

**RAPID TRANSIT OF MATERIAL.**

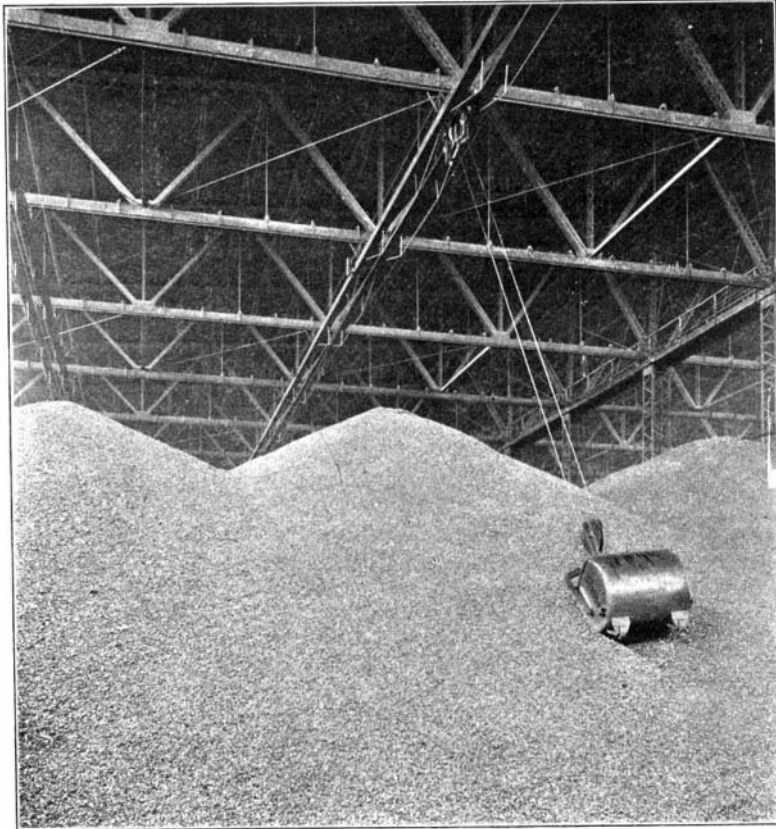
BY DAY ALLEN WILLEY.

The changes that have taken place within a comparatively few years in the mechanism for the handling of material at the factory, in the storage yard and at the docks, have been productive of truly marvelous economy in time, labor and cost. One of the best known of the modern systems for the mechanical handling of material is the Brown hoist, which has been developed into a variety of forms, of which the bridge tramway plant is the best known. This device is principally used in transferring ore, coal and other material from the car or vessel to the storage pile, and is composed of steel trusses supported upon towers which move along tracks. The tramways are provided with hinged aprons, which project over the car or vessel, and with cantilever extensions at the opposite ends. The buckets serve a space 300 to 350 feet in width if desired.

