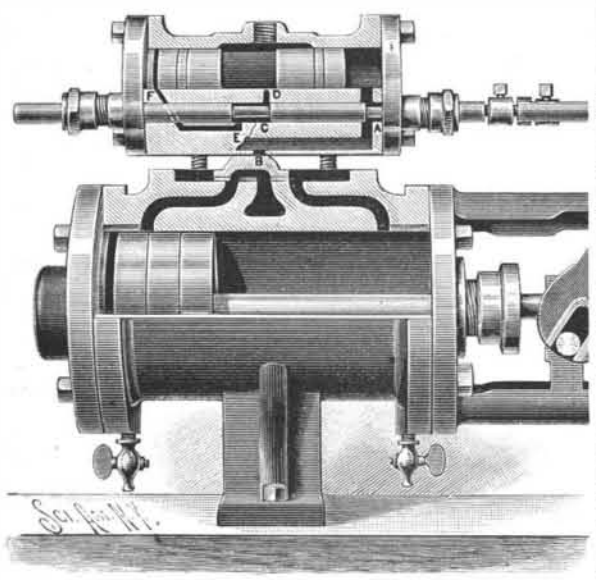
AN IMPROVED STEAM ACTUATED VALVE.

The valve shown in the illustration is more especially designed for use with steam pumps, and is of simple and durable construction, very effective in operation, and arranged to positively control the movement of the main piston valve. It has been patented by Mr. Joseph J. Kwis, of Findlay, Ohio. The pump has the usual steam cylinder, with the end inlet ports and central exhaust port, controlled by the usual slide



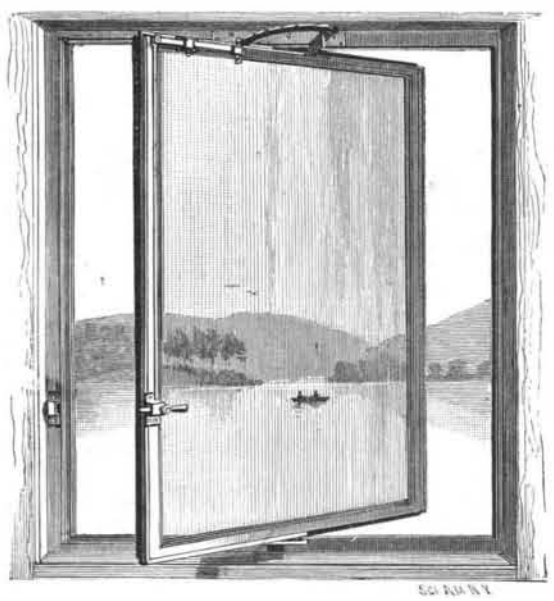
KWIS'S STEAM ACTUATED VALVE.

valve extending into the steam chest, within which also is an auxiliary piston valve adapted to be directly actuated from the piston in the steam cylinder, the steam chest having a main bore and an auxiliary bore. Steam inlet ports lead from the auxiliary bore to the ends of the main bore and exhaust ports independent of the inlet ports, and lead from the end of the main bore transversely through the auxiliary bore to the common exhaust passage. The auxiliary balanced piston valve sliding in the auxiliary bore has reduced portions controlling the steam inlet ports and the exhaust port, whereby the auxiliary piston valve is directly and positively actuated from the main piston rod, avoiding all undue friction, and positively shifting the main piston valve whenever the piston nears the end of its outward or inward stroke. In the illustration the exhaust is shown open at A, and enters main exhaust through the opening at B. The live steam which supplies the recess, C, is admitted through hole, D. The live steam port is shown open at E, and entering steam chest at F.

Further information relative to this improvement may be obtained of the Adams Brothers Company, the Findlay Machine and Boiler Works, Findlay, Ohio.

A WIDOW SASH FASTENER.

This is a device especially adapted for use in connection with window sashes pivoted at their centers at top



KIRSCH'S WINDOW SASH FASTENER.

and bottom, and is very simple, durable and inexpensive, and capable of quick and easy manipulation. It has been patented by Mr. Richard Kirsch, of Bay Ridge, L. I., N. Y. Near the upper central pivot of the sash an outwardly projecting rack is secured to the window frame, the rack being preferably of a quadrant form, and having a downwardly projecting flange which serves as a stop to prevent the sash from passing over a center line when opened. Extending across one side of the top rail of the sash, and passing adjustably through a block adapted to act as a pivot, is a locking lever, one end of which works in a bracket-like guide secured to the sash, there being at this end an adjustable locking pin adapted to engage one of the apertures of the rack. The locking lever is capable of lateral adjustment in its pivot block, and in an outer end block by which it is connected with a vertical connecting rod extending down one side of the sash. This rod is held to slide in one or more guides, and has at its lower end a guided movement in a plate in which is pivoted a connected operating lever, which may be either an elbow, an angle or a crank lever, forming a suitable handle by means of which the locking pin may be made to engage any one of the apertures in the rack, according to the position in which it is desired to adjust and lock the sash.

