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ANCIENT LOCOMOTIVE ENGINES.

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In these modern days, when transportation by steam is so cheap, rapid, and luxurious, and when railways are now so far a necessity of our lives that if their traffic was stopped to-day existence would soon become impossible, it is not easy to realize the stupendous difficulties and discouragements the early railway engineers had to contend with, not only in the introduction of the locomotive itself, but in the initial trouble of overcoming the dense opposition of the people as well as the ruling classes of England, and of getting the legislature to permit a railroad to be built at all.

The earliest locomotives bore little resemblance to the magnificent engines of the present day. Their designers were naturally influenced by stationary engine practice, and, with few exceptions, they placed the cylinders in a vertical position, with either fly wheels or more or less cumbrous gearing between them and the driving wheels, while the boilers had but a single flue; consequently, the heating surface was small and they were unable to generate steam

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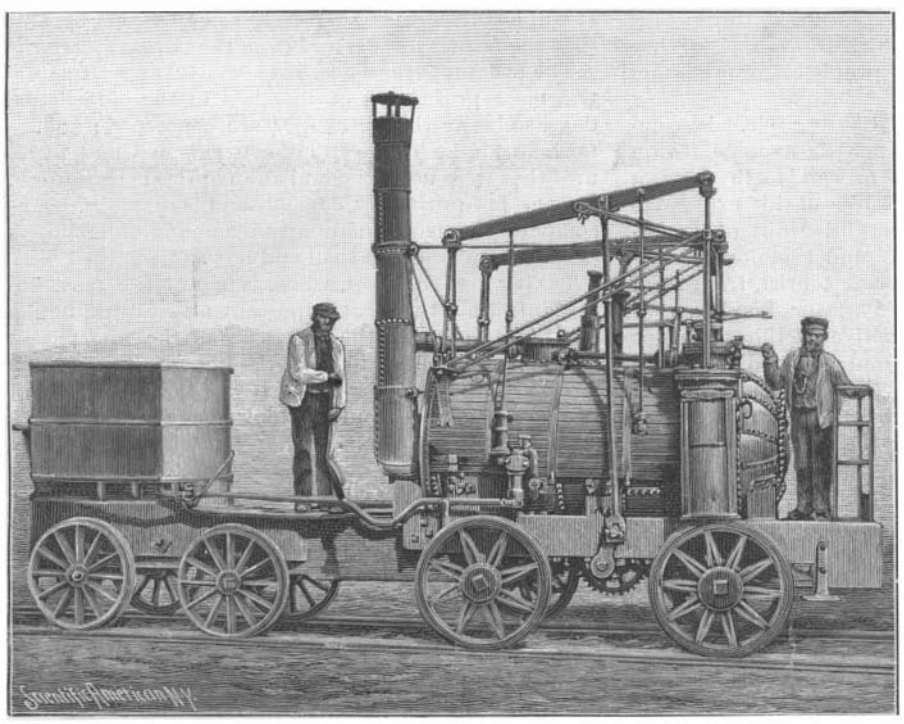

Fig. 1.—ENGINE "PUFFING BILLY," WYLAM RAILWAY, 1813.

