STREET CARS.

Street railways for passenger cars were first established in the United States about 1850, and in England about ten years afterward. The Boston and Cambridge Railway, commenced in the fall of 1858, was the first in New England. Street cars are usually drawn by horses, but many attempts have been made to drive them by machinery. Steam engines, known as dummy engines, have been used with success, but the fire and noise of escaping steam are considered objectionable.

We give herewith several engravings of street car motors selected from Knight's "Mechanical Dictionary."

Fig. 1.

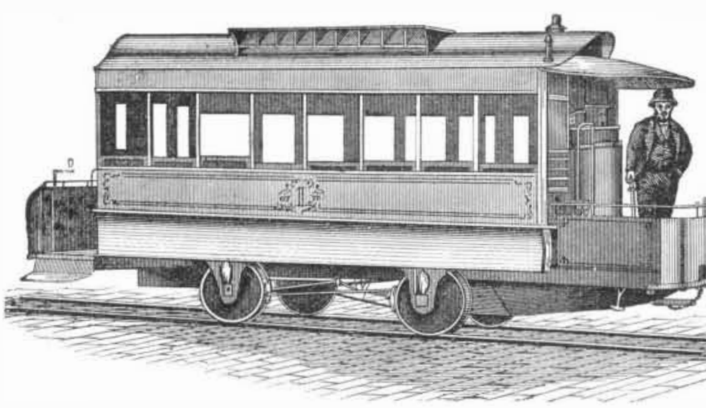


Fig. 2.

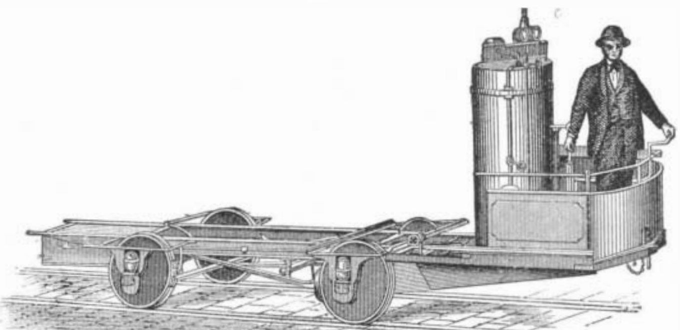


Fig. 3.

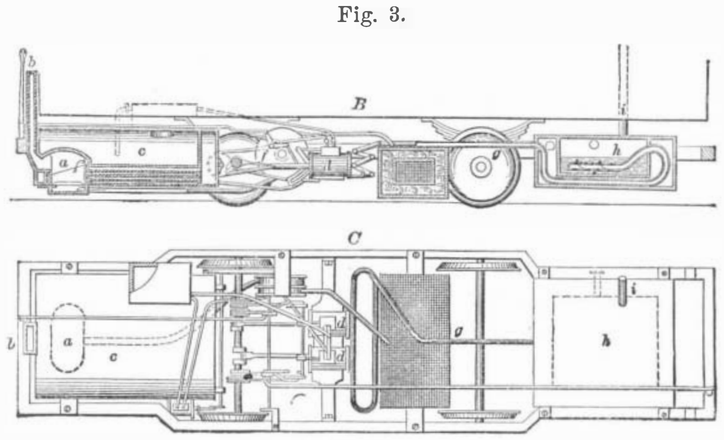


Fig. 1 is a view of the Baxter steam car, Fig. 2 the truck and machinery of the same. The boiler is upright, and is placed on the front platform; a non-conducting partition prevents heat from entering the car. The engine is below the platform. It is compound and double-acting. In ordinary use, the steam from the smaller cylinder exhausts into the larger; but, in ascending grades, the full pressure of the steam may be made available in both cylinders, greatly increasing the power.

Fig. 4.