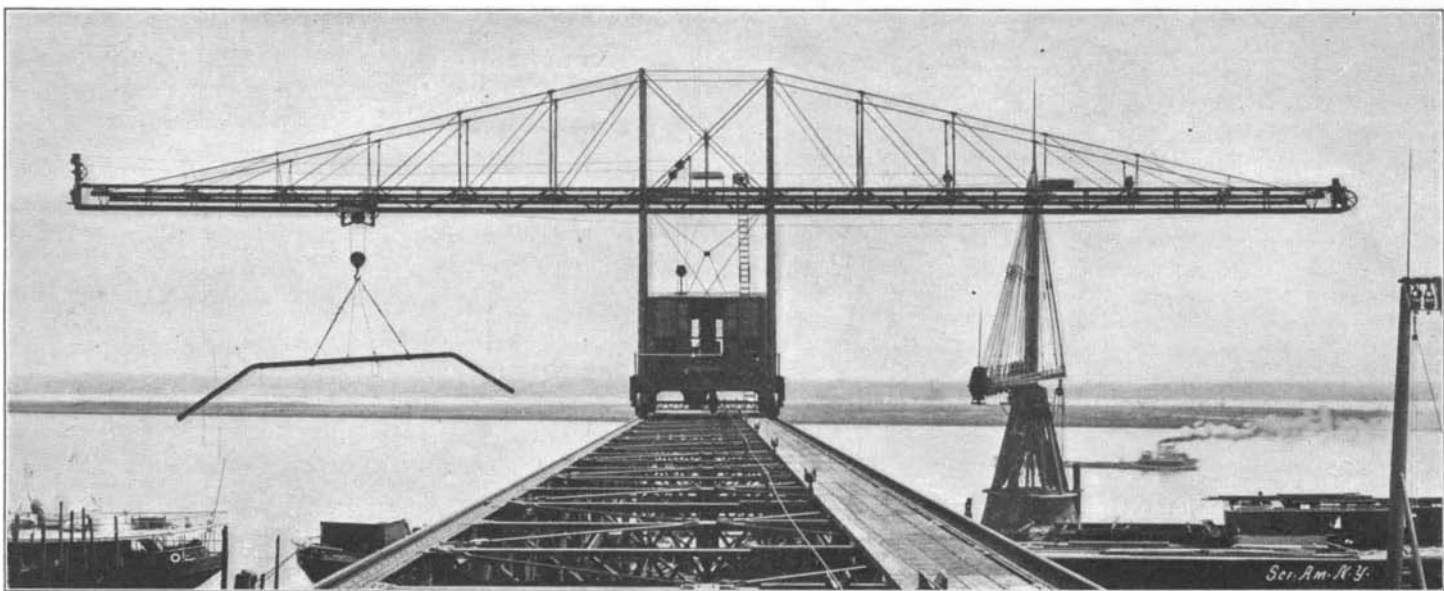
The equipment for handling ore consists of an automatic dumping-tub or bucket, attached to the "trolley," which is the popular name for the hoisting and conveying machine proper. The trolley, running along the track suspended from the bridge, can be moved to the end of the apron, or of the cantilever, or to any intermediate point, at the will of the operator. It is moved by means of a wire rope and a drum in the engine house. The engine is usually of the double-cylinder type, and is built for heavy service. Levers are provided, allowing it to be quickly controlled by the operator. In handling fine material, such as nut coal and sand, a self-filling and dumping "grab bucket" is employed. The machinery is installed so compactly that one engine is usually sufficient for three or four of the bridges. The plan of operating the trolley and controlling the transfer of the load is described as follows: At a given signal the operator throws a lever and hoists the bucket at full speed through the hatch of the vessel, or out of the car, the bottom block hooking a trolley. The trolley now carries the bucket to a point along the bridge or cantilever extension, where dumping irons have been previously placed, which automatically trip the latch of the bucket, allowing it to upset, discharge its load, and automatically right itself. The operator then releases his lever and allows the bucket to return by gravity to its starting point. The block unhooks automatically from the trolley, allowing the bucket to be lowered into the hold, where the empty bucket is unhooked and a filled one hooked on.

