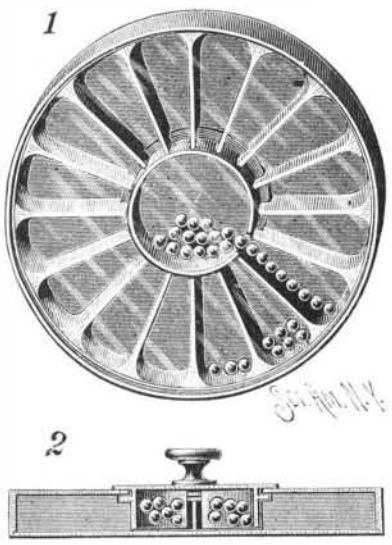
A KINDERGARTEN TEACHING DEVICE.

An exceedingly simple educational device, adapted for use in the kindergarten method of instruction, is shown in the illustration, and has been patented by Mr. Jose Gallegos, of Ocos, Guatemala, C. A. A light cylin-

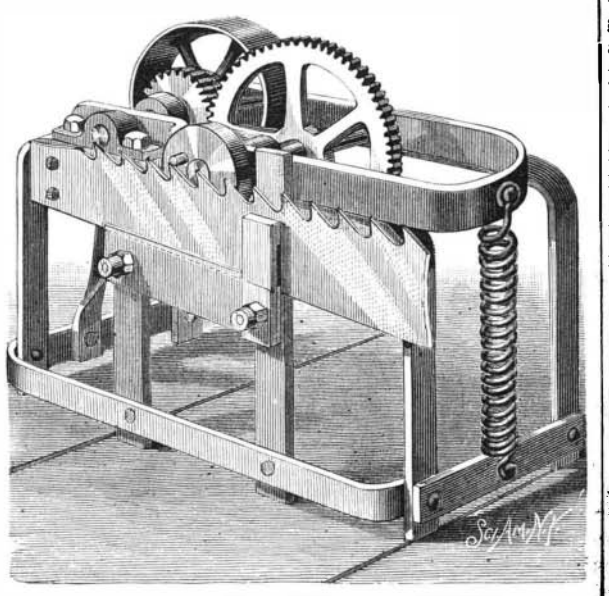


GALLEGOS' DEVICE TO TEACH ARITHMETIC.

drical case, with a glass front, is divided by radial ribs into numerous compartments open at their inner ends, where there is a central recess, in which is placed a circular pocket. This pocket is revoluble by means of a knob or handle at the back of the case, as shown in the sectional view, Fig. 2, and has in one side a slot to permit the balls to pass through, one by one, into the several compartments between the ribs. By permitting one or more balls to pass through the slot, as shown in Fig. 1, the pupil may be taught to add and multiply as the balls are distributed, counting being taught as the balls are dropped one by one through the slot. The device is also designed to serve to some extent to amuse small pupils.

A MACHINE FOR FINISHING SAWS.

A new method of finishing saws, with a machine adapted to facilitate the work, form the subject of a patent recently issued to Mr. Thomas J. St. Louis, of Cadott, Wis. It is designed by this means to prevent the cracking of the saws by removing their sharp edges, destroying the cross creases, and breaking up and removing the case-hardening made by the emery wheel in grinding the teeth. The saw is held upon an anvil on the front side of the frame of the machine, in such a position that each tooth may be engaged by a die in the shape of a pin projecting from a crank disk, as shown in the illustration, the pin-shaped die having a groove in its working edge which straddles the top edge of the saw tooth. The crank disk is held on a transverse shaft mounted in a slightly swinging frame, which has its fulcrum on the main driving shaft, the shaft frame being yieldingly held on the main frame of the machine by a spring connecting it at one end with the base of the machine. A laterally sliding pinion and clutch on the main driving shaft afford the means of causing the rotation of the crank shaft as desired on moving a shifting lever. With the saw held in position, as shown, the rotation of the crank disk moves the die in contact with the top edge of the saw tooth, the die rolling off thereon and finally engaging and rolling in the throat, at the same time pushing the saw forward as the rotation of the disk continues, the yielding frame swinging upward according to the downward movement of the die. The distance of the die from the center of the crank disk is such that at every revolution the saw blade will be moved forward a sufficient distance to cause the die to engage the next tooth on the succeeding revolution, the die in each case exerting a rolling pressure along the top edges of the tooth, in the base of the throat, and up on the forward edge of the succeeding tooth.