Protection of Iron from Rusting.

Mr. W. Thomson, of Manchester, is continuing his researches into the oxidation and corrosion of iron and steel; and he recently published some further observations on the subject in the *Journal of the Society of Chemical Industry*. According to this statement, Mr. Thomson had a number of sample pieces of thin sheet iron, of uniform size, weighed and painted with one coat of each of the paints, and weighed again; then left for about a week exposed to the atmosphere, and again weighed. The difference between the two first weighings gave the weight of the wet paint employed, which was calculated out to the square yard of surface; while the first deducted from the third gave the weight of dry paint. The coatings thus tested upon the sample strips, which measured 4 inches by 1¾ inches, varied in weight from ¾ ounce for linseed oil alone to 7 ounces for oxide of iron paint; tar weighed 1·56 ounces; solution of pitch, 1·24 ounces; red lead, 6·24 ounces; and so on.

Having tried in vain the effect of spraying the samples with a saline solution, Mr. Thomson proceeded to immerse the samples in a glass vessel containing sufficient saline solution to half cover each. He observed that, after two or three days, the clear solution began to grow turbid; and in a few days more it threw down a precipitate of the peroxide of iron. Some time later on it could be observed that the iron beneath some of the coatings of paint was undergoing oxidation to a much greater extent than others. It suggested itself to Mr. Thomson that if each plate of iron were placed in a separate glass beaker with the saline solution, the turbidity of the clear liquid would be some criterion of the progress of the rusting action. This was done in a case of a second series of experiments, which went to show that this observation is just; and Mr. Thomson was able to ascertain that oxide of iron paint, white lead, and the ordinary paints of commerce, have comparatively little protective influence on iron as contrasted with red lead, for the latter showed no signs of turbidity in the saline solution after all the others had become turbid, and deposited a considerable precipitate of ferric oxide. Mr. Thomson further lays stress on the electrolytic corrosion of iron; and he suggests that, for the protection of large iron structures from this effect, it might be advisable to place a large ball of zinc in wet ground in metallic contact with the iron of the structure by means of wires, which he believes would tend materially to prevent corrosion at comparatively small cost.

The Germ of Smallpox.

Professor Guamuri, of the University of Pisa, is of the same opinion as that published by him in 1892, in the *Archivi di Scienze Mediche*, viz., that the process of pustulation, both of cowpox and smallpox, is originated by a parasite which develops in the epithelial cells. He has studied both the morphology and biology of this organism. It is capable of amœbic movements, which can be seen on examination of lymph taken from the initial vesicle at the temperature of the human body. By this process Professor Guamuri has also verified the multiplication of the parasite under the microscope, and the fact of phagocytosis by polynucleated leucocytes. With a stain of gentian and methylene, the structure of this low organism may be studied. It consists of a roundish body with a clear outline. Professor Guamuri has succeeded in reproducing the parasite in the cornea of rabbits with inoculation of the same lymph, and he has verified the fact that no other source of irritation is capable of producing anything of the appearance of the same parasite in the cornea. Professor Guamuri believes that it is a zooparasite belonging to the class of rhizopode, and that it is the cause of both cowpox and smallpox.

A Home for Truants.

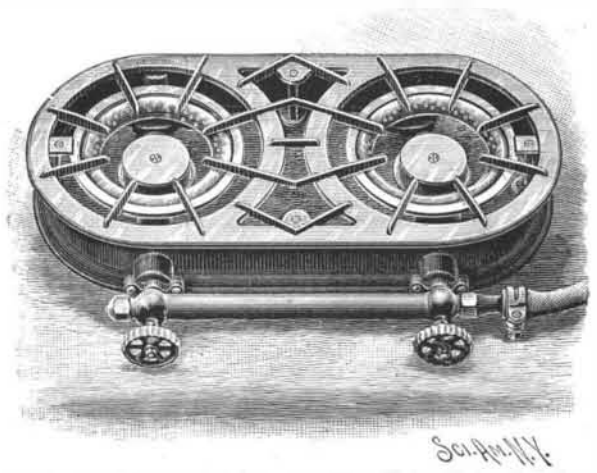
Boston is soon to have a home school for truants and troublesome boys. They are to be gathered into families of about twenty-five, under the care of a superintendent and his wife. A teacher of rare gifts of mind and heart is to be assigned to each group, and under his direction, three hours a day are to be devoted to study. The boys are to do all the household work and to cultivate the estate of thirty acres where the home is to be placed.

