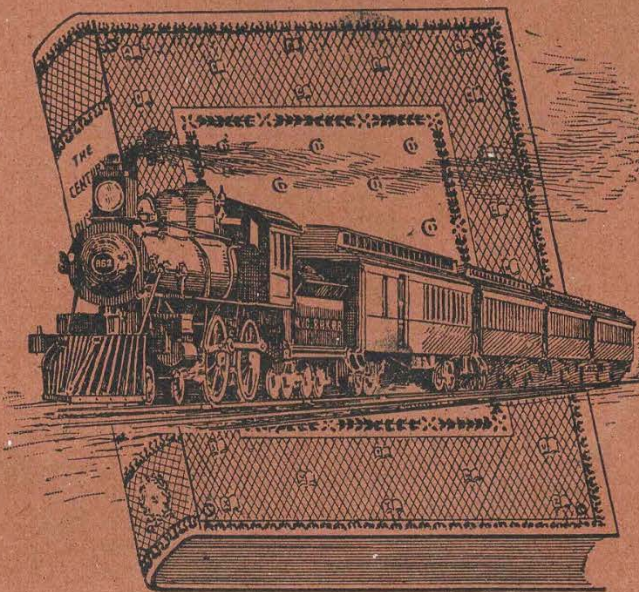


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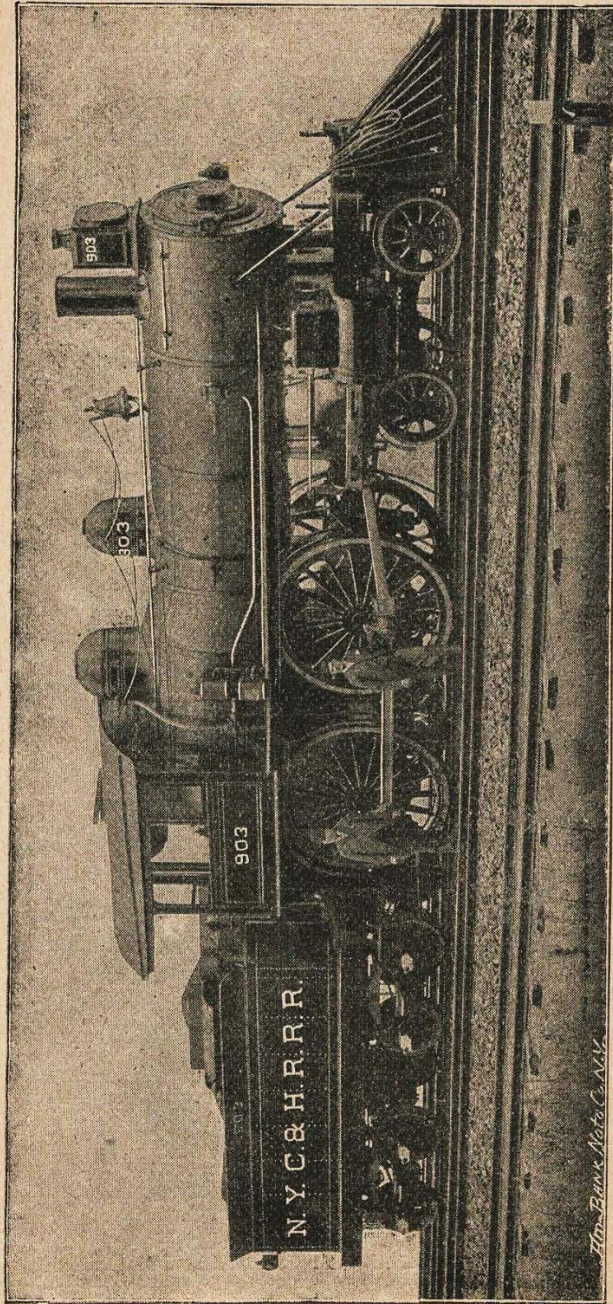
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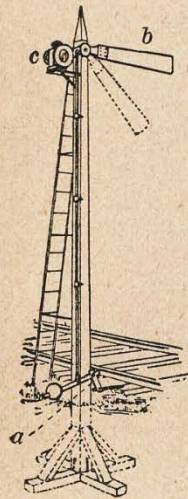
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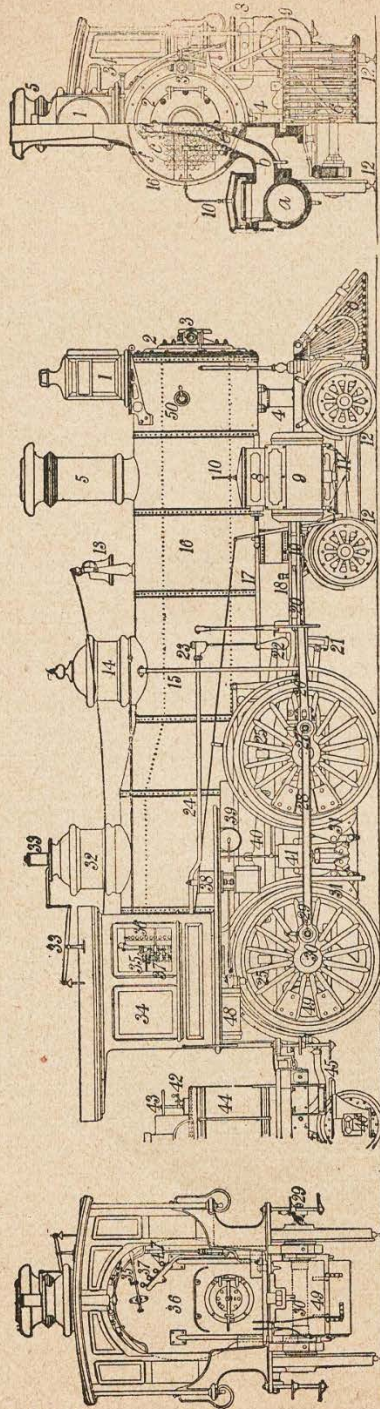
Railway Semaphore.
a, lever, which operates both *b*, blade, and *c*, lantern. (See p. 12.)