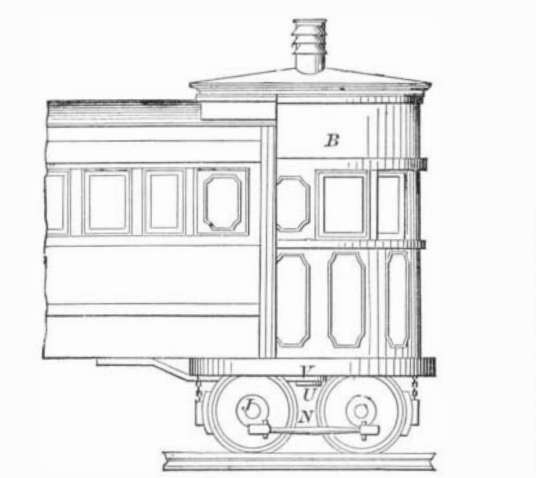
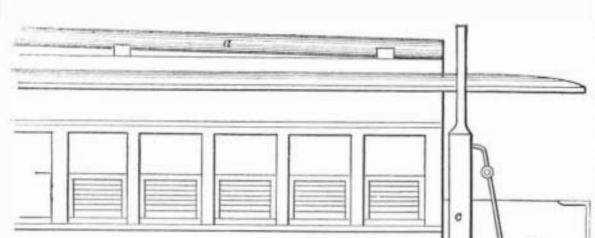


Fig. 3 is the Knapp car; B is an elevation, and C a plan of the motive apparatus. *a* is the furnace, supplied with coal from the platform through the chute, *b*; *c* is the boiler; *d d* are the cylinders. The exhaust steam is condensed by a blast of cold air from the fan blower, *f*; *g* is a smoke pipe, terminating in a reservoir, *h*, containing milk of lime, to remove the carbonic acid from the smoke; this also acts as a spark and dust arrester, so that the gas, which finally issues from the pipe, *i*, is invisible, and causes no inconvenience to the passengers or others.

The car, Fig. 4, has a circular cab, B, which contains the dummy engine and boiler, and is supported on a circular platform, I, resting upon the fore truck, V, and is provided with anti-friction rollers, *h i*, upon which the front of the car body, A, rests; the shell of the cab also bears against anti-friction rollers, *m m*. A reach and center pin, U, connect the body and fore truck of the car, and the body is supported on a similar pivoted truck, provided with anti-friction rollers, enabling the two parts to turn independently of each other. The front and rear axles of the fore truck are coupled by connecting rods, N, and the rear axle, J, which is cranked, is worked as a driver by a pair of oscillating engines.

Todd's combined dummy and car, Figs. 5 and 6, has a main lower frame 22 feet 6 inches long over the buffers, 7 feet wide over all, and 3 feet high from the rail to the top; and on this frame is placed the 14 feet body of an ordinary

Fig. 8.



car. In the center of the frame are two receivers, each containing 30 cubic feet of water. Below the buffer beams are screw couplings and stop valves with perforated pipes running right through the receivers. The wheels are 24 inches diameter, placed 4 feet 6 inches between centers. Cylinders are 9 inches diameter and 8 inches stroke, surrounded with large jackets open to the water of the receivers. At each end of the car, outside the dash plate, is placed a brake handle, and on either side of this a regulator and reversing handle, all arranged as shown. These latter handles fit into spring sockets, so as to be changed from one end to the other, principally to prevent any one from behind moving the car. There are four sand boxes, with handles brought to the foot boards. There are two exhaust pipes, the end of each projecting slightly upward from the edges of the curtains over the footboards; and by a cock the waste steam is turned into whichever pipe happens for the time to be at the rear end of the car. All the working motion is quite protected from dirt by light boxes which have hinged doors at the sides. The engine is started on its journey with an initial pressure of 200 lbs. to the inch; and owing to the jacketing of the cylinders the loss by radiation is said not to exceed 5 lbs. pressure per hour, allowing the engine to run 40 miles on level lines at one charging of the boiler. Fig. 5 is a longitudinal section of the car, and Fig. 6 is an exterior elevation, also showing the stationary boiler from which the apparatus is charged.

Among other methods proposed for propelling street cars are engines driven by exploding gas: mixtures, for instance, of hydrogen and atmospheric air. Other machines are operated by carbonic acid gas, which is compressed into a liquid and carried in strong cylinders. Another device involves the use of india rubber springs; another of steel springs; another of ammonia vapor: and there are a large number of patented street car engines utilizing compressed air. To this last class belongs

