

CHATEL'S DIRECT ACTING STEAM COCK.

The bronze cock shown in the annexed figure consists of a shell, *a*, closed at the top by a hemispherical cap, *K*, with which is cast in a piece the two guides, *c c*, which serve to maintain in a vertical position the conical key, *b*. When the hand wheel, *V*, of the screw, *F*, is revolved, the nut, *d*, which is connected with the key, *b*, by means of the projections, *h*, moves upward or downward and carries along with it the key.

It will be seen from this that the arrangement of this cock allows of the integral section of the pipes being preserved—a first class advantage that is not met with in ordinary cocks; for the section of these, being usually different from that of the conduits, diminishes the pressure of the steam.

As the key of the cock under consideration does not revolve in the shell, it follows that there is no gripping. As for the closing of the cock, that is perfect because of the great surface of contact of the key and its seat.

PERREAUX'S STEAM TRICYCLE.

We must go back more than two centuries to find the first idea of a steam carriage, and this is due to Isaac Newton, who proposed it in 1680. His system, which was one of the most rudimentary, was nothing else than an aëroplane mounted on wheels. Specimens of it are still to be found as scientific playthings in a few cabinets of physics.

The first tricycle based upon the principle of the steam engine was built by Cugnot, in 1770. To begin with this date, projects have not been wanting, the solutions proposed benefiting each time by the progress of the steam engine applied as a fixed motor. Murdoch in 1784, Symmington in 1786, Read in 1790, Trevethick in 1802, etc., successively proposed apparatus which to-day are forgotten. In 1804, Evans invented the *oruktor amphibolis*, a sort of boat-carriage, the first and last amphibious steam vehicle that has ever been built. We may cite also the steam carriage of Griffiths in 1821, of Gordon in 1822, of Gurney in 1828, of Anderson and James in 1829, and of Hancock in 1833.

The latter was the most fortunate of all inventors of such vehicles, since, in 1835, he had not less than three of them in current service, making the trip by steam on the Paddington route. According to Mr. Thurston, Hancock succeeded in constructing a light steam phaeton for his own use, which ran in the city among horses and carriages, without interfering with or injuring any one, at an ordinary speed of ten miles per hour, and which could be increased to twenty.

The success of locomotives on rails somewhat diminished the ardor of experimenters in this direction, and, in fact, competitions became impossible for steam street carriages.

To-day the question has assumed a transformation. Owing to narrow gauge locomotives and to tramways in the streets, there are no longer any endeavors to build vehicles designed to supplant horses, but there are still endeavors being made to get up a self-propelling vehicle, convenient and easy to maneuver, designed to receive a small number of persons—one or two at the maximum—and capable of operating regularly for a few hours without demanding too great an amount of attention on the part of the one who drives it.

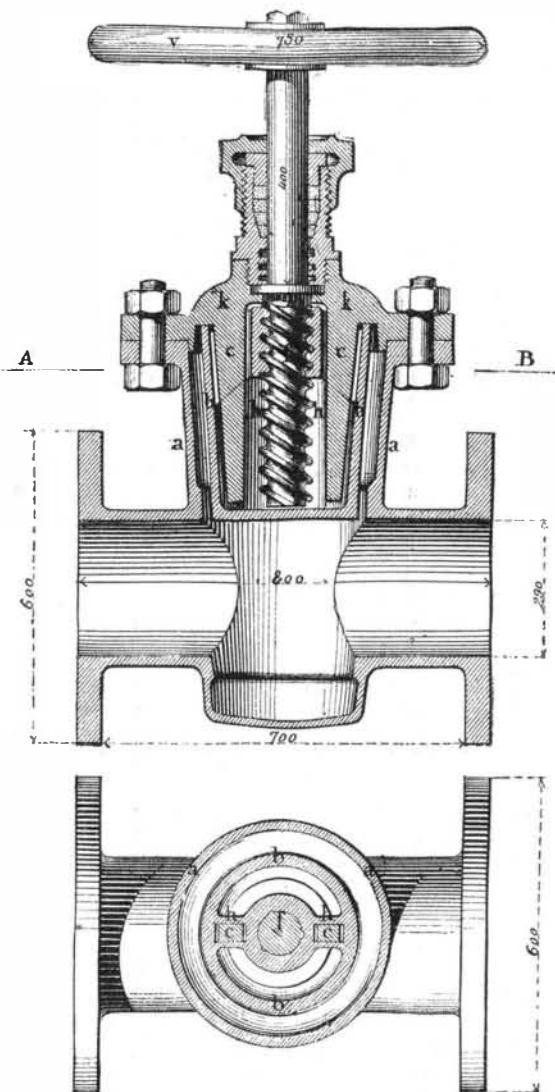
With this object in view, there have been proposed carbonic acid machines, compressed air motors, and electric motors supplied by piles or accumulators. The few experiments that have been tried in this direction have not as yet given very striking results, but the end is far from having been reached.

