SCIENTIFIC AMERICAN

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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LX.—No. 23.
ESTABLISHED 1845.

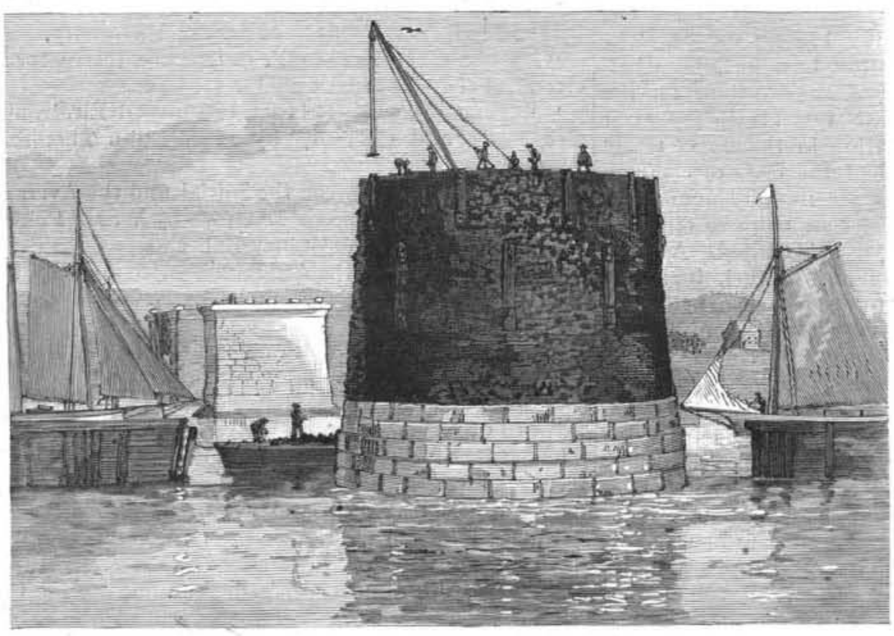
NEW YORK, JUNE 8, 1889.

$3.00 A YEAR.
WEEKLY.

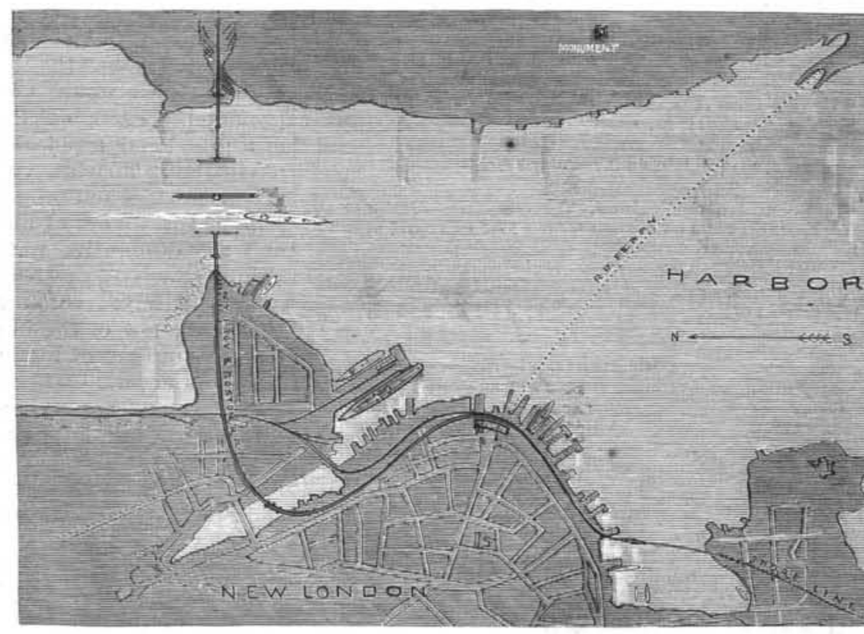
THE NEW LONDON DOUBLE TRACK RAILROAD BRIDGE AND DRAW SPAN.

We illustrate in the present issue the great railroad bridge crossing the Thames River at New London, Conn. Hitherto the "Shore Line" trains on the Providence and Boston routes have been ferried across the stream on a special ferryboat, which was capable of carrying an entire train of cars. The crossing of the "Groton Ferry" has come to be looked for as a regular incident of the trip between Boston and New York, and has perhaps been welcomed often by the passenger on day trains as an agreeable variety in the route. But in a few weeks the boat will take her last trip, and the trains will then cross the estuary