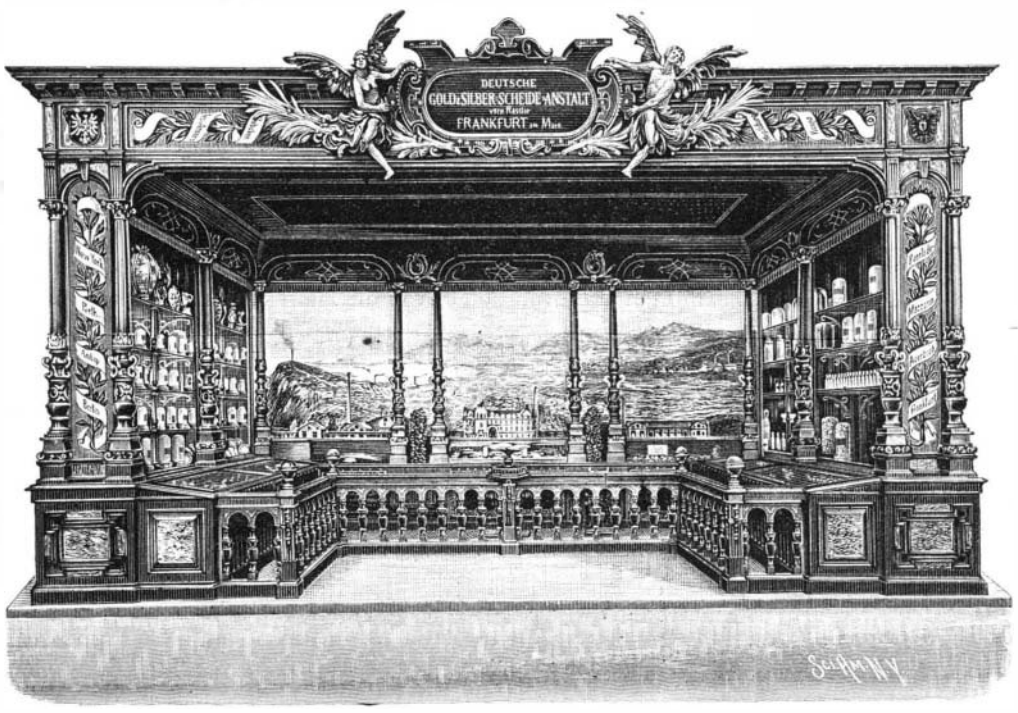


ST. LOUIS' SAW FINISHING MACHINE.

A GOLD AND SILVER REFINING ESTABLISHMENT.

An exhibit in the German department of the Mining building highly pleasing to the eye, through its refined elegance, is the pavilion of the Deutsche Gold u. Silber Scheide-Anstalt, vorm. Roessler (the German Gold and Silver Refinery, late Roessler), Frankfort-on-the-Main, located on the main aisle dividing the building from east to west. The large showcase is entirely constructed of walnut with gold ornamentations, the chemicals, etc., manufactured by the concern and its branches being shown to the right and left in large glass cases, while the background is formed by a plastic and pictorial representation of the different establishments.

Well executed models of the works and the central office in Frankfort-on-the-Main and of the desilverizing establishment at Hoboken, near Antwerp, are mounted in the foreground. To the left is seen the Mediterranean port of Mazarron, in the Spanish province of Cartagena, with the silver-lead ore smelters of the Compania Metalurgica de Mazarron, the Spanish branch of the concern. To the right, the painting represents the Bergstrasse in Odenwald, with the quinine factory Auerbach and the ruin of the old castle of the same name. The azure blue of the Mediterranean, with its bright sky overhead, the brilliant coloring of the southern landscape, and the more somber hues of the Hessian Mountains, all combine to produce a striking effect and to relieve the exhibits, otherwise of a strictly commercial character.



THE COLUMBIAN EXPOSITION—A GERMAN GOLD AND SILVER REFINERY EXHIBIT.