IF we want to find how to spell a word or how to obtain an authoritative definition of it, we are in the habit of looking in the dictionary, but if we want to know the difference between the British Parliament and the American Congress, or whether it is a green light or a red light swung beside a railroad track that means danger, it would not probably occur to us to consult a dictionary; in fact, we would not know just where to find out.

At last a great book has been born into the world of letters that answers just such questions as these—that tells us briefly and concisely what we want to know about the thousand things that go to make up our everyday life. This book is *The Century Dictionary*, and in this little pamphlet have been brought together some of the interesting items on one topic, railroads, that are to be found within its covers. It is a different kind of a dictionary from any that has ever been issued before,—a good deal more than a dictionary. Its subtitle is “an encyclopedic lexicon,” and it has been made not only by scholars, but by practical men in the trades and professions. Railroad men have furnished the information about railroads.

If you look at the word **railroad** in *The Century Dictionary* you will find that “railroad” and “railway” are synonymous, and that both words are of about equal age. “The former is more commonly used in the United States, the latter now universally in England. In both countries steam-railroads are called *roads*, seldom *ways*.” A number of interesting quota-

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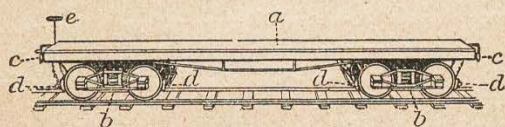
Diagrams of a Passenger-engine. From The Century Dictionary.

1, headlight; 2, front end; 3, signal-lamp; 4, spark-pipe; 5, smoke-stack; 6, pilot; 7, air-brake hose; 8, steam-chest; 9, cylinder; 10, oil-pipe; 11, cylinder-cocks; 12, engine-truck; 13, bell; 14, sand-box; 15, sand-pipe; 16, jacket; 17, valve-stem; 18, guide-cup; 19, cross-head; 20, guides; 21, link; 22, rocker-arm; 23, injector-check; 24, injector-pipe; 25, driver-spring; 26, main rod; 27, forward crank-pin; 28, side rod; 29, back crank-pin; 30, back driving-axle; 31, driving-wheel brake; 32, steam-dome; 33, whistle and whistle-lever; 34, cab; 35, throttle-lever; 36, boiler-head; 37, gage-cocks; 38, donkey-pump; 39, reach-rod; 40, equalizer; 41, driving-wheel brake cylinder; 42, tank-valve; 43, tender hand-brake; 44, tank; 45, feed-pipe hose; 46, oil-box; 47, reverse-lever; 48, auxiliary reservoir; 49, main air-reservoir; 50, hand-hole. *a*, cylinder (same as No. 9); *b*, exhaust-passage; *c*, steam-pipe; *d*, branch pipe (end of dry pipe); *e*, exhaust-pipe; *f*, smoke-arch.

tions follow, among them one from an English newspaper of the year 1825, in which is the statement that "The American government has possessed itself, through its minister, of the improved mode of constructing and making *railroads*, and there can be no doubt of their immediate adoption throughout that country."

