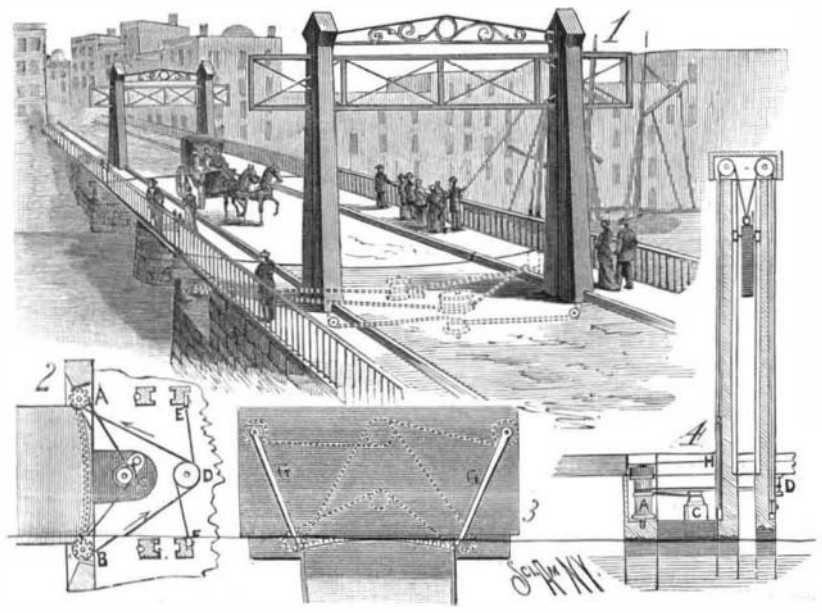
DRAWBRIDGE GATE.

This gate is so arranged as to be automatically moved to close the roadway when the bridge is opened, this closing being effected irrespective of the direction in which the bridge is moved. On each end of the bridge is a circular rack, engaging with pinions, A B (in the plan view, Fig. 2), mounted on vertical shafts stepped in the bulkhead. These shafts also carry drums, shown in Fig. 4, back of which is a double drum, D, and a



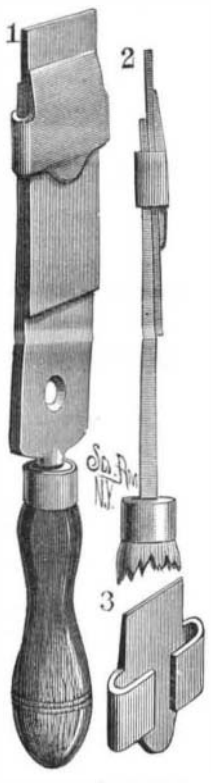
QUATERMASS & ELLSWORTH'S DRAWBRIDGE GATE.

guiding sheave, C, carried by an adjustably mounted bracket. An endless wire rope or chain passes around these drums, as shown in Fig. 2. The gate slides in slots in two posts mounted upon either side of the roadway. Two ropes, secured to opposite sides of the drum, D, pass under sheaves, E F, at the bottom of the posts, thence over sheaves at the top of the posts, and have their ends attached to the gate, which is provided with suitably arranged counterweights.

It is evident that, no matter in which direction the gate may be moved, the pinions will be rotated so as to carry the rope in the direction indicated by the arrows, so that the drum, D, will move to unwind its chains and permit the gate to move down. Appropriate stops prevent the gate from being lowered beyond a certain point. Fig. 3 represents a modification, in which the barrier closing the roadway consists of two swinging arms, G, carried by vertical shafts having drums mounted upon them. The illustration clearly shows the manner of operating these arms.

This invention has been patented by Messrs. R. Quatermass and H. R. Ellsworth, of Moline, Kansas.

SCRAPING TOOL.