A plant of three bridge

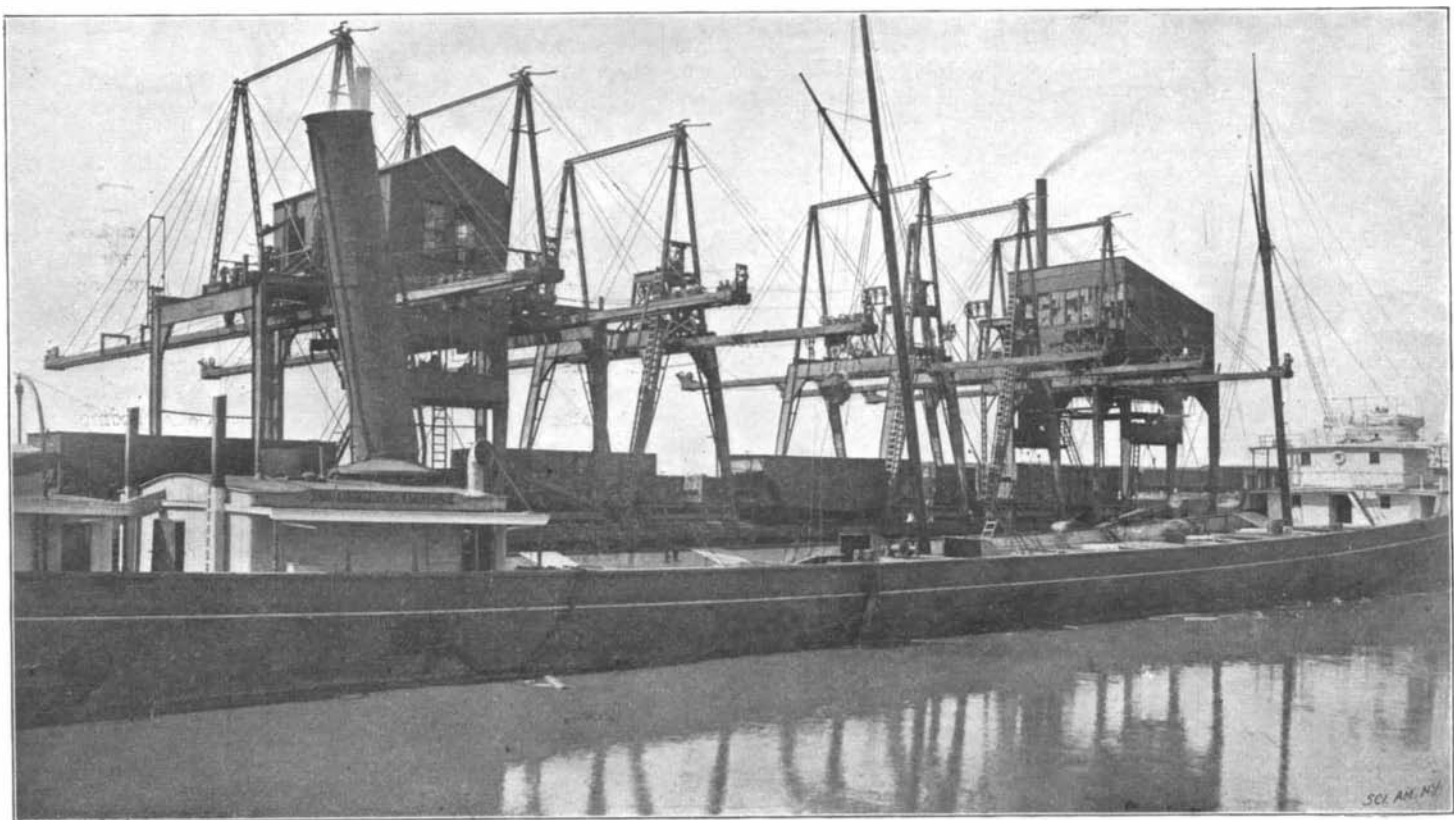
tramways will hoist and dump on a dock 1200 tons of ore per day of 10 hours, moving the material for 150 or 200 feet. This is the speed under ordinary conditions, but the capacity can be increased if the buckets are filled and attached to the trolley as rapidly as the machinery can be moved, which is seldom the case. A rate of 45 seconds per trip has been made



Bucket Shovel in Coal Storage and Rehandling Plant at Cheektowaga, N. Y. Capacity of Shed, 250,000 Tons.



Electric Cantilever Shipbuilding Crane; Serves Two Shipways, One on Each Side.



"Fast Plant;" Modified Form of Bridge Tramway for Unloading Direct from Car to Ship without Storage.

**MECHANICAL HANDLING AND TRANSPORTING OF MATERIAL.**

in testing one of the tramways. The "fast plant," as it is termed, is a modification of the bridge tramway, and is utilized where space is limited and no storage room afforded. It is intended for loading directly from vessels to car and *vice versa*. The "bridge" is limited to the arms or cantilevers extending over the deck of the vessel and the railroad tracks. As the distance to be covered is very short, the time required for transferring the material is less than by the former method. The engine is usually located in the framework of the supporting pier in order to save space. The tower or pier is mounted upon rails, so that it can be moved to any portion of the wharf desired by its own power. The arms vary in length. In large plants they are capable of serving cars upon five parallel tracks and extend a distance of 80 feet from the supporting tower. The plants herewith illustrated are in use at the piers of the Pennsylvania Railroad Company at Cleveland, Ohio. Each has a capacity for lifting a load of five tons a distance of 300 feet per minute, and trolleying it at the rate of 1,000 feet per minute. The photograph shows a series of six operated by two engines having a combined capacity for transferring 2000 tons per hour when all are working at full speed. By their use five trains of cars can be loaded at one time.