Figs. 5 and 6

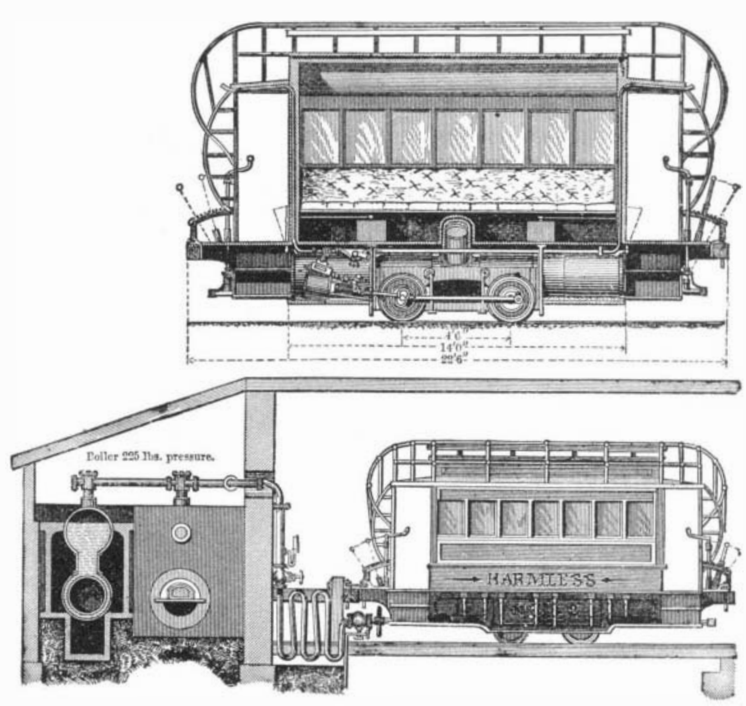
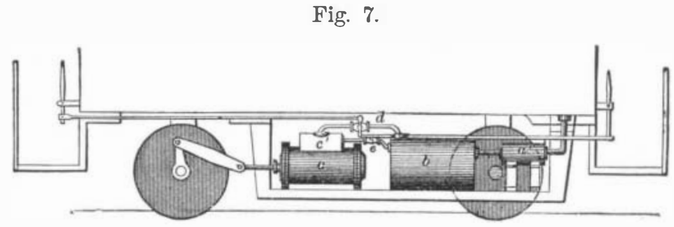


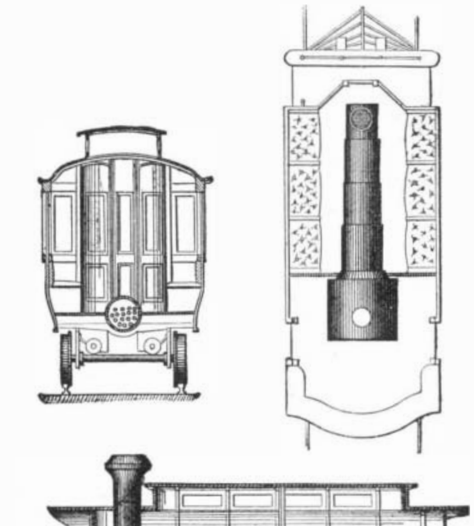
Fig. 7.



SMITH'S PNEUMATIC ENGINE,

which is represented in Fig. 7. Compressed air, contained in a large tank on the body of the car, is admitted to a governor or regulator, *a'*, and thence passes to a small auxiliary tank, *b*, underneath; this is connected with the cylinder valve chest, *c'*, by two pipes, one of which, *d*, is open and the other, *e*, closed while the car is in motion; but on stopping the car the latter is opened and the former closed, causing the compressed air in the cylinder, *c*, to be pumped back into the

Fig. 9.



auxiliary tank, where it is stored up to assist in starting again. The illustration shows the car bed and lower works.

A car provided with

SMITH AND DE COPPET'S AMMONIA ENGINE

is represented in Fig. 8. Liquid ammonia, stored in a reservoir, *a*, is withdrawn and injected by a pump, *b*, into a vaporizer, *c*, heated by a lamp beneath. The gas is conducted to the engine, *d*, by a pipe, and is exhausted into a condenser, *e*, where it is liquefied by a shower of spray falling through a perforated plate, the water being supplied by tanks, *f*, one at each side of the car, and withdrawn therefrom by a pump. A third pump removes the ammonia from the condenser and forces it into a tank, *g*, beneath the car, where it is retained for further use. Chains communicate motion from pulleys on the engine crank shaft to pulleys on the driving wheel shaft.