Secured to a suitable handle is a bar of uniform width throughout its length, but diminishing in thickness from the end next the handle. Fitted to the bar is a clamp, shaped as shown in Fig. 3. The thin end of the bar is inserted between the arms and body of the clamp and a hardened and tempered scraping bit is placed between the clamp and the bar of the bar. When the latter causes the clamp to draw tightly against the bit, which is held firmly in position for use. By means of this improvement, the bit may be made of uniform temper throughout its entire length, and may be moved forward as fast as it is worn away by grinding. In addition to the advantages secured by the adjustment of the scraper, this construction gives a peculiar elasticity, which causes the scraper to work smoothly.

This invention has been patented by Mr. James Wright, of Torrington, Conn.

STEAM TRAVELING CRANE.

The steam traveling crane forming the subject of illustration, by Henry J. Coles, of 89 Sumner Street, Southwark, is shown at the Liverpool Exhibition. It is of five tons power at a radius of 16 ft., lighter loads being raised at proportionately greater radii. The crane has two steam cylinders, each 7 in. in diameter by 10 in. stroke, fitted with an improved form of reversing motion. The lifting gear is single purchase, of the proportions of about 8 to 1; and as the steam cylinders are of ample area, a quick speed of lifting is attained without running the engines at an excessive number of revolutions. The hoisting pinion is fitted on a long steel feather on the crank shaft, and is made to slide out of gear when lowering by the brake. The main hoisting wheel is keyed to the barrel shaft by a sunk steel key, and has cast to it a strong brake ring. This ring is turned and fitted with a powerful wood-lined strap brake, capable of holding the maximum load suspended, and worked by a suitable lever from the foot plate. The chain barrel is 12 in. in diameter, of great width, having turned flanges; and for any ordinary depth of working it coils the whole of the chain without a lap. The maximum loads are raised at a moderate speed, using the snatch block and return chain. A very quick speed for loads up to about 2½ tons is obtained by working in single chain only.