The Dictionary tells us further that: "The parts of an ordinary passenger- and freight-railway proper are the road-bed, ballast, sleepers, rails, rail-chairs, splices, spikes, switches and switch mechanism, collectively called *permanent way*, and the signals; but in common and accepted usage the meaning of the terms *railway* and *railroad* has been extended to include not only the permanent way, but everything necessary to its operation, as the rolling-stock and buildings, including stations, warehouses, roundhouses, locomotive-shops, car-shops, and repair-shops, and also all other property of the operating company, as stocks, bonds, and other securities."

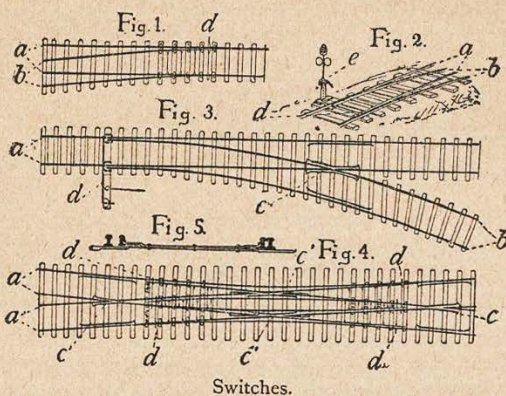
There is a very interesting cut of a **passenger-engine** under that entry, with all the parts of the engine named, and if you turn to any of these parts in its proper place you will find a reference to this cut, so that you will have a diagram of that part in its relation to all the other parts. Under "locomotive" it is stated that "American locomotives are distinguished from those constructed in other countries by the exterior position of the cylinders, the absence of heavy fram-



Platform-car.

a, platform; b, truck-frames; c, buffers; d, brake-shoes;
e, brake-wheel.

ing," etc., etc. Here are definitions of various kinds of locomotives,—“compressed-air locomotive,” “double-ender,” “fireless,” “freight-locomotive,” “Mogul locomotive” (“a type of freight-engine with three coupled driving-wheels on each side, and a swinging two-wheeled truck in front”), with many items of interest, such as, “speed is sought at the sacrifice of power in passenger-locomotives, the peculiar characteristics



Switches.

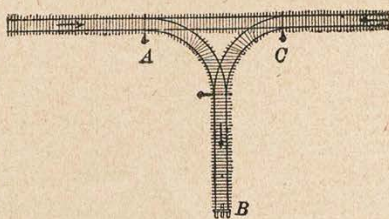
Figs. 1 and 2. Point-switches, or Split Switches. Fig. 3. Stub-switch. Fig. 4. Double-slip Switch. Fig. 5. Section of fig. 1. *a, a*, main tracks; *b, b*, branch tracks, or sidings; *c, c*, single frogs; *c', c'*, double frogs; *d*, switch-bar or -rod (that nearest the point is called the *front rod*); *e*, switch-stand, with butterfly-signal and lamp. In fig. 4 the switches are shown as arranged at a crossing for shifting a train from one track to another in either direction. The outer rails in point-switches are full rails and rigidly spiked to the ties, while the inner are movable and taper to a point (whence the term *split*, as applied to them, is derived). In stub-switches the rails are full, and the rails of the main track adjacent to the branch as well as the branch rails are rigid, while the movable rails are on that part of the main track which meets the branch. The double-slip switch is simply composed of four point-switches.

of which are large driving-wheels and engines having short strokes in comparison with the diameter of their pistons." A "switching-locomotive" is "a freight-locomotive having the peculiarities of its class carried to an extreme point, to adapt it to the heavy work of starting and slowly moving trains in switching at stations." To which is added the statement that switching-locomotives are called "shunting-engines" in England.