Other inventors are continuing their researches in regard to thermic motors, and more especially in regard to steam motors. As one of the most curious of these latter we may call attention to the steam tricycle of Mr. L. G. Perreux, one of our compatriots, whose labors are the more worthy of being better known and encouraged from the fact that the inventor has followed up his idea with remarkable perseverance for fourteen years, and has made considerable sacrifices of time and money to perfect his apparatus. Now that his patents are about to become public property, just on the verge of a success that he had hoped for to indemnify him for his outlays, we deem it of interest to briefly describe Mr. Perreux's system, which, by a singular coincidence, presents some analogy with that of Sir Thomas Parkins, than which it is older by several years, since it figured in the Universal Exhibition of Paris in 1878 under a less improved form than that possessed by the present model.

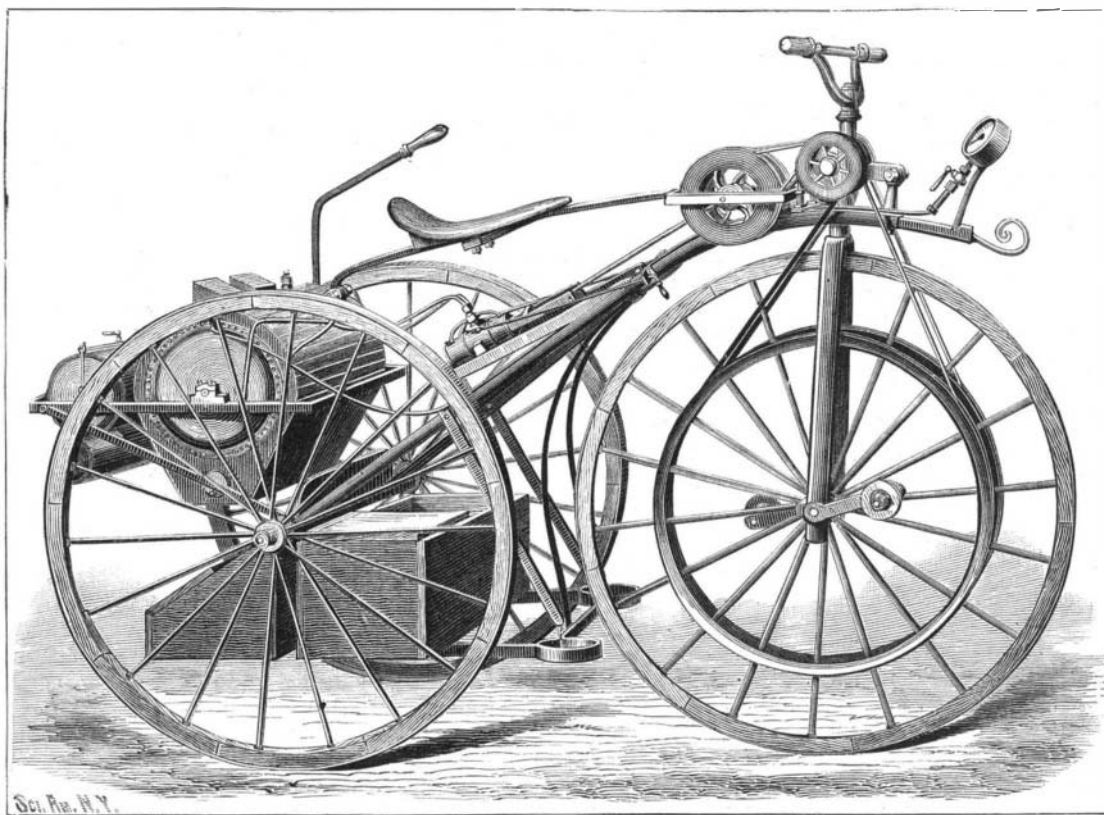
Mr. Perreux's first experiments were made with an ordinary two-wheeled velocipede carrying the boiler behind the seat of the driver, and the motive mechanism under the seat. It is evident that such a type can only serve for experiments and in a few rare cases. It requires a very peculiar ability

on the part of him who maneuvers it, and, for this reason it was, in the experiments, fixed to a whim of four meters radius.

