

benefit of it. The question, therefore, was whether Sir Joseph, as patentee or manufacturer, had been sufficiently rewarded for the invention; and he argued that looking at the expense and trouble involved, and Sir Joseph Whitworth's well-known efforts to educate and improve the workpeople in his trade, a prolongation of the patent was justified.

Mr. Gorst, on the part of the Crown, admitted the great value of Sir Joseph Whitworth's invention, and only directed their lordships' attention to the accounts submitted to them in order to guide them as to whether or not the patentee had, as yet, profited sufficiently by his invention.

Their lordships, in the result, prolonged the patent for five years, on the usual and formal understanding that the Government and its contractors might use the invention without the payment of any royalty or charge.

Fast Torpedo Boats.

Messrs. Yarrow & Co., of the Isle of Dogs, have just completed two torpedo boats for the French Government, which they lately delivered at Brest. As a record of a long run for boats of this class—by far the longest that has ever been made yet—it may be mentioned that they steamed the whole distance of slightly over 500 miles, that they were under way 34 hours, and that a mean speed was maintained of 15 miles an hour. The consumption of coal was eight tons, which amount the boats are designed to carry without requiring a fresh supply. This gives 525 lb. per hour, or 35 lb. per mile. The above data are important as showing that long distances can be accomplished by small craft of the kind, provided an excessive speed is not required. Should a speed of 23 statute miles an hour be wanted, the consumption of fuel would be at the rate of 17 cwt. per hour, or 83 lb. per mile. The vessels were subsequently tried on their arrival at Brest for three hours' continuous running at full speed, and were also tested for their turning powers, and in every respect they were found to exceed the best performances of any torpedo boat in the French navy.

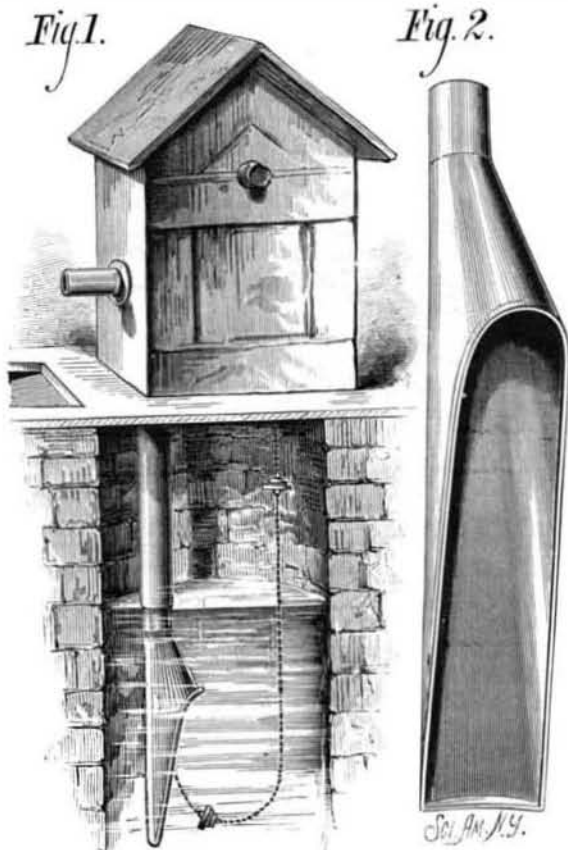
THE ST. LOUIS BRIDGE.

The great bridge over the Mississippi river at St. Louis, shown in the accompanying engraving, which is the largest arched bridge in the world, with its spans of 520 and 515 feet, was designed by Captain James B. Eads as Chief Engineer, and the superstructure was made from his designs and erected by the Keystone Bridge Company. The tubes of the arches are composed of six rolled cast steel staves forced into a cylindrical envelope of steel, the lengths of sections between the joints being about twelve feet, and the depth of the arched rib between the centers of two concentric tubes about the same. The two lines of tubes are braced together, and the ends of contiguous sections are united by couplings, made in two parts, with projections turned on the inner surface to fit into corresponding grooves on the ends of the tubes. The connecting pin for lateral struts, diagonals, and lateral bracing between the several arches is tapered and driven tightly into the joint, the whole connection being made water-tight.