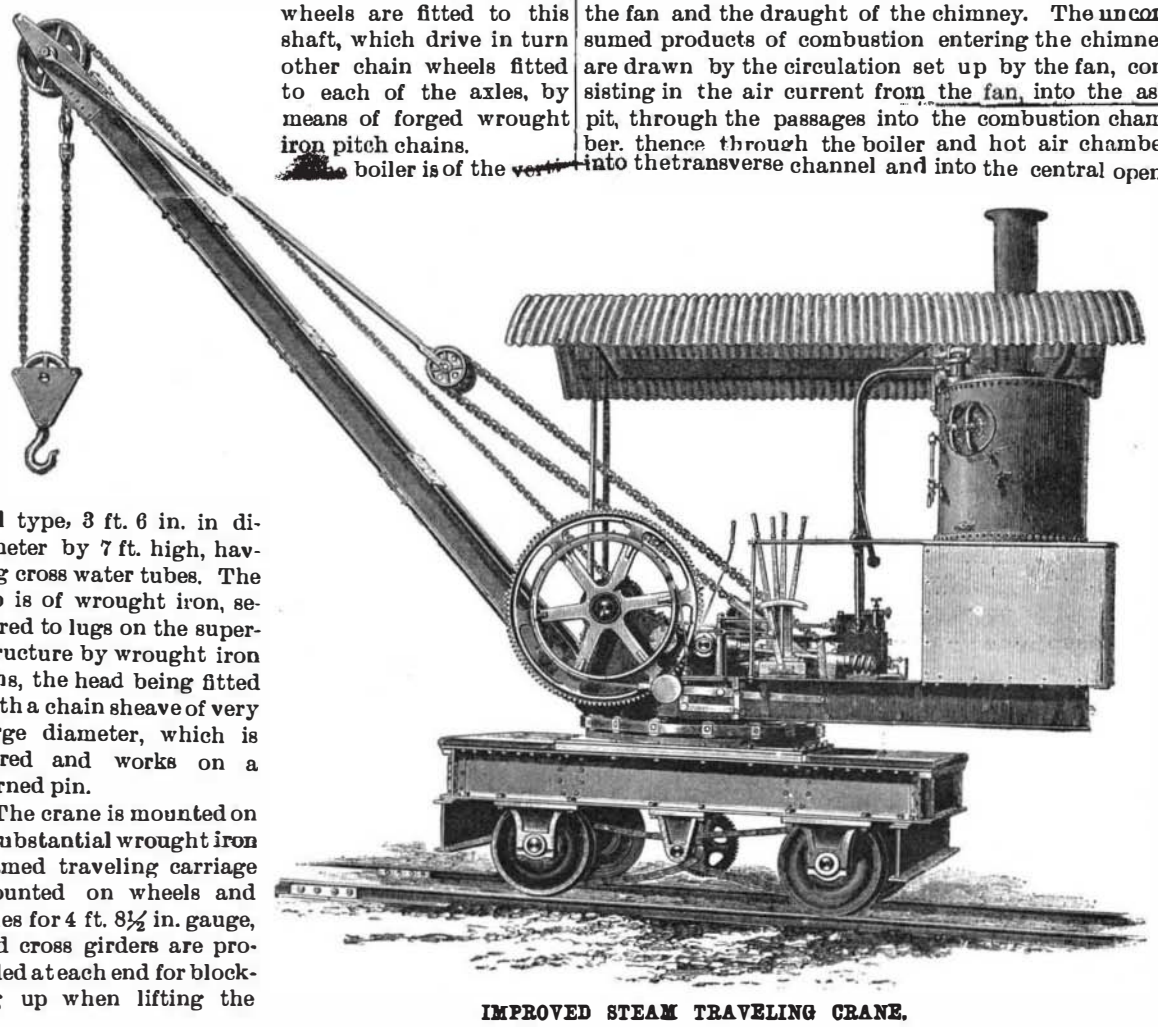
The crane revolves completely round in either direction by steam power without stopping or reversing the engines; and an improved arrangement of loose slewing rack is placed between the upper and lower portions of the crane, which prevents all risk of breakage to the gearing, should the crane be started or stopped too suddenly. The friction cones, which transmit the power from the engines for the revolving motion, are fitted to a shaft running in wide gun metal bearings having loose caps and lock nuts. This shaft is bored up, and has passing through it a spindle fitted at the end with a cotter, this cotter being fitted to the female clutch and held by the spindle. A collar is formed at the outer end of the spindle, which runs in a circular box having phosphor-bronze friction washers on either side to take the thrust of the friction cone. The circular box is attached to a screw working in a suitable nut, so that by merely turning the box in either direction the female cone clutch is worked to correspond, and the rotating motion is imparted to the crane. This method of actuating the cones has been in use in these cranes for some years, and was adopted to obviate the great wear and tear which occurs in the case of a ring either wholly or partially encircling the clutch.

The radius of the jib is varied at pleasure by means of steam derrick motion worked from the crank shaft by suitable bevel gearing driving a steel worm and tangent wheel. The wheel is fitted to the derrick chain barrel, and securely holds the jib locked in any position.

The crane also has its own propelling power for traveling on the rails. The center pin is bored up, and a steel shaft passes through it, having bevel gearing fitted at the top driven from the crank shaft, with a pinion at the lower end gearing into a bevel wheel fitted to a shaft running in separate bearings under the traveling carriage. Chain wheels are fitted to this shaft, which drive in turn other chain wheels fitted to each of the axles, by means of forged wrought iron pitch chains.

The boiler is of the vertical type, 3 ft. 6 in. in diameter by 7 ft. high, having cross water tubes. The jib is of wrought iron, secured to lugs on the superstructure by wrought iron pins, the head being fitted with a chain sheave of very large diameter, which is bored and works on a turned pin.