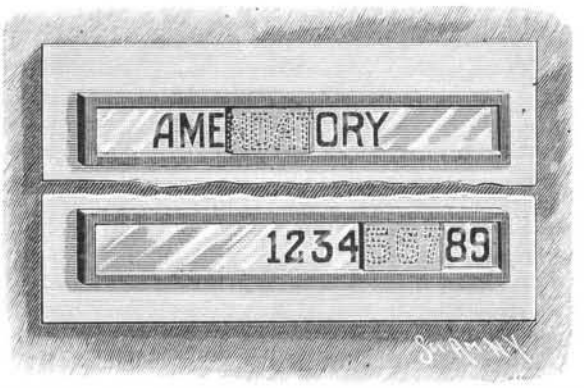
The German gold and silver refinery of the company refines about 9,000,000 ounces gold and silver during a year, and its total sales in 1892 amounted to 10,000,000 ounces silver and 200,000 ounces gold. The chemical works of the concern have a large output of nitrate of silver, chloride of gold, cyanide of potassium, metal oxides, and other chemicals for pharmaceutical and industrial uses. Their ceramic department manufactures liquid bright gold and many hundred shades of overglaze and underglaze colors, the total sales of colors and chemicals being more than 14,000,000 marks per year. The year's production of the quinine factory Auerbach is over 2,000,000 ounces of quinine.

A flat showcase in front of the models contains refined gold in ribbons and grain silver to the value of many thousand dollars. In another case the Roessler & Edelmann's new desilverizing process is demonstrated by a series of products. This patented process, which introduces the aid of aluminum in the old zinc desilverizing process, is for the first time exhibited in any world's exposition. A pamphlet describing fully the process points out as its principal merits the saving of time and material. It is in use in the above named desilverizing works in Hoboken, near Antwerp, where about 67,000,000 pounds of lead, 4,000,000 ounces of silver, and 5.000 ounces of gold are yearly produced.

The Roessler & Hasslacher Chemical Company, an independent New York corporation, with works in Perth Amboy, N. J., whose products were described in a recent issue, is the American branch of the Frankfort concern. Bernhard Roessler & Co. and Louis Roessler & Co. are the branches of the concern in Berlin and Vienna. All these establishments are named on the border of the showcases.

A DEVICE TO TEACH SPELLING.

This is a cheap and simple device, which may be easily carried in the pocket. It consists of a small and light frame, flush with the back side of which is inserted a glass, while its top or outer portion has flanged



GALLEGOS' DEVICE TO TEACH SPELLING.

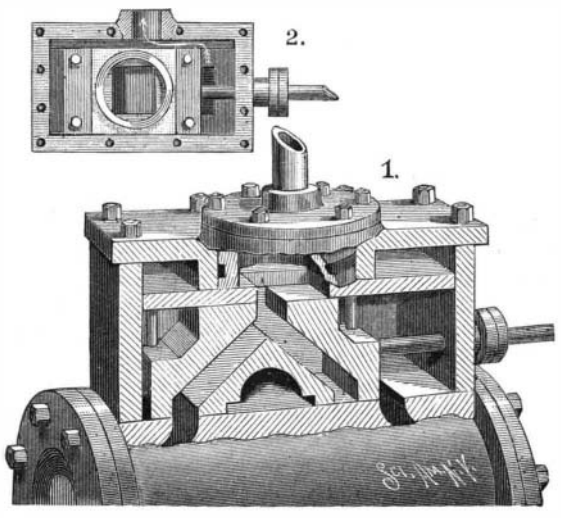
edges adapted to inclose a slide block designed to be moved along over the glass. The device may be applied to words or numbers upon a book or any other surface, so as to cover a portion and expose other portions, dividing the word into syllables and letters, as may be desirable in teaching small children, or exposing successive figures as may be advantageous in teaching the reading of numbers. The improvement has been patented by Mr. Jose Gallegos, Ocos, Guatemala, Central America.

An Adhesive Cement.

Equal proportions of gum tragacanth and tapioca are ground together and heated with water at about 70° Fah., after which there are added about 50 per cent of gum hog and an equal amount of starch, and the whole mixture heated at from 70°—120° Fah. The cement thus produced is said to be superior to any hitherto known for the requirement of silk and cotton manufacturers, calico printers, book binders, hat and boot makers, etc.

AN IMPROVED BALANCED SLIDE VALVE.