The engraving of the bridge will give the reader an excellent idea of its general design and magnitude. The method of erecting the superstructure was described in this journal during the progress of the work. The arches were built outward simultaneously from the abutments and from each side of the piers, being supported by means of direct guys, composed of two lines of main cables of forty-two square inches section, passing over towers to anchorages on the shore, and by guys balanced over towers on the piers. The towers stood on hydraulic rams, which were caused by automatic gauges to rise and fall, to compensate for changes of temperature in the arches and cables.

IMPROVEMENT IN CHAIN PUMPS.

Mr. John P. Ryan, of Sardis, Miss., has recently patented an improvement in chain pumps which relates especially to the funnel connected with the lower end of the chain tube. The funnel, as will be seen by reference to Fig. 2, is of a peculiar form, well calculated to guide the buttons carried by the chain into the water tube; it has a straight wall and a flaring cut-away side, and a neck which is threaded and adapted to the lower end of the iron water tube. The straight wall of the funnel stands in the path of the chain and prevents it from swinging beyond the foot of the water tube and guides it easily and smoothly, so that little power is required to drive the pump. It is not necessary where this device is used to employ a lower chain guide wheel, as it would only add to the expense of the pump and increase friction, so that more power would be required to work it.



RYAN'S IMPROVED PUMP.

The inventor states that he uses but three buttons to twenty-five feet of chain, and that the pump will easily draw twice as much water as the ordinary chain pump.

Fireless Locomotives.

The fireless locomotives invented and used in New Orleans, La., and heretofore described by us, with engravings, are now being extensively introduced on the street railways in England and France. At a recent session of the Mechanical Engineers, London, Mr. Crampton and M. Bergeron both spoke very highly of the performance of the engines at work in and near Paris, and the opinion seemed to be general that the fireless locomotive offered an excellent solution of the problem of street tramway working. It also removes the objections to mechanical power in docks and on quays where hitherto horses have been used in deference to the laws relating to fires on such premises. Several modifications in

detail were suggested, more particularly with reference to the necessity for raising the working parts of the engine as high as possible from the ground, the arrangement adopted by Mr. Brown, of Winterthur, being referred to as suitable.

There is no doubt that the principle involved is likely to become largely adopted, though the engine itself as at present designed will probably be very materially modified in this country. The advantages claimed for the engine were summed up as follows: "No danger of explosions in the street, or of accidents to the boiler; no red glimmer from the fire during the night; no burning cinders dropped on the road; no cases of fire or other accidents caused by the engine; no noise produced by the valves, blow-off cocks, or blast; no smoke, soot, or disagreeable smell of burnt gases; no stoppages resulting from the burning out of fire-bars, cracking of plates, leakage of tubes, or other causes, and to all may be added that which is the most important of all, namely, the economy which can be realized."

John Miers.

The venerable John Miers, long known as the patriarch of British botanists, died in London, on November 17th, in his 91st year. He was born in London, August 25, 1789, was educated as an engineer, and after leaving school devoted himself to the study of mineralogy and chemistry. In 1825 he published his "Travels in Chile and La Plata." Soon afterward he proceeded to Brazil, where he resided eight years, and made extensive collections of plants and insects. After his final return to England he was elected a fellow of the Linnæan Society in 1839, and of the Royal Society in 1843, acting for a time on the council of both societies. Besides many separate papers he published two large works, "Illustrations of South American Plants" and "Contributions to Botany," in which he exhibited a marked tendency to multiply genera and species. He was one of the few botanists who remained faithful to a belief in the fixity of specific type, rejecting the modern evolutionary ideas. He served on the jury of the Brazilian sections of the Universal Expositions of 1862 and 1867, and was decorated by the Emperor Dom Pedro II. with the commandership of the Order of the Rose. Mr. Miers left his botanical collections to the British Museum.