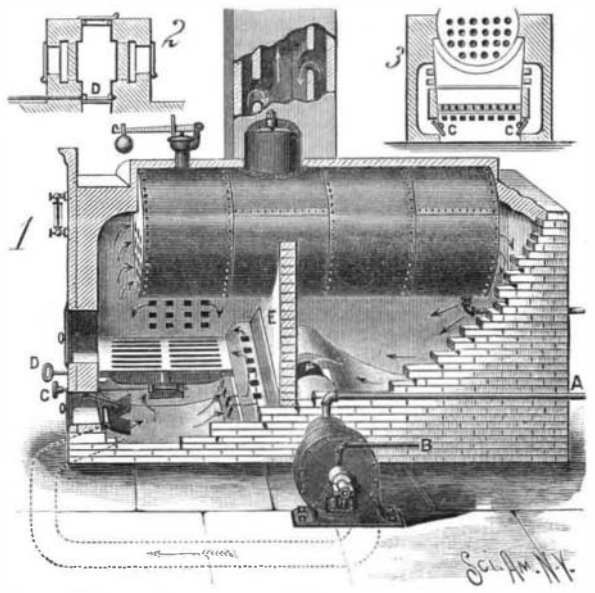
The crane is mounted on a substantial wrought iron framed traveling carriage mounted on wheels and axles for 4 ft. 8½ in. gauge, and cross girders are provided at each end for blocking up when lifting the maximum load sideways. The total weight of the crane in working order is 16 tons.—*Engineering.*



IMPROVED STEAM TRAVELING CRANE.

FURNACE FOR STEAM BOILERS.

The object of the invention herewith illustrated is to provide a furnace for steam boilers, in which a complete combustion of the fuel is accomplished by introducing a mixture of steam, hot air, and gases into the fuel. The bridge wall at the inner end of the grate bars is provided with a partition wall, E, which divides the furnace into two main compartments—the combustion chamber over the grate and the hot air chamber under the rear of the boiler. In the bridge wall are several flues which begin under the grate and open into the combustion chamber, as represented in Fig. 1. In the side walls are other flues, Fig. 3, leading from the ash pit to the combustion chamber; these are furnished with dampers. Into the bottom of the ash pit opens a flue which leads to a mixing apparatus placed at the outside of the wall, and connected with the hot air chamber and with the



HASECOSTER'S FURNACE FOR STEAM BOILERS.

chimney by a transverse channel through the bridge wall. Into the mixing apparatus, consisting of a fan rotated in any convenient way, opens a pipe, A, admitting steam; an opening also provides for the admission of air from the outside. The heating of the journal box is prevented by cold water admitted through the pipe, B. The transverse channel is provided at its entrance to the chimney with a damper, D, shown in the plan view, Fig. 2. On the three outer sides of the chimney are doors, one of which leads directly into the central chimney opening, while the others connect with vertical side flues, which communicate with the central openings through apertures, Fig. 1.

The heat of the fire enters the front end of the boiler flues, and, passing through them, enters the hot air chamber, from which it is drawn up the inclined bottom into the transverse channel by the suction of the fan and the draught of the chimney. The unconsumed products of combustion entering the chimney are drawn by the circulation set up by the fan, consisting in the air current from the fan, into the ash pit, through the passages into the combustion chamber, thence through the boiler and hot air chamber into the transverse channel and into the central open-

ing of the chimney. Other heated products, consisting of combustible gases and hot air, pass into the mixing apparatus, where they are mixed with steam and fresh air entering from the chimney. This mixture enters the ash pit, and part passes through the burning fuel and part enters the flues leading to the combustion chamber. Air from the outside enters the chimney by the side doors, and, after passing up the side flues, enters the central opening, down the outside of which it is drawn by the mixer. This furnace takes the combustible gases from the hot air chamber, and, after adding steam and air, forces them into the combustion chamber.

This invention has been patented by Mr. George Hasecoster, of Fifth and Chestnut Streets, St. Louis, Mo.