In storing of ore by machinery, a modified form of the bridge plant is used, and so placed that it serves not only the storage yards, but the furnaces, if the latter are adjacent. If the furnaces are inland and receive their supply by rail, the bridge is constructed so that the cantilever or apron will extend over the tracks, the material being transferred to the storage pile or the smelter as desired. This type of bridge plant is the largest in use in this country, as it must be adapted to cover a wide area.

The bridges illustrated are a portion of the equipment of the Carnegie Steel Company at Duquesne, Pa. They are operated by electric motors, and serve a storage space 233 feet in width. The tubs are of five tons capacity each, what is known as a "shovel bucket" being used in taking the ore from the yard to the furnace. Each plant will store from 2,000 to 3,000 tons in a day of 10 hours, and transfer from yard to furnace from 1500 to 2000 tons in the same time; yet but one man is required to operate each trolley, and one engineer each engine.

The storing of coal in yards and warehouses offers an extensive field for the use of apparatus such as we have described. The invention of the bucket shovel, already alluded to, has provided a means by which any tonnage desired can be moved

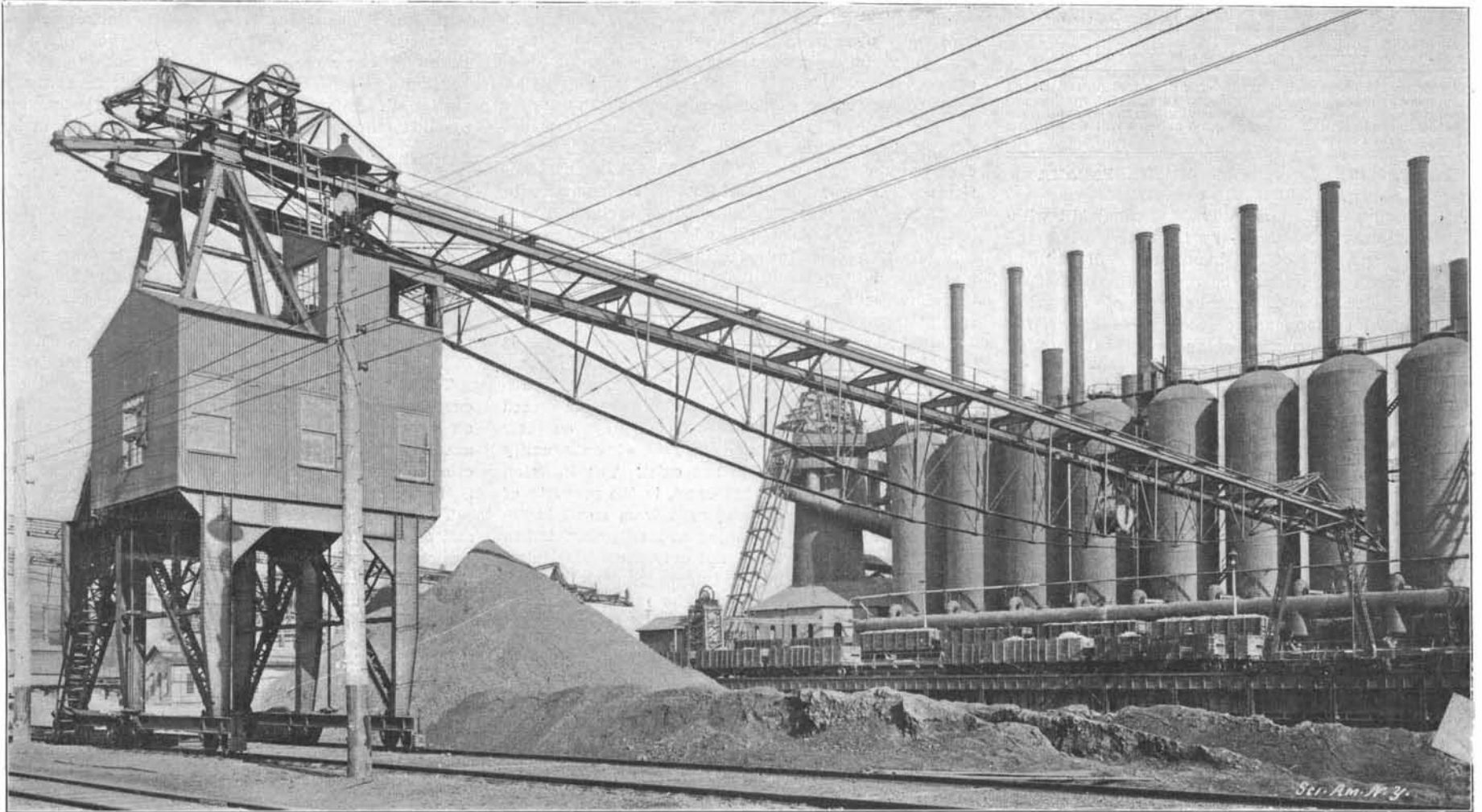
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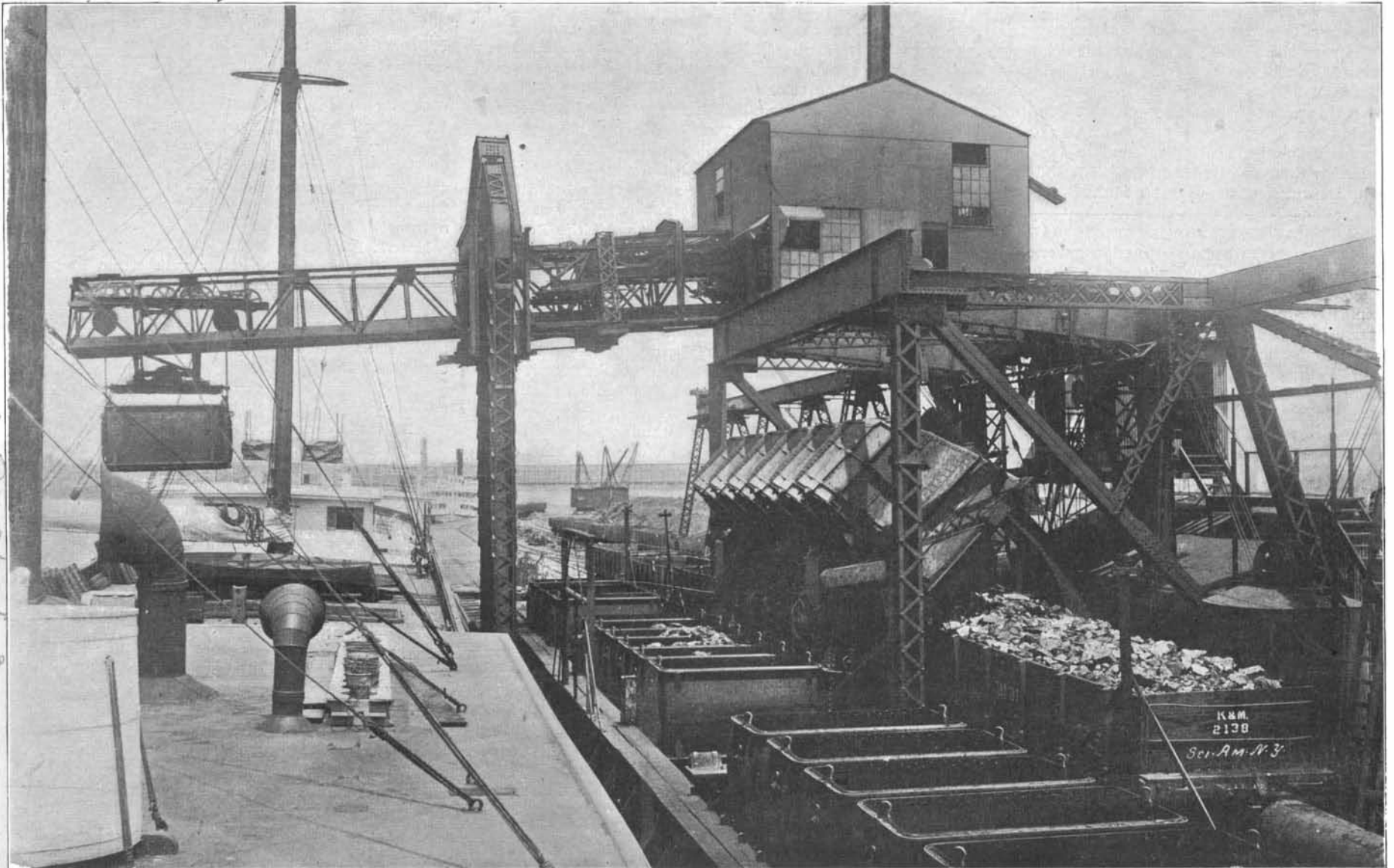
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Tramway Plant for Conveying Ore, Coal, etc., from the Cars to the Storage Piles and Furnaces.