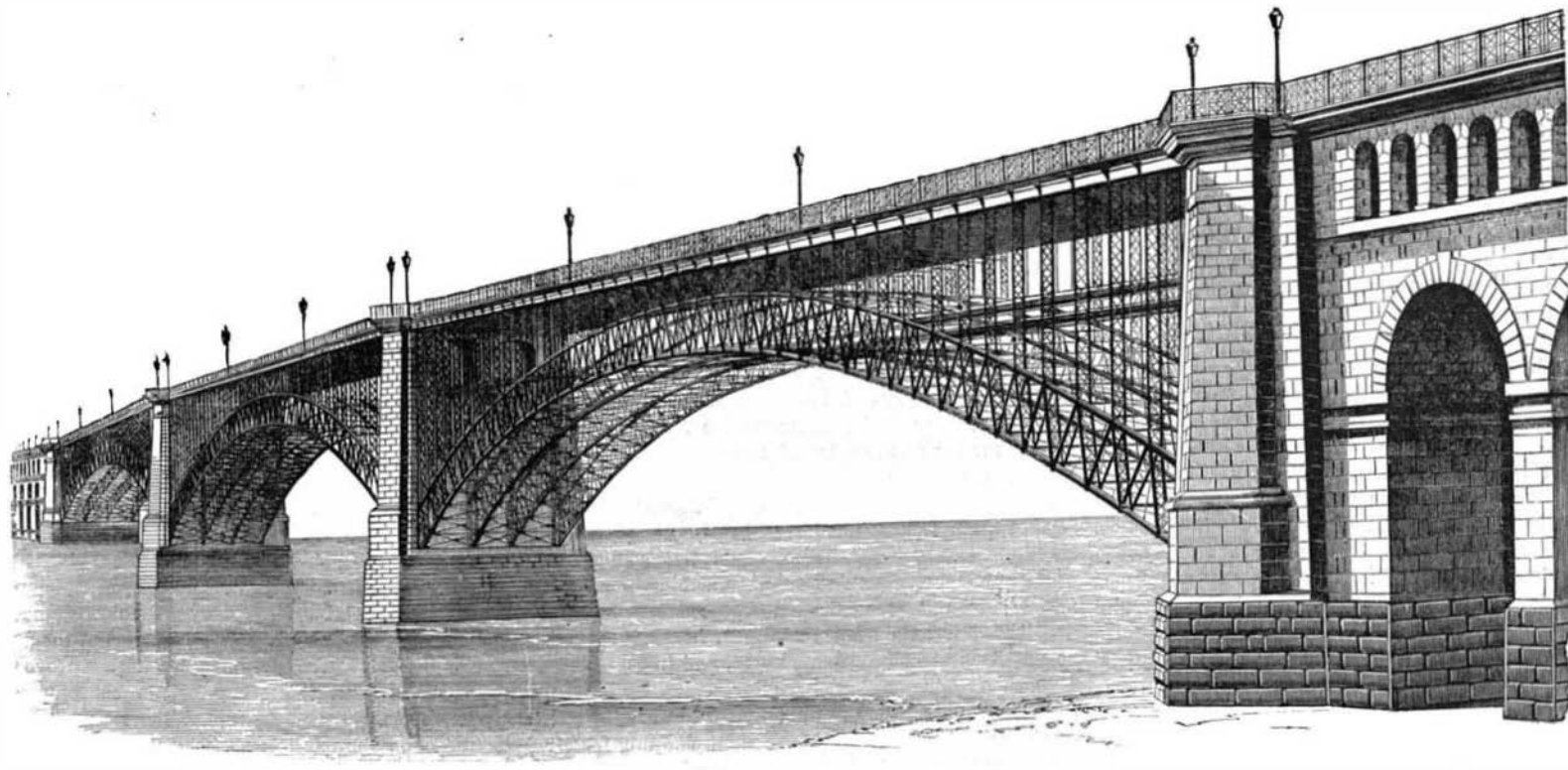
Jean Charles Chenu.

The eminent French naturalist, Dr. Jean Charles Chenu, died recently at the age of 71. His first publication was a treatise on cholera morbus (1835); his second, an essay on thermo-mineral waters (1840). He next applied himself to the preparation of his great folio work, "Conchological Illustrations, or, Description and Figures of All Known Shells, Living or Fossil, with the New Genera and the Latest Discovered Species" (1842-47). In 1852 he became librarian of the School of Military Medicine, made the campaign of the Crimea in connection with the ambulance service, and was director general of ambulances during the siege of Paris (1870-71). Besides many other works, he was author of an "Encyclopedia of Natural History" (31 vols., 1850-61), of treatises on the medical history of the Crimean and Italian wars, and elementary handbooks of ornithology, natural history (1846), and conchology and palæontology (2 vols., 1862, with 5,000 illustrations). He was made a Commander of the Legion of Honor in July, 1871.

The Navigation of the Siberian Polar Sea.

Professor Nordenskjöld's earlier conclusions with regard to the navigability of the sea north of Siberia, and the practicability of a commercial route that way, seem to have been considerably modified. His opinion now is:

1. That a voyage from the Atlantic to the Pacific Ocean,



ILLINOIS AND ST. LOUIS BRIDGE.