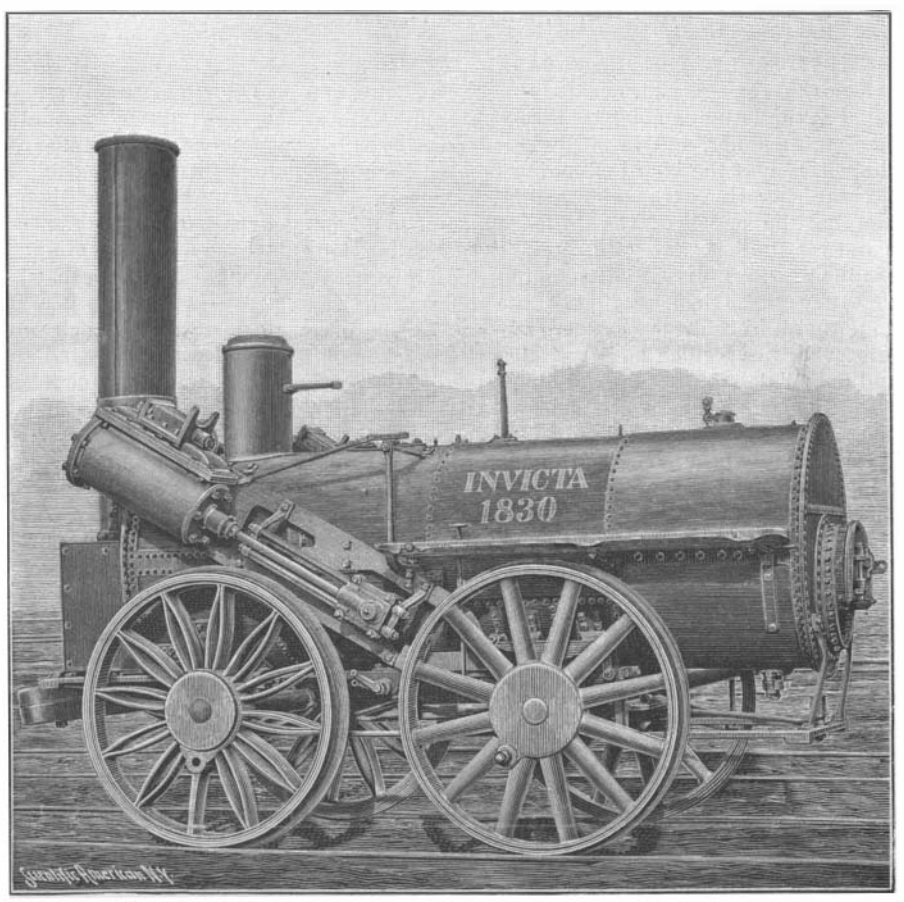

Fig. 3.—ENGINE "INVICTA." CANTERBURY AND WHITSTABLE RAILWAY, 1830.