The valve shown in the illustration, recently patented by Mr. George S. Neeley, of Pacific, Mo., is of very simple and durable construction, and is designed to reduce the friction to a minimum and utilize the steam to the greatest advantage. Fig. 1 is a sectional view showing the valve in position on a steam chest, Fig. 2 being a plan view. The ports of the valve are moved by the valve stem to alternately connect with the ports at either end of the cylinder, the valve ports diverging from a common port registering at all times with a port in a plate held loosely on the top of the valve. On this plate is a hollow piston fitting steam tight in a cylinder in the cover of the steam chest, the upper end of the cylinder being closed by a cover through which extends the steam supply pipe, while on the under side of the cover is a spring pressing on the hollow piston, to hold it in contact with the plate. The area of the piston is about one-fifth more than that of the port in the plate, and, while all the steam passages are very direct, it is designed that, by the interposition of the plate between the hollow piston and the slide valve, the latter will be sufficiently counterbalanced to insure easy running, with the least possible friction.



NEELEY'S BALANCED SLIDE VALVE.

The Malleability of Iron.

The mill manager of Messrs. W. Hallam & Co., of the Upper Forest Tin Works, near Swansea, succeeded in making a sheet of the finest appearance and thinness that has ever yet been seen by mortal eye. The iron from which the sheet was rolled was made on the premises. It was worked in a finery with charcoal and the usual blast; afterward taken to the hammer, to be formed into a r gular flat bottom; from thence conveyed to the balling furnace, and when sufficiently heated taken up to the rolls, lengthened, and cut by shears into proper lengths, piled up, and transferred to the balling furnace again; when heated it was passed through the rolls, back again into the balling furnace, and when duly brought to the proper pitch was taken to the rolls, and made into a thoroughly good bar.

It was then taken to the tin mills and rolled till it was supposed to be thinner than 23 grains, afterward passed through the cold rolls to give it the necessary polish, and it stands on record as the thinnest sheet of iron ever rolled. The sheet in question was 10×5½ inches, or 55 inches in surface, and weight but 20 grains, which being brought to the standard of 8×5½ inches, or 44 surface inches, is but 16 grains, or 30 per cent less than any previous effort, and required at least 4,800 to make one inch in thickness.—*Paper Maker's Journal, England.*

Great Circle Sailing.

The advantages to be derived from sailing upon the arc of a great circle are described in the North Atlantic Pilot Chart for July, issued by the United States Hydrographic Department, as follows:

It is too common a practice among mariners to accept the straight line of the Mercator chart, *i. e.*, the rhumb line, as a direct route. The rhumb line, in itself, offers the single advantage of a true course (technically, so called) which is constant; but this is more an imaginary than a real advantage, because the true course must frequently be corrected for the magnetic variation, and the original rhumb is never strictly maintained over long distances.

Although the chart serves to direct a vessel's course and to mark her progress, the vessel herself actually sails upon the surface of the sphere. When her course is shaped by the rhumb, she approaches her port in a roundabout way, in reality never heading for her port until it is in sight. The rhumb line of the sphere is a spiral, which has the property of making a constant angle with the meridians. Upon the Mercator chart it projects as a straight line, and thus presents a false appearance of minimum distance.