Massive Machine for Dumping Carload of Material at a Time into Buckets and Discharging Same into Hold of Vessel.

MECHANICAL HANDLING AND TRANSPORTING OF MATERIAL.—[See page 8.]

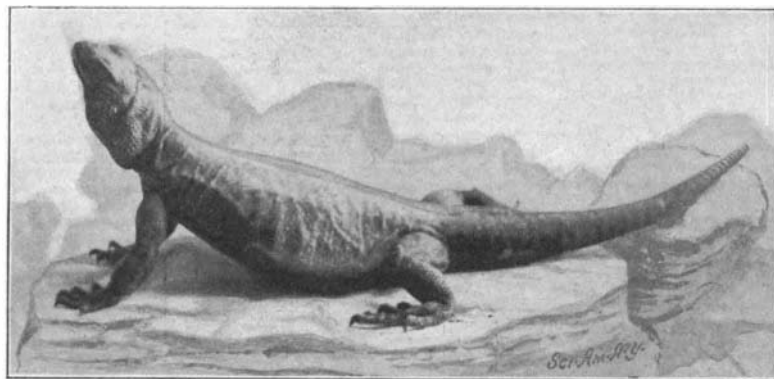
in an incredibly short time. In place of the ordinary bucket, the shovel is attached to the trolley rope, the latter traveling on overhead tracks, suspended from the roof of the storehouse or from a bridge tramway. The operator at the lever controls at all times the motion of the bucket. This method is being extensively used in the Pennsylvania anthracite regions for loading cars from storage piles, and at the breakers. It is also in vogue for handling coal under roof, the illustration showing the interior of the plant of the Philadelphia & Reading Railroad Company at Cheektowaga, N. Y., near Buffalo. This is one of the largest coal sheds in the country, being 674 feet long and 354 feet wide, while the trolleys are operated at an elevation of 80 feet above the floor, allowing the material to be piled to a height of 70 feet. The total storage capacity is 250,000 tons, and with the equipment of the shovel buckets provided, 3000 tons can be transferred in 10 hours.

Another interesting form of the Brown hoist is the type used by the Cramp Shipbuilding Company. As will be noted in the illustration, the cantilever is divided into two arms, one aiding to balance the loaded arm by means of a counterweight. It is operated by electric motors, which give it a speed of 200 feet a minute, hoisting a load of 14 tons. It can "trolley" the same weight at the rate of 500 to 800 feet a minute, and move along the tramways carrying 5 tons at the rate of 750 feet in a minute. It serves two sets of shipways at one time, and two men only are required for its operation. As a further indication of the performance of these cranes in shipbuilding, it may be stated that a cantilever at the yard of the Cramp Shipbuilding Company transferred the sternpost of the battleship "Retvizan," weighing 18 tons, from the railroad cars in the front part of the yard to its proper position in 20 minutes, including all the time required to secure it temporarily.