Under *switch* the Dictionary defines the simple form of switch, and then goes on to say that the objection to it is that "a car moving on a track not connected with the switch is liable to be derailed by running off the open ends of the track. This has led to the adoption of safety-switches, of which there are various forms. One of the most common of these is the *split switch*, in which the ends of the rails, instead of being square, are drawn out (split) to a thin edge so as to lie close against the side of the next rail. The narrow rails used are flexible and are fitted with springs, so that in the event of the displacement of the switch the

lateral pressure of the wheels will cause the points to move back and thus keep the wheels on the line, the points returning to their original position by the recoil of the springs. Another form of safety-switch is designed to keep unbroken the track of the main line, so that the main-line rails are not cut at all. To use this form of switch the levers are moved, and the car rises on an inclined rail and passes over the main rails to the siding.

A great number of devices have been invented to make switches more safe, to render them automatic (as at the terminus of a line where the engine is to be shifted to the other

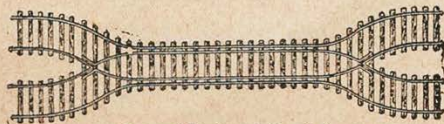


Y-track.

end of the train), to render them interlocking, so that no one switch of a system can be opened without locking all others, and to connect them with signals and annunciators. Switches in one yard are now commonly controlled by means of long levers with a central tower from which one switchman can see and control them all."

A **Y-track** is "used instead of a turn-table for reversing engines or cars. In operating it, an engine or car advancing toward *A* (heading as shown by the arrow) is switched at *A* to the track *B*, and then backed up over the switch *C* to the main track again, heading now in the reversed direction."

Another interesting form of switch is the **railroad gantlet**, a diagram of which is shown here. The Century Dictionary describes it as "the running together of parallel tracks into the space occupied by one, by crossing the two inner rails so as to bring each side by side with the opposite outer rail. It is used



Plan of Railroad Gantlet.

chiefly to enable a double-track railroad to pass a single-track tunnel or bridge without breaking the continuity of either rail."



Section of Rail.

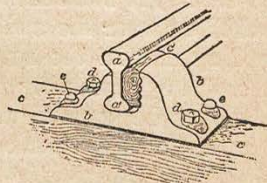
a, head; *b*, web; *c*, base; the part *d* is at the inner side of the head, and made to correspond with the throat of the car-wheel.

The general form of rail now most in use is the *T-rail*, shown in this diagram. "But," the Dictionary says, "though these rails all have a section vaguely resembling the letter T, the proportions of the different parts and the weights of the rails are nearly as various as the railroads themselves. In the accompanying diagram is shown a section of a rail weighing seventy-five pounds per yard in length, the weight of the length of one yard being the common mode of stating the weights of rails. These weights are in modern rails sometimes as great as eighty or eighty-five pounds per yard, the more recent tendency having been toward heavier locomotives and heavier rails."* There is a "compound rail," a "double-headed rail," a "fish-bellied rail," a "flat rail" ("first used in 1776"), a "point-rail," and many more. Under the word *steel* the process of making Bessemer steel (invented by Sir Henry Bessemer about 1856), so important in the development of the steel rail, is fully and entertainingly described in an article longer than this entire pamphlet. The principal use of Bessemer steel is for rails, and the Dictionary states that, during the past few years, from seventy to eighty per cent. of the Bessemer steel made in the United States has been used for that purpose.

In Great Britain railway-rails are secured to the sleepers by means of an iron block called a **rail-chair**. With the flat-bottomed rail common in the United States, chairs are not required, the rails being attached to the sleepers by spikes.

This suggests looking up the word **sleeper**, and one finds that not only is wood used for sleepers,—and most extensively,—but also "stone, toughened glass, and iron, the last to a considerable extent. In some instances," the Dictionary says, "the sleepers are laid longitudinally with the rails and bound to-

* The New York Central Railroad has just adopted one hundred pound American steel rails as the standard, and these are now being laid on its lines.



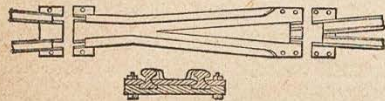
Double-headed Rail and Rail-chair, as used on the London and North-Western Railway England.

a, upper head of rail; *a'*, lower head of rail; *b*, chair; *c*, sleeper; *c'*, wedge of wood; *d*, wood screws; *e*, spikes.

gether by cross-ties. This system is in use on some important European railways, and generally on elevated railways and street-railways, both in the United States and elsewhere; but the most common method is to lay the sleepers at right angles to the rails, and about 2 feet from center to center, except when they support points and angle-bars, when they are placed 1 foot 6 inches from center to center. They are thus made to act both as sleepers and as cross-ties."