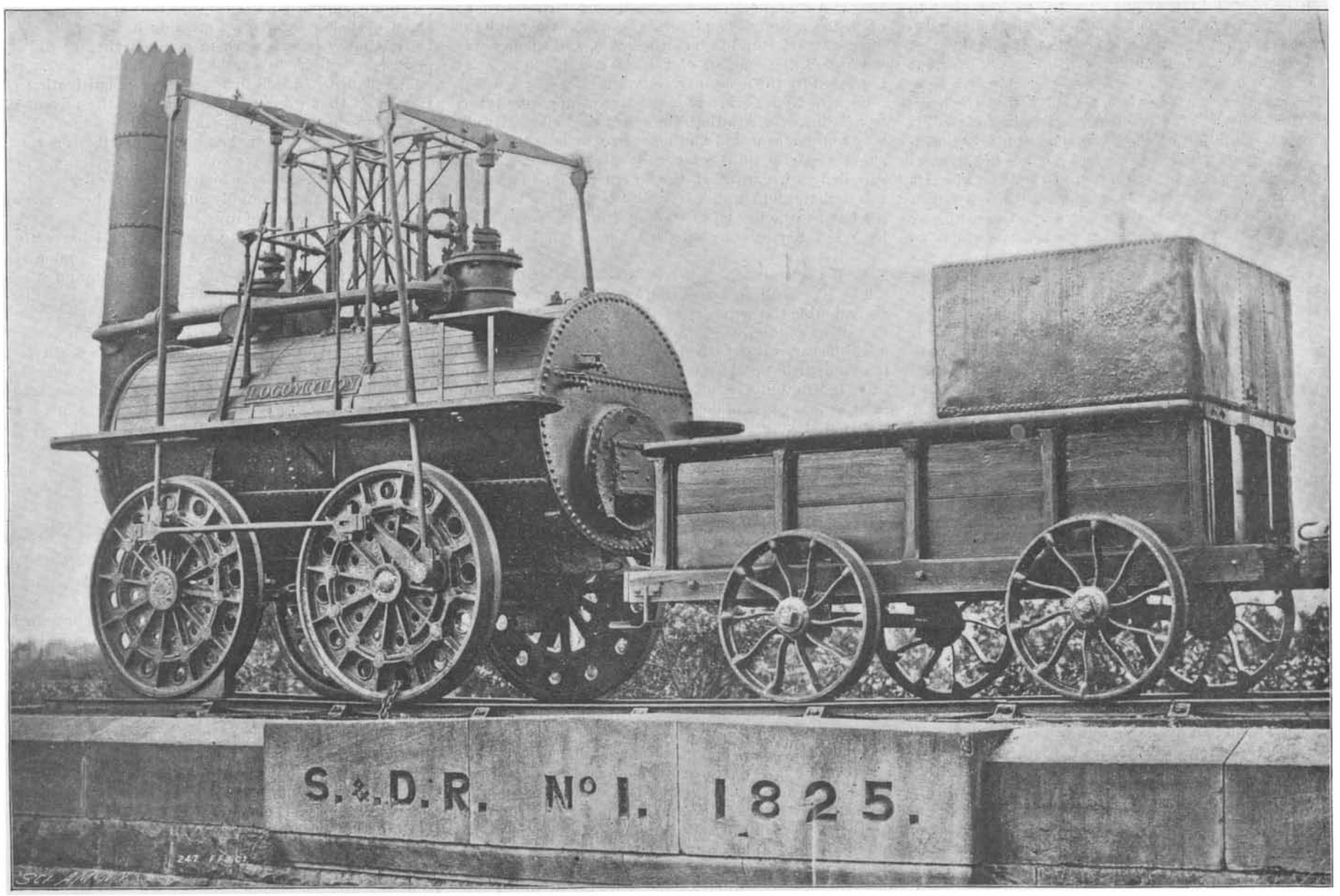

Fig. 2.—ENGINE "LOCOMOTION," STOCKTON AND DARLINGTON RAILWAY, 1825.

ANCIENT LOCOMOTIVE ENGINES.

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with the rapidity required by an engine of the locomotive type.

The attention of the reader is invited to three early English locomotives which are illustrated herewith. The engravings were made from photographs of the engines, published by F. Moore, the well known railway photographer, of London.

Fig. 1 shows an engine built in the year 1813 by Messrs. Blackett & Hedley for hauling coal trains on the Wylam Colliery Railway, Newcastle-on-Tyne. It will be seen that the engine had vertical cylinders, grasshopper beams, and parallel motion, the cranks working toothed wheels connected to the driving axles. The exhaust steam was turned into the chimney. The boiler had a return flue, so that the fire door was at the same end as the chimney, where the fireman attended to his duties, standing in the tender. The engine driver was accommodated with a seat at the other end of the boiler, where he had the levers and working parts within easy reach.

This engine was in continuous service until the year 1862, and was afterward removed to the South Kensington Museum, London, where it has been on view ever since.

The first public steam railroad in the world was opened on September 27, 1825. It was named the Stockton & Darlington Railway and was constructed by George Stephenson. The road is about twelve miles long and now forms part of the Northeastern Railway. Fig. 2 shows the first engine to be used on this railroad. It was named "Locomotion" and was designed and built by Stephenson. As will be seen, the two cylinders were vertical and partly within the boiler; they were thus steam jacketed, which was a good idea as far as it went. The piston rods were kept in line by a species of parallel motion and were connected to cross beams, to which were attached connecting rods to crank pins on the driving wheels. The wheels were coupled, and, as each cylinder actuated but one set of wheels, the awkward looking return crank on the rear driver was necessary to keep the stroke in quarter and so avoid dead centers. The boiler had a single straight flue, which was lined with fire brick at the furnace end. In this respect it was inferior to the "Puffing Billy" (Fig. 1), which had a return flue, giving the fire time to heat the water before passing up the chimney; but in the case of "Locomotion" the fire rushed through the straight flue and out of the chimney, so that it soon got red hot when the engine was laboring. This may account for the expansion joint in the exhaust pipe, seen just back of the forward connecting rod.

The leading dimensions of "Locomotion" were: Boiler, 10 feet long by 4 feet in diameter; working pressure, 25 pounds per square inch; heating surface, 60 square feet; cylinders, 10 inches diameter by 24 inches stroke; wheels, 4 feet in diameter; weight of engine in working order, 14,560 pounds. The safety valve was pressed down by a weight. The tender was of wood mounted on wheels having a diameter of 2 feet 6 inches. A sheet iron tank of 240 gallons capacity held the feed water. The fuel was coal, and the tender in working order weighed about 5,000 pounds. The fireman stood in the tender, and the engine driver had a seat on the foot board at the side of the boiler—an uncomfortable and dangerous position.

On the opening day an immense concourse of people had assembled along the line to see the train go by, nearly every one prophesying that the engine (commonly called the "iron horse") would be a failure. At length the train was ready at the foot of the Brusselton incline, and Stephenson backed his engine down to it. It was a proud day for him, but withal a very anxious one. The train weighed about 90 English tons, and consisted of 6 wagons loaded with coal and flour, then a covered coach containing directors and proprietors, next 21 coal wagons fitted up for invited passengers (450 in number), and, lastly, 6 more wagons loaded with coal.