On the front page is shown a car-dumping machine, which is notable for its massiveness and power. Its principal features are a cradle, into which the car is clamped, which turns the car and discharges its contents into tubs or receptacles, and overhead traveling cranes, which transfer the tubs with their contents into the hold of the vessel to be loaded. When the cradle is in its lowest position, as shown in the picture, a loaded car of coal is pushed into the same by means of the car-pushing device, or "ground-hog," which is so named because it rests in a pit between the tracks, when not in use, to enable the cars to pass over it. Once in the cradle, the car is quickly clamped on the top and sides with hydraulic clamping-bars, and the engines set in motion, slowly turning the cradle over until the car is upside down. During the process of overturning the car, the coal has rolled from the car into six hopper-compartments attached to the cradle, and these six hoppers have each of them entered a transfer-tub, also shown in the picture. The hopper-compartments have doors which are automatically released on touching the bottom of the transfer-tubs. Therefore, when the cradle is returned to its original position, the car of coal is left in the transfer-tubs. It is necessary to put the coal in these oblong tubs, so that it can be lowered by cranes into the vessels. When the cradle has returned to its former position, the empty car is pushed out by the next loaded car coming in, and runs by gravity to the empty track; then the loaded car is clamped in place and the operation repeated. In the meantime, however, the tub-hauling car, containing the tubs just filled, is pulled away by the operator, and replaced by a car containing empty tubs.

Two overhead steam traveling cranes, running over the machine at a speed of 600 feet per minute, and provided with telescopic rams which work independently of the balance of the machine, take the tubs, one at a time, from the tub-handling car and lower them into the ship's hold, where, after touching the ship's bottom or the top of the coal pile, the doors are released, and the coal rolls out as the tub is returned to the car. The next tub is then dumped in the same manner. When all the tubs are emptied, the car is returned to the hoppers for another load. The crane operator can distribute the coal to all hatches. The vessel is on an even keel at all times. Two overhead cranes are ample to handle 5000 tons in 10 hours, and the tipping device is able to handle twice as much. Therefore, with the simple addition of two overhead cranes, one car dumper actually has a ca-

capacity of 10,000 tons in ten hours. The use of the bridge tramway and its modified forms is largely responsible for the rapid increase in size of the vessels on the Great Lakes. Fleets are now plying between Lake Superior ports and Cleveland, Conneaut, Buffalo and Chicago which carry from 6000 to 7500 tons of cargo each—as much as a large ocean-going tramp steamship. The largest of these vessels can be loaded or unloaded in less than 24 hours by means of the bridge tramways and fast plants, or the car dumpers, as the records show. Six thousand tons of ore have been taken from the steamship "Carnegie" at the Conneaut docks in 16 hours' working time, an average of 351 tons an hour. The steamship "Superior City," carrying 6700 tons, has been unloaded at South Chicago in



CALIFORNIA BLUE-TAIL LIZARD.

11¼ hours, an average of 569.2 tons an hour, while the "Manila," perhaps the largest cargo carrier on the Lakes, has been cleared in 12¼ hours, an average of 592.4 tons an hour. The "Manila" and "Superior City" are provided with twelve and thirteen hatchways, respectively, and a bridge tramway was connected with each hatch. The cost of handling ore by this method varies from 1.32 cents per ton to 1.75 cents, depending upon the price paid for labor and fuel at various points. In tests made of coal-dumping machines at Toledo, Ohio, twenty-seven vessels were loaded with 57,100 tons of coal at a cost of 3.48 cents per ton including premium, allowance for repairs and supplies, and 114 hours' time for which the men were paid when the apparatus was not worked. Coal has been loaded by this method at a cost of 3.3 cents per ton, allowing for all expenses except interest upon the plant. The force required to handle one of the coal-dumping machines at this dock consists of four men for handling the buckets, two to operate the "ground-hog," one car puller, two signal men, and from twenty to thirty men for trimming the cargo according to the size of the boat.

#### SOME CALIFORNIA LIZARDS.

BY CHARLES F. HOLDER.