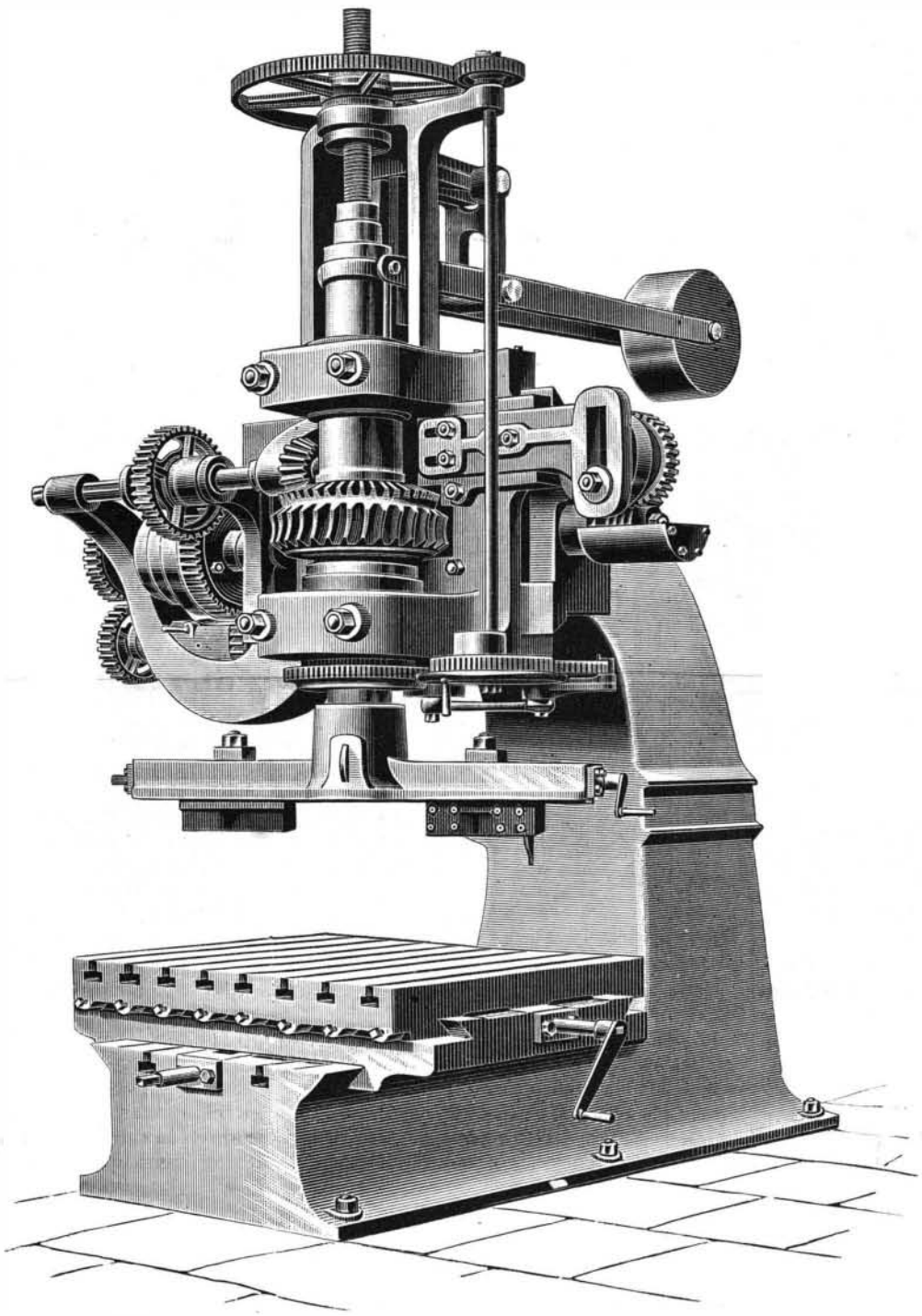
A glance at a globe, or at a thread stretched across its surface, makes it apparent that the shortest distance between any two places upon the surface of the sphere is along the great circle which joins them, and that it is only while maintaining her great circle course that the vessel heads for her port as if it were constantly in sight. Except when sailing along a meridian, or the equator, the true course upon a great circle changes gradually with the advance of the vessel, but so slowly that in practice a new course need be set only for each 100 or 200 miles of distance made good. Since the great circle course for any position of the vessel is quickly found, the necessity for a change of course may be easily investigated.

When a great circle route is to be taken, the whole route should be projected upon the sailing chart, either by a continuous line or by frequent points, that it may be examined for general direction, obstructions, meteorological conditions, etc. When a vessel falls off the original great circle, she should not attempt to regain it, for the shortest distance then is upon the great circle that joins her position to her place of destination. Her course is always the great circle course at her actual position. In general, it will suffice for sailing vessels to shape courses as usual, following the general direction of the original great circle as projected, but it is preferably for fast steamers to ascertain the exact great circle courses. From what has been said it is seen that a vessel, in pursuing a great circle route, practically sails upon a series of short rhumbs closely approximating a great circle.

The distance saved by a great circle route, as compared with a rhumb route, varies greatly, according to conditions. Between Yokohama, Japan, and Cape Flattery, Washington, it is 268 nautical miles; from Belle Isle to Malin Head it is only 36 miles, the total distance being only 1,692 miles.

IMPROVED CIRCULAR AND ELLIPTICAL BORING MACHINE.

