there is not sufficient telegraphic business of the kind required to keep such systems going at this enormous rate of speed.

It is impossible within the space at our disposal in the SCIENTIFIC AMERICAN to give a detailed description of Murray's most ingenious and successful telegraph. For this the reader is referred to a paper recently presented before the American Institute of Electrical Engineers, which is given in full in the SCIENTIFIC AMERICAN SUPPLEMENT of February 2 and February 9 of this year. The accompanying diagrams and photographs, however, show a complete installation, from the keyboard perforator at the sending station to the printer at the receiving station, and the subjoined description is sufficiently ample



Typewriter, with mechanical attachment, at the receiving station, on which, by the turning of a crank, the message is translated from the perforated characters on the tape to the printed characters on the page.

MR. MURRAY OPERATING A RECEIVING STATION PRINTER.



The typewriter, *G*, is removed to show the interlocking mechanism, *H*, by which the perforated characters on the tape are made to strike the keys of the Roman alphabet on the typewriter.

RECEIVING STATION PRINTER.

At the transmitting station the blank tape is punched with perforated characters in typewriter punching machine, *A*; then run through a modified Wheatstone transmitter, *B*. At the receiving station the impulses are controlled by relays, *C*, and a vibrator, *D*, and operate a punching magnet, *F*, which reproduces the perforated characters upon a blank tape. This tape is then run through an attachment, *H*, to a typewriter, *G*, which latter prints the message in page form in the Roman characters.

COMPLETE SET OF MURRAY PAGE-PRINTING TELEGRAPH APPARATUS—HIGHEST SPEED 130 WORDS PER MINUTE.