As six miles an hour was supposed to be the limit of speed, it was arranged that a man on horseback, acting as a marshal or herald, should ride on the track ahead of the engine, carrying a flag inscribed with the company's motto: "Periculum privatum utilitas publica."

The train was started without difficulty amid the cheers of the concourse, many trying to keep up with it by running, and some gentlemen on horseback galloped across the fields to accompany the train, the man on horseback carrying his flag with all due gravity. After a few minutes, Stephenson determined to show what his engine could do, and shouting to the horseman with the flag to get out of the way, for he was going to "let her go," and ordering the grinning fireman to "keep her hot, lad," he opened wide the regulator, and the speed was quickly raised to 12 miles an hour, and then to 15, which, it must be admitted, was a dangerous one considering the state of the track and the build of the engine.

The runners on foot, the gentlemen on horseback and the horseman with the flag were thus left far behind, and so, with the cross beams and side rods trembling with the violent motion, the red hot chimney ejecting clouds of black smoke, the roars of the delighted spectators, and the astonishment of the passengers—some of whom were "professors" of mathematics who had demonstrated that the locomotive engine could not move faster than six miles an hour—the immortal George Stephenson brought the train safely into Darlington.

The "Locomotion" was in continuous service from 1825 to 1841, when it was retired.

It is now in the Northeastern Railway Station at Darlington, and it is said to be still fit for service.

When the Stockton & Darlington Railway was in thorough working order Stephenson became engrossed in the improvement of the locomotive engine, and in the year 1829 he placed his engine "Rocket" on the Liverpool & Manchester Railway, with the success that all who take interest in railway history are familiar with. In the following year he designed and built an engine of similar construction, but of improved form. This engine was named "Invicta," and is illustrated in Fig. 3. It was placed in service on the Canterbury & Whitstable Railway, which now forms a part of the Southeastern Railway. The former road was opened May 3, 1830.

Unfortunately, the engine is in a dismantled condition, and some alterations were made to the firebox after it left Stephenson's shops, but it will be seen that the cylinders and valve chests were at the side of the smoke box, very similar to the arrangement of the modern locomotive. The main frames were of bar iron, but the cylinders were bolted to a frame of plate iron, which was firmly attached to the main frame. The wheels were coupled, but the coupling rods have become lost.

The principal dimensions of "Invicta" were: Cylinders, 10 inches diameter by 18 inches stroke; diameter of wheels, 4 feet; boiler, 10 feet long by 3 feet 4 inches in diameter; diameter of fire tube, 20 inches; working pressure, 40 pounds per square inch.

This engine is still preserved by the Southeastern Railway Company, and it is understood that by the efforts of Sir David Salomons, one of the directors, it will be (if it is not already) restored and placed on view at the Charing Cross Station, London.

An Electrical Injury.

A remarkable electric shock to an electrician occurred on the afternoon of March 7, at the power house on Lexington Avenue and 25th Street, New York. Joseph Hampel was working at one end of the switchboard when there was a flash of light and the electric lights in the building went out and the electric cars over a large section of the city were stalled. Every particle of clothing Hampel had on, except the overalls and drawers on his right leg and part of the right shoulder of his undershirt and blouse, and a piece of his right shoe and stocking, was burnt off. His body was black as burnt cork and his hair was entirely burnt off. The floor was also burned, a large hole being made into which he fell. He finally got his hand off the circuit, and, yelling with agony, ran out into the middle of the room, where a workman extinguished the flames which were still licking the man's garments. An ambulance was promptly summoned, and it was found that he was terribly burned. He was taken to the hospital, and, strange to say, it is probable he will recover. The cause of the accident is unknown. It is thought that Hampel had been using a wrench tightening a screw on the switchboard, and in some manner the screw completed the circuit.

New Comets.

Prof. Lewis Swift, who is stationed on Mount Lowe, just north of Pasadena, Cal., has announced the discovery of a new comet. It was discovered on March 3, and was a large bright comet, visible to the naked eye without a glass. The tail is flat, broad, and short. Prof. Keeler, at Lick Observatory, telegraphed to the Harvard College Observatory that Swift's comet was observed by Mr. Hussey on March 4. Captain C. H. Davis, of the United States Naval Observatory, has also telegraphed to the same observatory that the Swift comet was observed by Prof. Brown on March 5. Prof. Swift stated in his original telegram that the comet was 3 hours 45 minutes in right ascension and the declination was —29°. Prof. Swift has discovered twenty comets, and next to Sir William Herschel, holds the record for finding nebulæ.