We illustrate from *Engineering* a circular and elliptical boring machine constructed by Messrs. G. & A. Harvey, Albion Works, Govan. On the upper surface of the main frame or standard, which is of box section, there is bolted a slide or bed having planed V's and carrying a belt, cone and spur-driving gear. On the front of the bed there is fitted a saddle with a bearing for a sleeve, through which passes the boring spindle, which is 8 inches in diameter. On this sleeve a worm and bevel wheel are securely fixed, the former gearing into a bevel pinion on the end of the spur wheel shaft, the motion of either driving arrangement being conveyed direct from three-stepped cone or double gear, as desired. The spindle carries a double-ended tool slide having 8½ inches in vertical travel, the tool boxes of which are movable horizontally for boring diameters from 3½ inches to 60 inches. By using one tool box and giving motion along the slide to the saddle by means of worm, worm wheel, disk and connecting bars, holes may be bored varying from a complete circle to those of an elliptical form, whose transverse and conjugate diameters have not more than a difference of 7 inches. The spindle is counterbalanced by lever and weight, and has 14 inches vertical travel by hand or self-acting feed when the double-ended slide is removed. On the upper tool slide there is fitted a compound table adjustable by hand by means of screws. The upper table is furnished with ⊥-slots for securing the work required to be operated upon.



IMPROVED CIRCULAR AND ELLIPTICAL BORING MACHINE.

BY mixing a saturated solution of carbonate of soda with ordinary carmine ink, red lines may be successfully drawn on blue prints.

Practicability of Increased Tractive Power on the New York Elevated Railroad Structures.

The experience of the "Alley" elevated road in Chicago shows very conclusively, says the *Railroad Gazette*, that six, seven, and even eight-car trains are readily handled, so far as loading and unloading are concerned, whenever the platforms are made of snitable length. This is practically a demonstration that the capacity of existing elevated roads can be increased materially by hauling a greater number of cars at the hours when more capacity is needed.

In Chicago, for instance, the number of trains that can be sent out from Congress Street in an hour is limited to the delivery of a single stub terminal. The headway so far has been about 2½ minutes. With a six-car train this accommodates about 500 passengers each 2½ minutes, or 14,400 passengers an hour. With eight-car trains it would be 19,200 passengers an hour. The only extra cost of hauling the greater number of passengers lies in the increased number of guards on the trains and some additional expense for fuel. The increased fuel used is not in proportion to the increase in train, being much less; so that the total train expense per passenger is materially decreased by using the longer train. The result then is a decrease in train expense per passenger, and increase in total capacity by using more cars per train.

To make the same time over the road this requires a heavier engine, as elevated railroad motors are, as a rule, worked to their full capacity. In Chicago their capacity is about seven cars per train. So far as the structure is concerned, it is not strained practically any more by a longer train than by a short one, except perhaps on curves; but as the trains are allowed to float around the curves at a slow speed, probably no greater strain would be produced there. The limit of train length with the present form of steam motor lies in the limit of weight that can be made available for adhesion on the locomotive. The locomotives in New York weigh about 47,000 pounds; in Chicago about 58,000 pounds. If all of the weight of the Chicago engines could be made available for adhesion, the locomotives would be sufficiently powerful to haul at least nine cars per train. The steam supply is quite sufficient on those engines for the increased work that would be demanded. As the engines are designed, they have trucks under the tank which carry about 18,000 pounds, or nearly one-third of the total weight. This weight is useless for adhesion, and is, in fact, a dead weight that has to be carried without serving any really useful purpose.

This explains the preliminary facts relating to the point we wish to bring out, which is that the existing elevated railroad structures could be made to carry much longer trains by a proper arrangement of the weight of the locomotive. Before radical steps are taken, if ever they are, to modify existing structures of elevated roads, it should be seriously considered whether longer trains would not be more profitable than the five-car trains now run.

Sudden Death to Flies.

"Come inside a minute," said a Fourth Avenue dealer in pianos, yesterday afternoon. "I have discovered the greatest fly trap on earth and I want to show it to you." He led the way to an instrument at the rear of the store on which was a newspaper. On the paper had been placed a bunch of sweet peas. At least a thousand dead flies were lying on the paper in the immediate vicinity of the bunch of flowers. "I threw these here by chance," he continued, "and in about ten minutes I happened to notice that every fly that alighted on the flowers died in a very short time." Even as he spoke a number of the insects which had stopped to suck the deadly sweet had toppled over dead. They alighted with their usual buzz, stopped momentarily, quivered in their legs, flapped their wings weakly several times, and then gave up the ghost.—*Louisville Journal.*