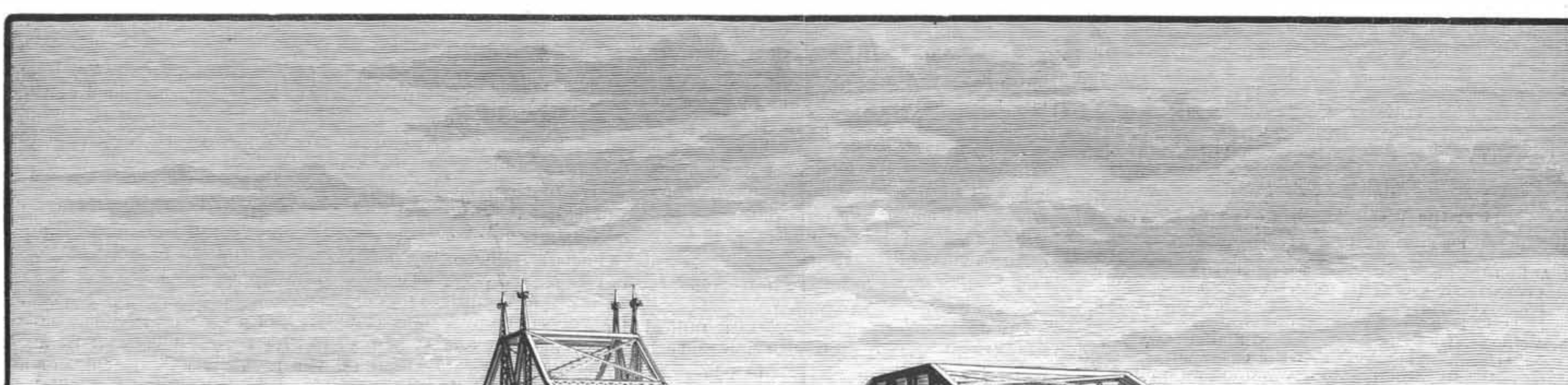
(*Continued on page* 357.)



LOADING THE PIVOT PIER WITH 2,700 TONS OF PIG IRON.



MAP OF NEW LONDON, SHOWING THE NEW AND OLD ROUTES.



THE NEW LONDON DOUBLE TRACK RAILROAD BRIDGE—THE LARGEST DRAWBRIDGE IN THE WORLD.

THE NEW LONDON DOUBLE TRACK RAILROAD BRIDGE AND DRAW SPAN.

(*Continued from first page.*)

by the largest drawbridge in the world, and a saving for the traveler of no inconsiderable amount of time will have been effected.

The work now in progress involves not only the bridge proper, but some five miles of approaches. Mr. Alfred P. Boller has been appointed engineer in the service of the railroad, for the designing and superintendence of this work. The new line of railroad makes a detour in New London and reaches the shore at Winthrop's Point, about half a mile above the present ferry landing. The company in building the bridge was limited by conditions imposed by the U. S. authorities as to its position and span, which, together with the favorable disposition of the shores, caused this point to be selected. On the eastern side, after the shore line is passed, some very precipitous and rocky ground is encountered. The new line is carried through this region for about four miles before joining the main line. No saving in distance is effected by the change. The legal restrictions and nature of the ground made the change of route a necessity.

The Thames River is a tidal estuary about fourteen miles in length. Near its mouth is the town of New London, at its head is the town of Norwich, at which point the Niantic and Shetucket rivers enter it. The bridge is located at a narrow portion, where the inlet diminishes to 1,500 feet in width. On the west shore, the bank descends quite steeply to the river; on the east, the rise is gradual and the water grows shallow more slowly. Fortunately for the building operations, the current is a sluggish one, even in spring freshets, as a rule, not being very serious. The depth of water in the channel, which may be said to include over two-thirds of the width, varies from forty to sixty feet. The bottom is soft at the surface, but runs into a stiffer clay with sand and gravel as a greater depth is reached, and about 130 feet below the water level a hard bottom is reached. This bottom, by means of piling, is used to support and carry the bridge piers.

It is evident that the depth was too great to admit of pneumatic working, and the expense of dredging down and sinking a complete caisson to the solid ground seemed to prohibit this mode of construction. A novel method was therefore adopted. An open caisson or double-walled crib was built and sunk into a hole formed by dredging to the depth of 18 feet below the natural bottom. The center area of this crib was divided into pockets, and the whole was driven full of piling that ran down to hard bottom. The piles were then sawed off; for the center pier, 60 feet below the surface of the water; for the other piers, 42 and 50 feet respectively. An open top caisson was now built with a solid bottom, and with temporary sides carried up above its floor. It was fastened with composition spikes. The bottom was of 12 by 12 inch hemlock, and the sides and deck were cased in double courses of planking impregnated with 14 lb. of coal tar creosote to the cubic foot of timber. It was floated to its position over the piling and crib work. The masonry for the piers was laid upon the bottom of this floating caisson, which gradually sank under the weight until it reached the piling. The masonry was then carried up until above the surface, when the temporary sides were removed, and the masonry pier stood alone in the center of the stream.