The stroller through Southern California cannot fail to notice the remarkable lack of noxious animals

or less power of assimilation. As you approach, it resembles the darkest stone, and possibly would not be noticed did it have the wit of some of its fellows; but perchance there is an element of vanity in this lizard as, at least in the experience of the writer, it apparently cannot resist the temptation of displaying its splendors and trying to dazzle the observer. This is accomplished by rapidly raising and lowering the body, which results in a blaze of bluish iridescent tints if the sun is shining, that at once attracts the attention and might disconcert a timid enemy. The lizard continues the movement, lifting itself rapidly on its fore-legs, displaying its charms, which are in the nature of a vivid iridescent patch just beneath the head and upon the breast, not visible

when the animal is in its normal position, but brought sharply into view when the lizard stops, raises its head and moves rapidly up and down, as a man waves his hand to display the dazzling effulgence of a diamond or ruby. What the object of this movement is, may be conjectured. It may be to arrest a pursuer or frighten it; yet the chief enemies of the lizard are the garter and other snakes and the roadrunner—foes which would not be stopped by so whimsical a display.

One of the most interesting members of this tribe is the blue-tail lizard. The body is dark brown, long and attenuated, the slender tail a vivid turquoise blue. So conspicuous is the latter that at some distance off it would attract the attention of the most indifferent animal or person, and is apparently a dangerous appendage, drawing notice to the defenseless bearer. But the lizard has other qualifications which offset this brilliant lure; it is one of the most agile of all the tribe, its movements being inconceivably rapid, so much so that in many months the writer secured but one specimen, though many were seen, and then the tail would often be tossed off, remaining a wriggling lure while the animal itself escaped.

The cañons of the Sierra Madre are interesting localities in which to observe the lizards. Among the ferns and dry leaves they are constantly scampering about; now, clinging to some branch or bough in pursuit of insect prey, or lying prone upon a moss-covered boulder in the hot sun, simulating it in color and tint to so remarkable a degree that it is almost invisible until touched. Other lizards, sluggish forms, are found in damp places, also imitating the color of the leaves. All these lizards have their enemies. The garter snakes capture many of them, rattlesnakes being equally dreaded. The butcher birds are always on the lookout for them, and the dried skins and skeletons of lizards are seen hanging to limbs of trees or impaled upon the spines of orange trees.

But the most insatiate enemy of the California lizard is the bird known as the chaparral cock, or road runner. Its fierce eye never fails to penetrate the cunning disguise of the lizards, and the latter are picked up and devoured by this bird in astonishing numbers. The writer has taken ten lizards from the crop of a single bird—not so suggestive of its appetite as its discerning powers. The road runner is remarkably fleet of foot. It is difficult to run it down with a fleet horse, as curiously enough they will run a long distance when pursued before taking to the wing, doing this only as a last resource. Their agility on foot explains why they capture so many lizards.

On the edge of the great mesa that reaches down from the base of the Sierra Madres, the earth is perforated in every direction with the holes and tunnels of the lizards which undergo this strange winter sleep every twenty-four hours. At night in winter they become rigid and stiff, and enter a state of hibernation or coma. In throwing

over piles of stones early in the morning many would be found in this condition, unable to move, apparently unconscious, but after a few moments' exposure to the sun they become active. In the Northern States, in the winter sleep the lizards descend into the earth and lie dormant until summer, but in California the winter sleep is undergone every winter night.

#### SANTA BARBARA'S BIG GRAPEVINE.

BY M. C. FREDERICK.

Wherever the fame of Santa Barbara has spread, that of her big grapevine has likewise expanded. The vines are of the Mission variety, brought from Spain by the Mission Fathers.

There was many a pang of regret when, in the Cen-



Circumference of double trunk, 8 feet 5½ inches. Area covered by vine, 115 feet square.

#### BIG GRAPEVINE AT SANTA BARBARA.

which are supposed to be a part of the equipment of tropical or semi-tropical countries. They may be summed up as rattlesnakes, tarantulas and scorpions, but are rarely seen, and as a rule have to be hunted for. Among the attractive animals are the lizards, which, owing to the peculiar changes of climate between day and night, pass through a winter sleep every twenty-four hours. Especially in the San Gabriel Valley every pile of stones or brush which affords a shelter has its lizard contingent, the one most in evidence being the brownish, bronzed alert little creature shown in the accompanying figure. It is generally found on the topmost stone, lying basking in the sun, a miniature Moloch. In color it ranges from a dark steel blue to brown, and has more