A common use of the word "sleeper" applying it to a railway sleeping-car, is called "colloquial" by the Dictionary. It is not heard except in the United States; nor is "vestibuled-train," which is defined as "a train of parlor-cars, each of which is provided with a 'vestibule' at each end—that is, a part of the platform is so inclosed at the sides that when the cars are connected together, a continuous passage from car to car is formed." The words "drawing-room car," "parlor-car," and "palace-car" are also stated to be of United States origin.

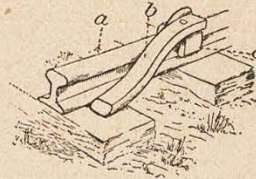
A **car-replacer** is a device which The Century Dictionary says is "carried on nearly all American railway-trains for quickly replacing derailed wheels on the track. It is used in pairs, one for each rail, and consists of a short heavy bar of iron swiveling on a yoke which is placed over the railhead. A sharp pull of the locomotive pulls the derailed wheels up the replacer, whence they drop upon the rails."



Railway Frog.

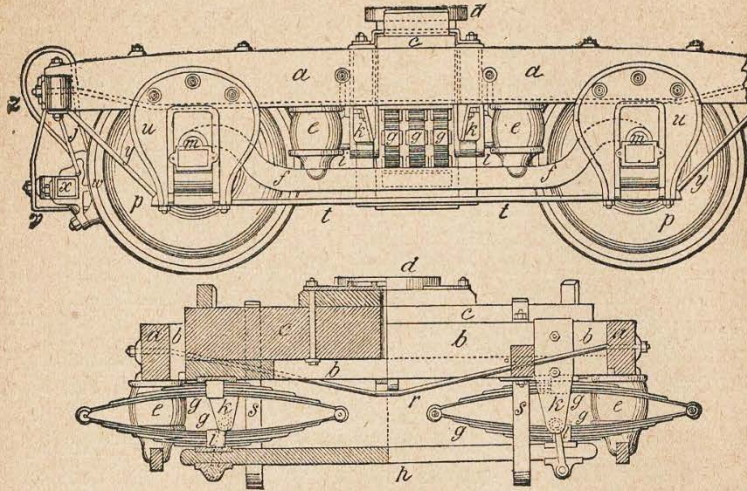
A **railway frog** gets its name from its resemblance to the frog of a horse's hoof, the elastic horny substance which divides the hoof into two branches, running toward the heel in the form of a fork. The resemblance is readily seen in the cut.

There is a difference between the car-trucks used in Europe and those of this country. Under **car-truck** it is stated that, "In Europe the pedestals for the axle-boxes are commonly attached to the body of the car.



Car-replacer.

a, rail; *b, c*, replacer. The part *c* embraces the head of the rail when in use. The derailed car-wheel rolls up the incline *b*.



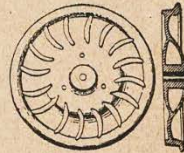
Side Elevation and Section of Passenger-car Truck.

a, a, longitudinal timbers of frame; *b, b*, transverse timbers; *c*, swinging bolster; *d*, center casting; *e, e*, gum-springs; *f, f*, equalizing-bar; *g, g*, elliptic springs; *h*, suspension-bar; *i, i*, yokes; *j*, swing-bars; *k, k*, hangers; *m, m*, upper boxes of the axle; *p, p*, wheels; *r*, tension-bar, or tie; *s, s*, and *v*, safety-stirrups; *t, t*, brace-rods; *u, u*, pedestals; *w*, brake-shoe; *x*, brake-bar; *y, y*, diagonal brace-rods for the pedestals; *z*, relieving-springs.

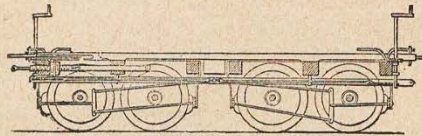
In the United States the car-body is supported upon two independent trucks placed beneath it." The "pedestals" are shown by the letters *u, u*, in the upper cut. They hold in place the journal-box of the axles, which rises and falls with the springs.

A car-wheel is not perfectly flat, but, besides having a projecting flange on the inner edge, to prevent derailment, the diameter is greater on the flange side than at the outer edge. This is designed to counteract in part any tendency of the wheel to leave the rail. The Dictionary tells us just what is a "paper car-wheel." It is "a car-wheel with a steel tire and a web of compressed paper between plates which are bolted to the hub and the tire." So it is not all paper.