The cribs, it will be remembered, were sunk into dredged holes. The center was pretty well filled with piling, but as it stood unbraced within the crib, sand was dumped upon it before the caisson was lowered. This filled every interstice, and the piling is now held as firm and immovable at the top as at the bottom.

The three river piers were all established in general by this method. As the center pier has to sustain alone and unaided the great draw span, it was thought best to submit it to an unusual consolidating process and incidental test. It was accordingly loaded with 2,700 tons of pig iron. This compressed all the timber portion strongly together and forced the caisson floor down upon the piling. Thus any piles that projected a few inches above the rest were forced into the wooden caisson bottom, so as to give all an equal bearing. To give some idea of the amount of metal thus deposited upon the pier, the operation of loading the pier is illustrated in one of the cuts.

The superstructure is built entirely of steel. For most of the members open hearth steel is used. For some compression members Bessemer steel is admitted. The end spans are covered by deck trusses on the triangular system, twenty-four feet deep. These are of 150 feet span each. Next come the two long spans, one on each side of the draw, and of 310 feet span each. These are through trusses, the floor or deck lying in the plane of the lower chord. In the center they are 45 feet deep, at each end 25 feet. The draw span is 502 feet long. At the center it is 75 feet deep, and runs down at each end to 25 feet. The curve described by each division of the truss is a parabola, so that the contour of the cable of a suspension bridge, when the bridge is equally loaded over its entire length, is to a certain extent exhibited. All the span lengths are given from center to center of piers.

The central draw span affords two clear openings of 225 feet width each. The great width was exacted by the Federal government, who possess a naval station above the bridge, and who desired as little obstruction as possible to be placed in the channel leading thereto. Another feature was designed to accelerate the rapidity of operation of the draw. The design provided for swinging the bridge through the entire circle. Thus, when opened for the passage of a vessel, it could be kept rotating, following the motions of the vessel as she passed through and closing without reversal.

The machinery for moving the draw is placed upon the central pier, below the bridge span. It comprises an engine with two oscillating cylinders, 7 by 10 inches, running at 200 revolutions per minute. This motor operates through differential gear, and is thrown into and out of engagement by friction clutches. The turntable proper is of steel, with a heavy rim, which bears upon fifty-eight cast steel wheels. These are coned and bear upon accurately matched steel tracks. The drum is 5 feet deep, and is supported upon eight equidistant points upon the table.

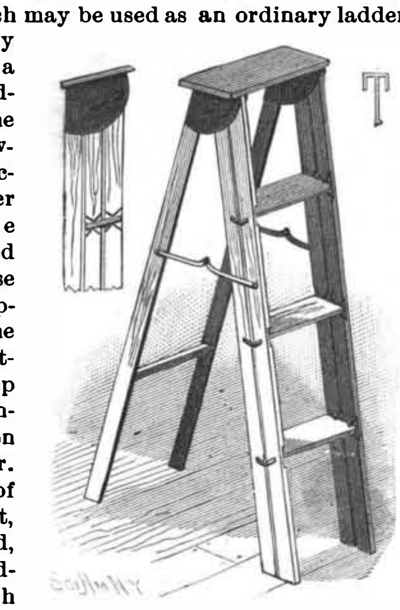
Under the pivot pier there are 640 piles, distributed over an area of about 5,000 square feet. The rest piers are carried upon 368 piles, each distributed over nearly 4,000 square feet. The draw span and table alone weigh 1,200 tons, and, in connection with the stone and caisson floor, brings a weight of eight to ten tons to bear upon each pile.

The superstructure is proportioned and calculated to bear a live load of 3,000 pounds to the lineal foot of track, with the superadded weight of two consolidated locomotive engines. It is two-tracked for its entire length.

The chief engineer, Mr. Alfred P. Boller, of this city, was seconded in carrying out the work by Colonel J. Albert Monroe, resident engineer. Mr. Alexander McGaw, of Philadelphia, was contractor for the masonry, and Mr. Warren Roosevelt for the piling and and timber work. The trusses and metallic superstructure were supplied by the Union Bridge Co., of New York and Buffalo.

AN IMPROVED FOLDING STEP-LADDER.

The accompanying illustration represents a folding step-ladder which may be used as an ordinary ladder, or automatically converted into a folding step-ladder, one of the small views showing a vertical section of the upper portion of the ladder in folded position for use as a folding step-ladder, and the other representing one of the step hinges. This invention has been patented by Mr. John A. Neill, of No. 214 L Street, East Portland, Oregon. The ladder is formed with two pairs of double uprights,



NEILL'S STEP-LADDER.

and folding supports or legs, the latter being secured to the top by plates bolted thereto and secured to the under side of the top. The upper ends of the double uprights project and move between the plates, and are connected thereto by screws or pins riding in curved slots in the plates. The upper ends of the double uprights are formed with inclined surfaces which fit against the under side of the top when the ladder is unfolded, and are connected together on each side by the bent cross portion of the hinge, the main portion of which extends between the uprights and beneath the steps, serving as a brace therefor. The legs and double uprights are held in unfolded position by means of folding brace arms.