In Fig. 9 three views of a dummy engine are given, showing the compact arrangement of boiler necessary to adapt it to the limited space in street cars.

Communications.

A New Method of Projecting Spectra.

To the Editor of the Scientific American :

If the inner coating of a Leyden jar be connected by a wire or a chain to one terminal of an induction coil, and the outer coating to the other terminal, when the battery connection is made or broken, the induced electricity is very much condensed, and shows itself as a much shorter spark; but the intensity of its light is vastly increased, and the passage of the sparks is accompanied with quite a deafening sound, especially if several follow each other in quick succession. Advantage has been taken of this form of spark to study the spectra of the elements by making the spark to pass between terminals of the material to be examined. I have lately found that the intensity of the light from such a spark from one of Ritchie's 10 inch vertical coil is sufficiently great to admit of projection upon a screen in the lecture room. The terminals were arranged one above the other, so as to give a vertical spark. A 1 gallon Leyden jar was used, and the battery had three Bunsen 2 gallon cells. The terminals could be separated about an inch. About a foot in front of the terminals was fixed a double convex lens, 4 inches in diameter and of about 1 foot focus, and a single bottle prism of bisulphide of carbon in front of the lens, where the larger part of the refracted rays would fall upon it at the proper angle, the refracted and dispersed rays falling upon the screen, the focussing being done by moving the lens until a plainly marked spectrum appeared. This spectrum could be very plainly seen when it was eighteen or twenty inches long. In this case, the spark itself answers for the slit in the ordinary method of studying spectra; and inasmuch as the spark is seldom or never straight, it follows that the spectrum will consist of a series of bright lines all with the same zigzag pattern, which gives a very curious and interesting effect, for no two have the same form; and yet all the bright lines hold the same relation to each other as in ordinary spectra.

It is only necessary to affix small pieces of different metals to the terminals of the coil and pass the spark between them to exhibit, to forty or fifty persons at a time, the characteristic spectra of the elements. Those that I used were sodium, copper, zinc, calcium, and brass. There is usually a tolerably plain continuous spectrum, which I take to be due to incandescent dust particles in the path of the spark, but this does not interfere with the bright line spectrum. This method may be usefully employed when the class is not too large, and when neither a fifty cell battery nor an oxyhydrogen lantern are owned. A. E. DOLBEAR.

Physical Laboratory, Tuft's College.

Are Iodide of Potassium and Chlorate of Potassa Therapeutically Incompatible?

To the Editor of the Scientific American :

In your issue of January 20, 1877, the above question is answered affirmatively in an article copied from the *American Journal of Pharmacy.*

I recollect having once seen a very sick patient treated with iodide of potassium and chlorate of potassa, administered alternately every two hours in large doses, for a number of days in succession, and the patient recovered. I called the attention of the physician to the possible danger of administering the two drugs at the same time; but he averred that he had frequently done it without any bad results following.

His knowledge of chemistry and incompatibles would have allowed him, no doubt, to administer tannic acid and iron, or iodide of potassium and acetate of lead, in the same prescription; yet sometimes from people's blunders we gain practical information. It is possible that the safety in these cases consisted in the fact that the drugs were administered with intervals of two hours between them, the one having been absorbed from the stomach before the other entered.

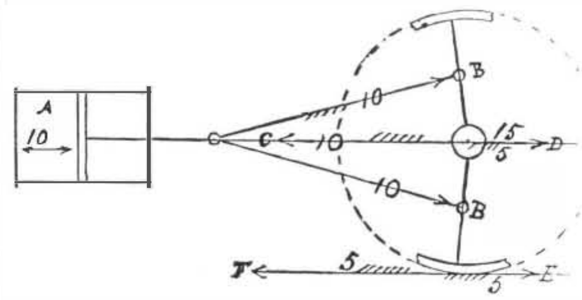
I am of the opinion that, when these drugs are administered with intervals of two or three hours between them, there is no danger of the formation of iodate of potassium. It would be reckless, however, with our present knowledge, for any practitioner to prescribe the two drugs in the same formula. A. C. SIMONTON, M.D.

Mitchellville, Iowa.

Traction of a Locomotive.