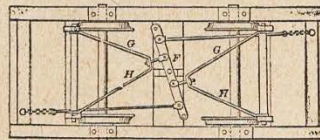
Under **brake** are definitions of the terms "automatic brake," "continuous brake," "double-lever brake," etc., and by a further reference we find the following definition of air-brake: "A system of continuous railway-brakes operated by compressed air. The air is compressed by a pump upon the locomotive, and conveyed, through

Washburn Car-wheel.
Side elevation and diametric section.

pipes beneath the cars and flexible hose between them, to cylinders under each car. The pistons of the cylinders are connected with and move the brake-levers,



Elevation.



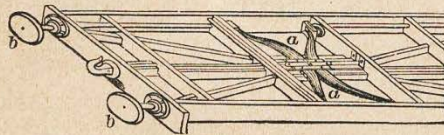
Plan.

Single-lever Car-brake.

The single lever *F*, pivoted at mid-length, is operated by chains and rods from the brake-wheel on either platform. To the lever are attached rods *G*, *H*, proceeding to the brake-bars which carry the shoes.

which transmit pressure to the brake-shoes. See *vacuum-brake*.*

Here we can find out all about **axles**,—"driving-axles," "leading axles" (in British locomotives), "telescopic axles" (permitting the running-wheels of a car to be slipped in or out, thus making them adaptable to tracks of different gage †), "axle-boxes," and "journals" and "rubber cushions" and "buffers." The **buffer** shown in the cut represents the form common on British railways, and consists of powerful springs and framing to deaden concussion. Under the word



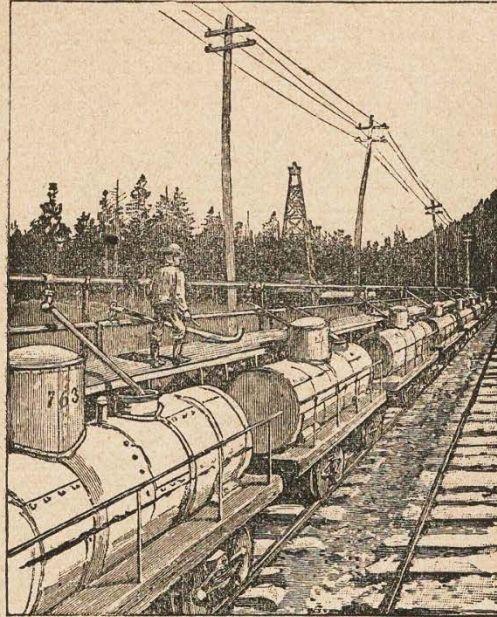
Buffer.

Part of under frame of an English railway-carriage, showing buffing-springs, *a a*, acted on at the ends by rods from the buffer-blocks, *b b*.

coupling is a description of the self-acting and self-locking couplings used in America. These usually consist of "hooked jaws, which slide past each other and are self-locking by means of springs or their own weight. Levers are also used to operate the couplings from the car-platform."

*The brakes used on the New York Central Railroad are the Westinghouse quick-action air-brakes.

†The Century Dictionary gives a preference for the spelling *gage* over *gauge*, stating that "the pronunciation and the regular former usage require the spelling *gage*."



Tank-cars.

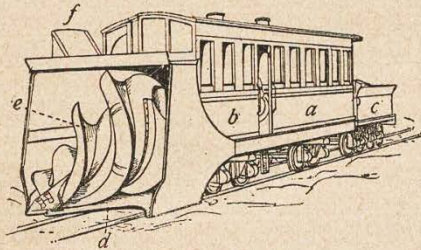
The picture of a train of **tank-cars** explains the use of that term as well as a thousand words of text. One sees the cars being filled with oil from the pipelines at the side of the track. The centrifugal **snow-plow** shown in the cut on the opposite page is a very recent invention. These plows "are often of great size, sometimes weighing fifty tons, and can be forced through very deep drifts."

The subject of **signals** is an interesting one. Under "signal-lamp" it is stated that "white usually indicates safety, red danger, and green caution; but on the continent of Europe green is a safety-signal, and also on some American railways." The cut of "semaphore" is shown on page 3. The derivation of this word is from the Greek, and it means literally "bearing a sign." "The word is now confined almost entirely to apparatus used on railways employing the block system. The blade is a day signal, the lantern is used at night. A vertical position of the blade or a white light exhibited by the lantern indicates safety; a horizontal position of the blade or a red light indicates danger; an intermediate position of the blade or a green light demands a cautious ap-

proach with lessened speed." A good deal is told about "interlocking system of signals" under "interlock."