The Electrical Census Machine.

This system of machines may be described as follows: The census collector will call with his printed blank, and answers to questions will be written in the usual way. These sheets will then be placed before a person who operates a machine which may be likened to a type writer, except, instead of the usual ink mark on paper, small round holes are punched in a card. The cards, one for each person, are about 6½ inches in length by 3 inches in width, and the particular position of a hole in a card indicates an answer to some of the questions in the printed blank. As many as 250 items of information can be punched out upon a card, although no one card would ever have more than one-tenth part of the whole number, as, for example, no one person can be classed as both white and black, American and foreign born, and if foreign born he can only come from one country.

These cards when punched are placed one at a time in a sort of press, and a lever operated by one hand is brought down, when a series of pins are brought against the card. Whenever a hole has been punched in a card the corresponding pin passes through into a mercury cup beneath, completing an electric circuit. These circuits, one for every hole, pass out to a large number of counters which operate electrically, and which add upon their dials all items of the same kind upon the same dials; as, for instance, all white men upon a dial marked white males; all business or professional people upon dials which indicate their particular business or profession. The cards, as they leave the press, are all sorted by means of an electrical sorting device, whereby they may be separated into groups or States of the Union.

It will thus be seen that the machines are much more reliable than the most accurate human agency, and that one machine will do the work of a large number of clerks. The next census of this country will be taken with these machines, and two will be sent to New York soon for the 1890 census taking.

Treatment of Foreign Bodies in the Stomach.

A method of treatment for foreign bodies in the stomach, which appears to be generally known and practiced with almost uniform success in both England and the Continent, consists in the administration simply of large amounts of potatoes, to which the diet should be restricted. It is stated by Professor Cameron, of Glasgow, that this plan, which, so far as we know, is almost unknown in this country, originated with the London pickpockets, whose custom it is to immediately swallow small articles of jewelry acquired in the pursuit of their profession, and then depend on their recovery through the evacuation which follows the abundant use of the potato diet. Several cases are on record where this method has proved eminently successful. Thus, Dr. Salzer (*Deutsche Medizinal Zeitung* for January 24, 1889) reports the case of a child who had swallowed a brass weight of three hundred grains in September, 1887, and in whom the physician was on the point of performing gastrotomy. According to Dr. Salzer's advice the child was put in bed, kept on his right side, so as to facilitate the passage through the pylorus, and then fed with as much potato, prepared in different methods to stimulate the appetite, as he could be persuaded to take. In five days the foreign body was evacuated in the fæces. He also refers to a case of a patient who had swallowed a set of artificial teeth, and another who had swallowed a breast pin one and a half inches in diameter, in both of which cases the foreign bodies were removed without difficulty.

At the meeting of the Society of Physicians in Vienna, at which the above cases were reported, the discussion which they stimulated led to the report of several other cases, one especially, by Hochenegg, which is especially remarkable in that it dealt with the case of a young carpenter, who, in 1884, swallowed a long nail, which was removed by gastrotomy. Two years later the patient was so unfortunate as to swallow a second nail similar in all respects to the first. The potato cure was employed, and the nail was secured after nine days. In the *Deutsche Medizinal Zeitung* for March 11, 1889, Dr. Deichmuller refers to a case of a young girl, ten years of age, who had accidentally swallowed a pin. Pain was complained of under the breastbone, and Dr. Deichmuller, acting on the suggestion acquired through the report of the above cases, restricted the patient to the potato diet. Very shortly afterward the pain disappeared from the chest and was felt in the stomach. Six days later it appeared in the right inguinal region; two days subsequently, having increased in severity, it was felt in the left inguinal region, while in the evening of this day the foreign body was evacuated with the fæces.

It is hardly necessary for us to call attention to the principles upon which this method is based. Potatoes, as is well known, are composed of nearly twenty per cent. of carbohydrates, eighty per cent. of the solids being starch and cellulose. On account of this large amount of carbohydrate, a great portion will resist the action of the digestive juices. The cellulose and other carbohydrates increasing greatly in volume from imbibition with water, lead to an accumulation of an immense amount of indigestible residue; consequently the intestinal tube is, throughout the entire time of the administration of this food, filled with large masses of non-absorbable matter. The folds of the intestine become obliterated, and fixation of the foreign body in the intestinal tube is thus avoided. It seems that from five to nine days, or even longer, are required for the evacuation of the foreign body, and in every case which does not seem desperate, a trial of this simple plan of treatment should precede resort to gastrotomy. In fact, at the recent meeting of the Vienna Medical College, Prof. Billroth said that since the introduction of this procedure, gastrotomy for foreign bodies should become an obsolete operation.—*Therapeutic Gazette.*