To the Editor of the Scientific American:

The inquiry is often made as to the principle upon which a driving wheel draws its load. The annexed simple analysis will, I presume, make the matter clear. An engine with a 16 inch piston, 4 feet driver, and 12 inch crank, working at a maximum cylinder pressure of 100 lbs. to the inch, will exert a force of about 10 tons upon the piston, A, and crank pin, B, and an equal force upon the head of the cylinder, and,



through the medium of the engine frame, upon the center of the driver in the opposite direction. When the crank is below the center of the wheel, the 10 tons acting upon its pin is divided equally, in this case, between the center of the wheel and its tread. 5 tons at each point; but as the 10 tons acting against the head of the cylinder and the center of the wheel in the opposite direction is just double this amount, the impelling force, in the direction of F and C, will of course be 5 tons.

When the crank is above the center of the wheel, the 10 tons acting upon its pin will exert a force of 5 tons at the tread of the wheel, as a fulcrum, in the opposite direction. This added to the 10 tons gives 15 tons as the force of acting upon the center of the wheel in the direction, D; but as this 15 tons is opposed by the 10 tons acting upon the head of the cylinder and center of wheel, we have just 5 tons progressive force towards E and D. The operation is clearly shown by the arrows.

The reader will perceive that the progressive motion is caused by the action of an ever-varying leverage whose effective fulcrum is the adhesion of the wheel to the rail. When the crank is below the center of the wheel, the length of the lever is the radius of the wheel, and the positive agency to locomotion is the pressure of steam against the head of the cylinder, and the negative agency is the pressure of steam against the piston; but when the crank is above the center of the wheel, the case is reversed. The pressure against the piston then becomes positive, and that against the cylinder head negative, and the length of the lever is the radius of driver *plus* the length of crank. I use the term positive because the engine moves in that direction.

Worcester, Mass. F. G. WOODWARD.

State Legislation Concerning Patents.

To the Editor of the Scientific American:

Apropos of your article in the SCIENTIFIC AMERICAN for February 17, in reference to State legislation tending to abridge the rights of patentees and owners of patents, I presume that the bill recently introduced in the New York Legislature is patterned after a law of this State (Pennsylvania), approved April 12, 1872, which enacts substantially as follows: That the words "given for a patent right" shall be prominently and legibly written or printed upon the face of any promissory note or other negotiable instrument, the consideration for which, either in whole or in part, shall consist in the right to make, use, or vend any patent invention or inventions claimed to be patented; and the party taking such note shall, as to any defence which the maker may or might have, stand in the shoes of the original payee or holder. The act proceeds still further, and makes it a misdemeanor, with a maximum penalty of $500 fine and sixty days' imprisonment, for any person to take, sell, or transfer a negotiable instrument not having the words "given for a patent right," as before mentioned, knowing the consideration thereof to be, wholly or partially, an interest or right in a patent or in an invention claimed to be patented.

In a case tried here some months ago, brought to recover on a note given for a patent, and not containing the statutable words, the judge charged that if the plaintiff knew, at the time he took the note, that the consideration was an interest in a patent, he committed a misdemeanor, and the note was, consequently, absolutely void. It has, however, been decided in a later case that a negotiable writing given for a patented thing or machine is not within the statute, as, the latter being a "very extraordinary" act, parties who invoke its aid must bring themselves strictly within its provisions, and the words of the act are a "right," etc., only.

When I first learned, a few days after its passage, of this law—which might better have been entitled "an act to relieve certain fools from the legitimate consequences of their folly," or "a law trap for the unwary"—I unhesitatingly expressed the opinion that it was in direct conflict with that provision of the Constitution wherein plenary power is granted to Congress to legislate upon patents. I have seen no reason to alter this opinion; and if the opportunity occur, professionally or otherwise, I shall seek to test the constitutionality of this absurd and impolitic State enactment in the court of final appellate jurisdiction, as provided by the Constitution of the United States.

Would it not be equally just and reasonable to require that notes given for horses, cattle, grain, etc., should bear across their face the words "given for a mule," or "given for a hog," as the case might be: or that an accommodation note (which, as between maker and payee, represents no value received) should have the words "given for accommodation" apparent on its face? It would not, assuredly, require superior astuteness or invention to discover a plan whereby anti-patent State legislators could, by an extended but similar interpretation of State rights, so legislate as to practically strangle, so to say, a valuable franchise granted by the *whole* United States. J. PUSEY.