In its present form the apparatus is a tricycle whose fore wheel constitutes the motive and steering one, while the hind wheels support the boiler and the greater part of the weight of the driver. The pedals serve for starting the vehicle; for the motive system, which is of very small

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dimensions, would not always do this quickly enough. The boiler, which is tubular, is heated by the vapors of alcohol furnished by a reservoir filled with that fuel, which is itself heated by an alcohol lamp having several wicks. The vaporization of the alcohol which burns under the boiler is regulated by a system of registers, which increases or diminishes the number of lighted wicks, and consequently regulates the production of the boiler according to requirements.

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The steam produced by the tubular boiler traverses two copper tubes that are wound about the latter and are in direct contact with the flame. There results from this a production of superheated steam which is afterwards sent to the motor. The use of superheated steam permits of a better utilization of it and requires for a given work a much less weight of it, thus diminishing the weight of feed water to be carried on the apparatus. This superheating of the steam

presents no danger, since it is performed on but a very small quantity at a time, and since the pressure never exceeds four atmospheres, as may be ascertained by the pressure-gauge placed in front of the apparatus. The motive system is a small engine having a single cylinder of 22 millimeters in diameter, and a stroke of 40 to 50 millimeters. Mr. Perreux estimates the work produced by his tricycle at 6 kilogrammeters per second, and that produced by his bicycle at 4 kilogrammeters. The escape of steam takes place under the seat, and the feed is effected by means of a small pump that draws water up into a small reservoir whose capacity is calculated for about a three hours' run without renewal. Motion is transmitted from the motor to the fire wheel by means of cords and pulleys. The driver has within reach all the parts, such as cocks, etc., necessary to operate the apparatus, and can, at will, allow himself to go at an ordinary speed of 12 to 15 kilometers per hour, or else aid the running by working the pedals with his feet so as to increase the speed. All the parts of this interesting little machine are constructed with remarkable ability; and in his last model the inventor has taken advantage of his experience in the introduction of numerous modifications and simplifications which we shall advert to after experiments have been tried with them. The question presents so much interest that we shall not fail to be present at such experiments nor to inform our readers of the results obtained.—*La Nature*.

The Action of Saliva in the Stomach.

Numerous samples of gastric juice pumped out of the stomachs of healthy persons, at different stages of the digestive process, have shown that during the early stages no hydrochloric acid can be detected even when the fluid is strongly acid. The period at which this acid first makes its appearance varies in different individuals, and, with a mixed diet, seems to depend primarily upon the quantity of food taken. After a light breakfast the hydrochloric acid will be found in three-quarters to one hour, but after a full dinner it does not appear for two hours.

Industrie Blatter says that Reinhard von den Velden has been experimenting upon the effect that saliva has on the gastric juice. These experiments showed that when starch paste was mixed with acid gastric juice (free from hydrochloric acid), and fresh saliva added, the mixture at once imparted a light yellow color to an aqueous solution of iodine in iodide of potassium. On the other hand, whenever the juice contained hydrochloric acid the iodine always gave a blue color, no matter how much saliva was added, or how long it was kept in an incubation stove. From this he concludes that there are two separate stages in digestion; that in the first the saliva can act, in the second the pepsine alone acts; the former is an amylaceous digestion, the latter an albuminoid. The latter will, of course, begin as soon as the juices are acid, but only takes place in full force when free hydrochloric acid is present.

Denver and South Park Railway.

In announcing the completion of the Gunnison extension of the Denver and South Park division of the Union Pacific the general passenger agent of that company, Mr. J. W. Morse, says that after crossing South Park it enters the

Arkansas valley, and leaving it pushes up Chalk Creek canyon to within 600 feet of the summit of the great Saguache range of mountains, and there, far above timber line, at the altitude of eternal snow and ice, it enters a tunnel 1,800 feet in length, and piercing the most rugged of the Rockies. Emerging from the tunnel on the Pacific slope, 11,524 feet above sea level, the enchanting valleys of Quartz Creek and its numerous tributaries, and 150 miles of monster mountains, stretch before the eye—a view of stupendous peaks and rugged canyons unexcelled for grandeur on this or any other continent. Alpine Tunnel, the first to pierce the main range of the Rocky Mountains, is the highest railway tunnel in North America or Europe. The approaches of the Denver and South Park division of the Union Pacific on either side are marvels of engineering skill, laid through scenes unrivaled for grandeur and magnificence. Although the tunnel commences with a sharp curve at its eastern end, so nicely was the engineering done that when

the workmen from either side met in the heart of the great Snowy Range they found only about one inch of variation of the respective bores.

THE official returns regarding the army show that the education of the German recruits has been yearly on the increase since 1875. In that year 2.37 per cent of the recruits could neither read nor write. In 1881 it was 1.54.