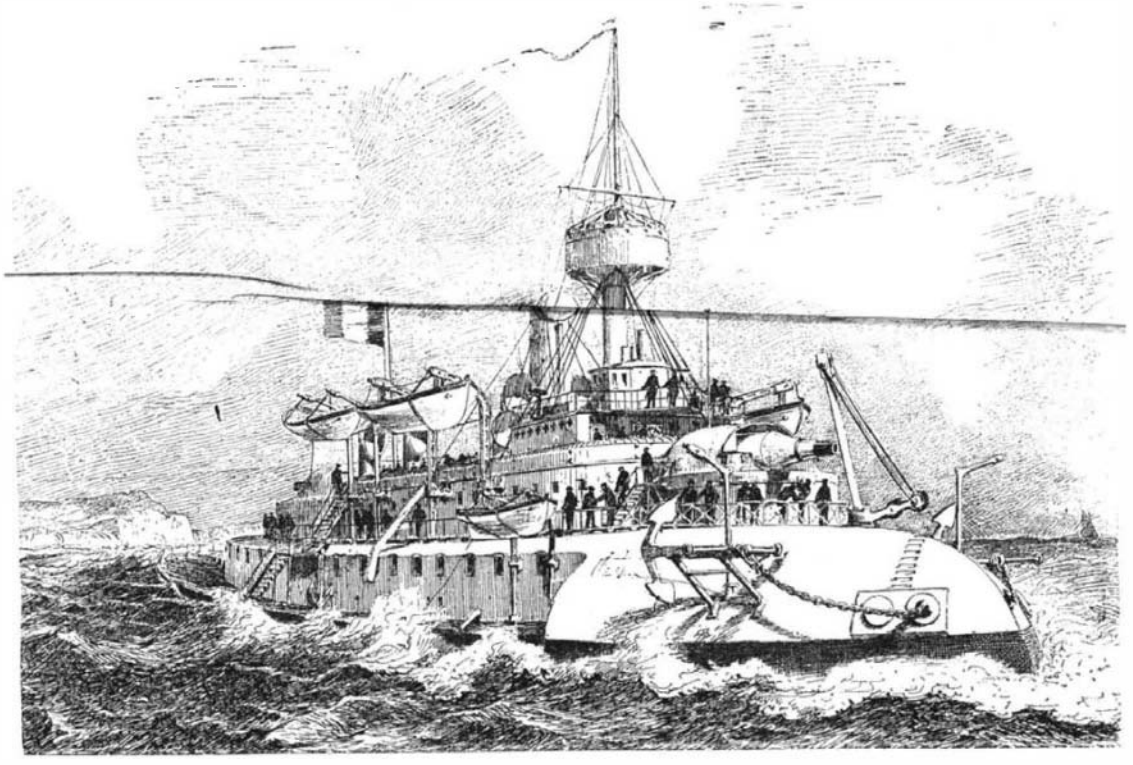
Good Advice.

The *Manufacturers' Gazette* relates of a Western railway company which gives the following advice to its employes gratis. It is applicable to employes in all parts of the country: "The servant, man or woman, who begins a negotiation for service by inquiring what privileges are attached to the offered situation, and whose energy is put chiefly in stipulations, reservations, and conditions to 'lessen the burden' of the place, will not be found worth the hiring. The clerk whose last place was 'too hard for him' has a poor introduction to a new sphere of duty. There is only one spirit that ever achieves a great success. The man who seeks only how to make himself most useful, whose aim is to render himself indispensable to his employer, whose whole being is animated with the purpose to fill the largest possible place in the walk assigned to him, has in the exhibition of that spirit the guarantee of success. He commands the situation, and shall walk in the light of prosperity all his days. On the other hand, the man who accepts the unwholesome advice of the demagogue, and seeks only how little he may do, and how easy he may render his place and not lose his employment altogether, is unfit for service; as soon as there is a supernumerary on the list he becomes disengaged, as least valuable to his employer. The man who is afraid of doing too much is near of kin to him who seeks to do nothing, and was begot in the same family. They are neither of them in the remotest degree a relation to the man whose willingness to do everything possible to his touch places him at the head of the active list."

NEW FRENCH CRUISER TONNANT.