Tuttle's Comet.—This comet was discovered by Méchain, at Paris, in 1790. Only a few observations were taken, however, and the comet was rediscovered by Horace P. Tuttle, at the Harvard College Observatory, January 4, 1858. Johannes Rahts, of Königsberg, made the most complete discussion of the orbit, combining the observations of 1858 and 1871–72, having regard also to the perturbations. His value of the period is 13·7 years. The comet was next seen in 1885, and was expected during the present year. An ephemeris was accordingly distributed from Kiel, and it was probably by means of this that a faint comet, supposed to be Tuttle's, was discovered March 5 by Dr. Wolf.

Science Notes.

The Vatican Observatory has recently issued volume v. of its "Pubblicazioni." It forms a volume of 808 pages. It is divided into four sections: astronomy, terrestrial magnetism, earthquake phenomena, and meteorology. The volume shows that they are doing excellent scientific work at the Vatican, which most people consider only in its religious and political aspect.

Mr. Louis de Rougemont still continues to publish his marvelous adventures, and each chapter becomes more wild and improbable. The editors of The Wide World Magazine began printing his wonderful stories as a contribution to geographical knowledge; but they now admit they were imposed upon, and still keep on publishing the articles for the curiosity of the thing.

Rome is to have a subway through the Quirinal Hill to the slopes of the Viminial and Esquiline. The tunnel will be 53 feet wide, with accommodation for carriages, electric cars, and foot passengers. The electric railway from the Porta del Popolo to the Porta San Giovanni will pass through it. The chief engineer estimates that it will take only seven months to build the tunnel.

Some experiments have been tried by Dr. Noel Paton, at Edinburgh. Dr. Paton has made a very thorough investigation into the life history of the salmon, the nature of the pigments which color the flesh, and the changes in its condition during migration. He concludes that when the salmon enters the river it ceases to feed, and relies on its own muscular tissue: but it is a curious fact, however, that salmon rises to the fly, which would tend to militate against this view.

It is stated that the "Physikalisch-Technische Reichsanstalt" is now using silicion carbide crystals or "carborundum," as it is called, to a great extent to replace diamonds in the production of finely graduated scales. Small, flat hexagonal crystals are chosen, from one-half to one millimeter in size. They are mounted in a steel holder by means of a drop of shellac. It is stated that the lines are much more even than those produced by a diamond. They have been examined and magnified fifty times and found to be still sharply defined.

Drs. Lange and Melzing, of Vienna, have succeeded in taking photographs of the mucous membrane of the stomach in the living subject. A stomach tube some 60 centimeters long and with a diameter of 11 millimeters is provided with an electric light at its lower end, and at the upper end is a camera. The stomach is first emptied of its contents, and after being washed is distended with air. Then fifty pictures or more can be taken in rapid succession in from ten to fifteen minutes. The apparatus can be turned on its axis so that all parts of the mucous membrane can be photographed. The photographs are naturally very minute, but they can, of course, be enlarged to any extent.

The plague microbe is most persistent. A Swiss paper gives the following facts: In 1660, the Dutch city of Haarlem was devastated by the plague. Whole families perished, and among them a family of the name of Cloux, the members of which were buried in the Haarlem church. Thirty or forty years ago it was found that the masonry of the tomb was out of repair, and the vault was entirely rebuilt. The masons in charge of the work remained in the vault an entire day, and, strange to say, notwithstanding the fact that two centuries had passed since the epidemic, all these workmen were attacked with the infectious grandular swelling called "bubo," and had to undergo treatment at the hospital. There were no symptoms, however, of the plague proper, and all recovered. It is impossible to give the reason for such a remarkable manifestation of the vitality of germs.

Telephones in England.

The Financial Secretary of the Treasury has announced in the House of Commons that the government has decided to introduce competition in the telephonic services of the country. He asked for a grant of $10,000,000 for a start, in order to enable the Post Office Department to develop the telephonic communication of London. In making the announcement Mr. Hanbury admitted that it was a notorious fact that Great Britain was far behind the United States and other countries in the matter of telephonic communication. The House adopted Mr. Hanbury's proposal.

A Great Demand for Coal.

With the great revival of trade in iron there comes a decided improvement in the anthracite coal business, which has been very much depressed, and at times the Reading Railway has been literally blocked with coal trains. There is a lack of coal-carrying cars on the railroads touching the anthracite regions. There are few dealers in the large cities who are not entirely out or at least short of coal following the February blizzard, and these are now being supplied.