The "block system" is explained as "a system of working railway traffic, according to which the line is divided into sections of a mile or more, with a signal and a telegraphic connection at the end of each section; the principle of the system being that no train is allowed to leave any one section till the next succeeding section is entirely clear, so that between two successive trains there is preserved not merely a definite interval of time, but also a definite interval of space."

Under **time-table** we find the term "time-table chart." This is something with which the public is not familiar, but it is a very useful thing in railway offices. It is "a chart used for determining the times at which trains reach the various stations on a line of railway. The distances of the stations are laid down to scale, and, at right angles to this, divisions of time for twenty-four hours. Thus, if a train is to leave A at 10 A. M. and reach B at 6 P. M., a line drawn from ten at A to six at B will cut the cross lines so as to show the times at intermediate stations."

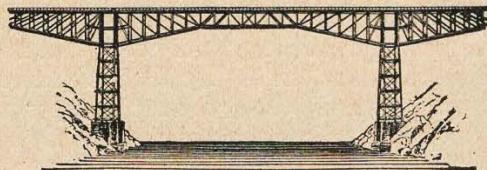


Centrifugal Snow-plow.

a, caboose; *b*, cab; *c*, tender; *d*, shoe, plate, or scraper which cuts horizontally at a level with the tops of the rails; *e*, auger which cuts into the snow-drift, and assists by its screw-like action to propel the machine (its centrifugal action projects the snow upward through the chute *f*, and laterally to a distance of 60 feet).

Under the word **bridge** in the Dictionary are definitions of all kinds of bridges,—“arched-beam,” “panel-truss,” “lattice,” etc., among them “cantaliver,” with a cut of the famous cantaliver bridge below Niagara Falls. This word is frequently written *cantilever* or *cantalever*, but the Dictionary says that the form *cantaliver* in Bailey’s Dictionary, 1733 (Johnson, 1755, *cantiliver*), appears to be the earliest and is nearest the probable original, namely from the Latin *quanta libra*,

of what weight or balance,—not, as by some supposed, from *cant*, an angle, and *lever*, a support. A cantaliver bridge is “a bridge in which the span is formed by bracket-shaped beam-trusses, extending inward from



Cantaliver Bridge, Niagara Falls, New York.

their supports and connected at the middle of the span either directly or by an intermediate truss of ordinary construction. When piers are used to support the beam-trusses, they are placed near the center of each truss, and not, as in ordinary truss-bridges, at its ends. The strains due to a load upon the span are carried outward toward the ends of the bridge and beyond the piers by bracket-arms similar to those forming the central span, the extremities of which may be secured to other piers to serve the twofold purpose of resisting by their weight the uplift caused by the load when upon the central span and of themselves supporting vertical pressure; or they may form part of other spans similar to the central one. This form of bridge presents the great advantage of permitting the construction of the main span without scaffoldings beneath. A fine example is the cantaliver bridge below Niagara Falls, built for the Michigan Central and Canada Southern railways.”

Everything is here, even **railroad euchre**.

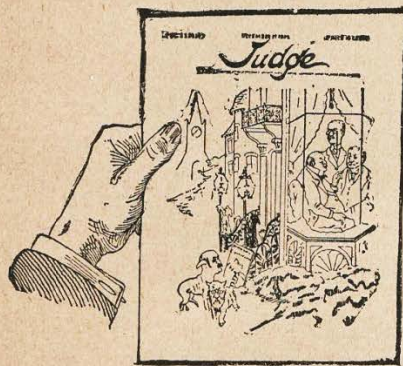
And this is only a little of what the Dictionary has to say of that wonderful combination of science and skill and energy, the railroad of to-day.

It defines **adequate** as “equal to requirement or occasion; fully sufficient.” The printers of this book chose this word to entitle the best compact Atlas ever made. The Matthews-Northrup *Adequate* Travel-Atlas of the United States justifies the name; small enough for the pocket, it fills every travel-need. Its 86 three-color maps show every mile of railroad, and village of size in our country, and all important hotels or streets in 22 great cities. Everything is **indexed**; 250 pp., cloth. Sold everywhere, or mailed by the M-N Co., Buffalo, on receipt of \$1.25. If not satisfied, return it promptly, and they will refund your money.

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