The illustration, which we take from our contemporary of Paris, *L'Illustration*, represents one of the newest types of French cruisers. It was launched at Rochefort in 1880, and is now quite completed and is ready to undergo its trial trips. Its armament consists of one heavy gun of 14 in. caliber in the turret and four smaller guns mounted on its forecastle. This formidable man-of-war measures 248 ft. at the water line; beam, 58 ft., with a depth of 18 ft., and having a draught of 16 ft. 8 in. Its displacement is 4,523 tons. Its armor amidships is 13 in., 10 in. forward, and 9¾ in. aft. The turret is also incased in armor, 14 in. in thickness. The Tonnant carries a crew of 197 men.

According to the new classification adopted for the ships of the navy, the fleet comprises 9 new cruisers, of which the Onondaga is the oldest, and dates from 1863. The Tonnant is the newest, and is the most perfect of all.



THE TONNANT—NEW FRENCH WAR STEAMER.

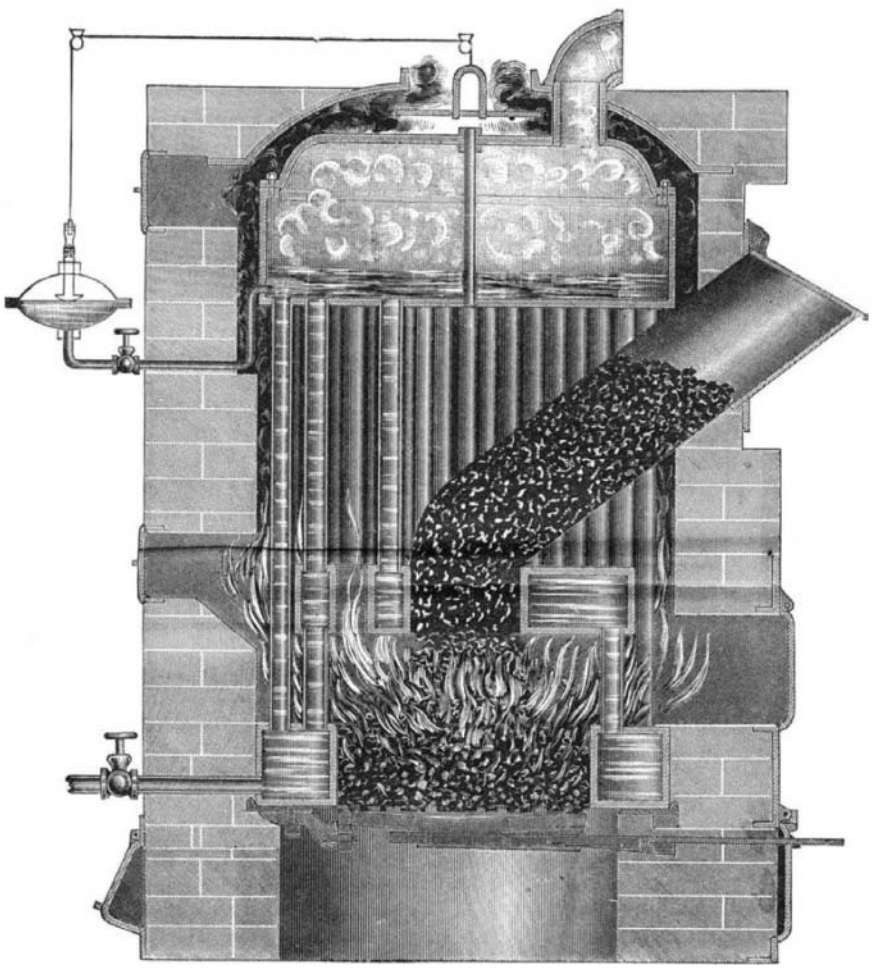
"IN the great fire which burned Murrey's Opera Hall, on Sept. 27, one large door, which was painted with H. W. Johns' asbestos fireproof paint, was the only wood that was not consumed."—*Albany, Wis., Vindicator.*

Metallic Ties.