501 Chestnut St., Philadelphia, Pa.

PRACTICAL MECHANISM.

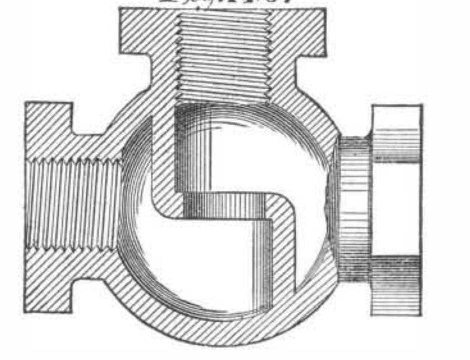
BY JOSHUA ROSE.

NEW SERIES—NO. XXI.

PATTERN MAKING.

In Fig. 146, we have for an example a common globe valve, shown partly in section and with a gas thread cut in

Fig. 146.



the openings. The flanges vary in shape; but as a rule, small valves are provided with hexagons and large ones with round flanges suitable for bolting to similar flanges to make joints. For small valves, say up to 2 inches, the pattern is usually made with the hexagons cut out of the solid, but for sizes above that, they should be made in separate pieces, as shown in Fig. 147, and screwed to the pattern, so that in case of necessity they may be removed, and flanges substituted in their stead. In Fig. 148, we have a perspective view of the finished pattern; and Fig. 149 represents the pattern as prepared, ready to receive a flange or hexagon as may be required. A globe valve pattern should be made in halves, as shown in Fig. 150, the parting line of the two halves being denoted by A B. To make this pattern, we first prepare two pieces of wood so large that, when pegged together, the ball or body of the pattern can be turned out of them, and long enough not only to reach from P to P, in Fig. 149, but also to allow an excess by means of which the two pieces may be glued or

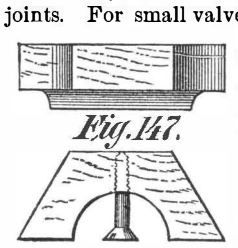
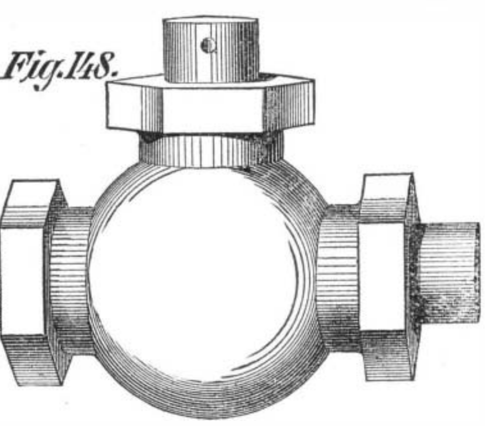


Fig. 147.

Fig. 148.



otherwise fixed together. These two pieces we plane to an equal thickness, and then peg them to retain them in a fixed position, taking care, however, that the pegs do not occur where the screws to hold the flanges will require to be. We also place two pegs within a short distance of what will be the ends of the pattern when the excess in length referred to is turned off. We next prepare, in the same way, two more pieces, to form the two halves of the branch, shown at B, in Fig. 149, for which, however, one peg only will be necessary. These pieces must be somewhat wider than the size of the required hexagon across the corners, that is, supposing the hexagon is to be solid with the branch; otherwise we must make them a little wider than the diameter of the hub of the flange, or of the round part of the hexagonal pieces. Their lengths must be such as to afford a good portion to be let into the ball or body of the pattern (as shown by the dotted lines in Fig. 149), which is necessary to give sufficient strength. The two pieces must be firmly fixed together, and then turned in the lathe.

During the early stages of the turning, or, in other words, during the roughing out, we must occasionally stop the lathe and examine the flat places on the body; for unless these places disappear evenly, the work is not true, and one half will be thicker than the other, so that the joint of the pattern will not be in the middle. It was to insure this that the pieces were directed to be planed of equal thickness, since, if such is the case, and the flat sides disappear equally and simultaneously during the turning, the joint or parting of the pattern is sure to be central. If the lathe centers are not exactly true in the joint of the two pieces, they may be made so by tapping the work on the side having the narrowest flat place, the process being continued and the work being trued with the turning tool at each trial until the flat places become equal. By this means, we insure, without much