The Vera Cruz railway, in Mexico, began using steel ties in 1884, and has now some 20,000 of them on its bed. So satisfactory has the experiment been, that 40,000 have been ordered from England for use this year, and it is proposed to put in from 40,000 to 50,000 per year hereafter. The "life" of a steel tie is considered as indefinite, but it may safely be set at from 30 to 50 years, the former being an American estimate by a competent metallurgist. The steel tie is now produced in England—where the manufacture has been so extended as to make the production very much cheaper than formerly—for five shillings apiece, or $1.25 gold. By chartering its own vessels, the Vera Cruz company can land its steel ties at a cost which permits their extensive use. It may be set down that the outside cost will not exceed $2 each, Mexican silver. The wooden ties which the steel ties are replacing on the Vera Cruz line range in price, according to the quality of wood, from 90 cents to $1.62, silver. The latter price is paid for the zapote tie, a very hard and durable wood. The best white oak ties last from five to six years, the red oak about three years. In India the steel tie, sent out from England, is displacing even the teak tie, one of the best woods, and the change is being made on the score of economy. In using the steel tie, expense of spikes is saved.

IMPROVED STEAM HEATING BOILER.

The accompanying engraving represents a steam heater possessing many features deserving attention. In the top of the heater, which is walled in, as clearly shown in the cut, is an annular water chamber, from the top of which leads the steam supply pipe. The fire pot is formed of an annular water chamber, which is connected with the upper one by an outer circle of tubes. Just above the lower chamber, and directly over the grate, is a third water chamber, which is connected by pipes with both the top and bottom chambers. The tube forming the coal magazine, which is inclined as shown, passes through the center of the middle chamber. This construction insures good steaming qualities, as every part of the pipes and chambers is exposed to the direct action of the heat, which, in its passage from the grate to the chimney at the top, is compelled by the arrangement of the pipes and chambers to take a circuitous route. This construction also provides a very perfect and rapid circulation.



BRONSON'S MAGAZINE BASE-BURNING STEAM HEATING BOILER.

Further particulars regarding this steam heater can be obtained from the inventor, Mr. William C. Bronson, of 676 Broadway, Saratoga Springs, N. Y.

Another Electric Motor.

A Third Avenue elevated car, brilliantly lighted with Edison incandescent lamps, recently made trips on the Thirty-fourth Street branch of the elevated railroad in this city. The car was filled with a crowd of interested electricians, for the Sprague electric motor was on trial. Notwithstanding the unfavorable condition of rain and a rusty track, the test was a successful one, and the fact that the car was both lighted, heated, and propelled by electricity, and that the station platforms were similarly illuminated, seems to show that comfort and rapid transit are both to be increased by the use of electricity.

The Sprague motor is carried on the truck of the regular car, and differs from all other systems in the fact that all its parts and movements are controllable by electricity. On this trial the speed of the car was made to vary from 23 miles an hour to a bare crawl. It stopped, switched, and reversed satisfactorily. No brake was used, the car being stopped by electricity. Stopping turns the motor into a generator, thereby saving much of the loss of electricity which happens in other systems. The electricity was supplied by two wires from a house half a mile away. Three tracks were employed, one wire being attached to the two outside tracks and the other to the middle track. The potential used was 600 volts. Mr. F. J. Sprague is the inventor of the new motor. His machine weighs only a ton, while the steam locomotives now in use weigh 20 tons. The motor is attached to each car, thus dis-

Sweetened Mortar.

A letter in the London *Times*, by Mr. Thomson Hankey, points out that cane sugar and lime form a definite chemical compound, which has very strong binding qualities, and forms a cement of exceptional strength. Equal quantities of finely powdered lime of a common kind and of good brown sugar, mixed with water, form a mortar which has been found to join stones and even glass with great success. It is important that the lime should be thoroughly air-slaked, for if any dry particles be left they will swell and eventually break the joint. It is stated that this mortar is equal in strength to Portland cement, and that the latter may probably be improved by the addition of sugar, or perhaps even of treacle. A number of small experiments which have been made have proved entirely successful, and it now remains to see whether the material offers advantages in actual work sufficient to pay for its extra cost.