They are also to devote four hours a day to training for occupations to be had in the city.

The instruction on Sunday morning is to be moral and religious, and in the afternoon it is to be denominational.

AN EFFICIENT HEATING GAS BURNER.

As shown in detail in the SCIENTIFIC AMERICAN of April 7, the base of this burner, where it is attached to the gas supply tube, is supplied with apertures to admit air to mingle with the gas before it reaches the point of combustion, while the tube which surrounds the flame has air-receiving openings on its under surface and smaller air-discharging apertures in its upper surface, where the tube is impinged upon by the flame. The tube thus being raised to a high temperature, and correspondingly heating the air discharged therefrom to mingle with the burning gas, is designed to afford the most perfect combustion, with the attain-

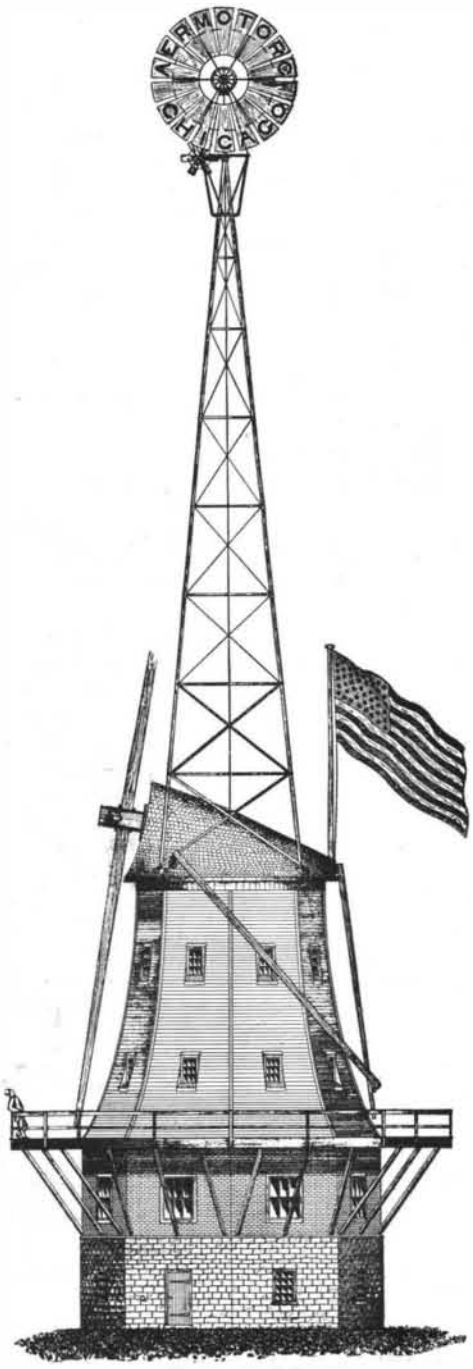


WILLIAMSON & BUZBY'S HEATING GAS BURNER

ment of the highest possible degree of efficiency for the quantity of gas consumed. The illustration represents the practical construction followed in the application of the improvement recently patented by Messrs. John R. Williamson and Isaac W. Buzby, of Seattle, Washington.

A HIGH WINDMILL.

Among the windmills shown at the late World's Columbian Exposition, that of the Aermotor Co., of Chicago, represented in the accompanying illustration, was perhaps the most unique and striking. It was 55 feet from the ground to the turret of the old Dutch windmill, from which sprang a galvanized steel tower 87 feet high, surmounted by a 16 foot wheel, making a total height of 150 feet. This windmill towered above



A HIGH WINDMILL.

all competitors at the Fair, and around the lower structure was a balcony nearly 150 feet in circumference, from which an impressive idea of the height of the tower was obtainable.

THE BICYCLE UPON RAILS.

It is from Russia this time that comes to us a curious cycling apparatus. The accompanying engraving reproduces a photograph taken in the vicinity of Moscow a few hours previous to the passage of the imperial train. Some Russian gendarmes, one of whom is seated upon the apparatus, have just made an inspection of the track. The Czar may now pass, as there is nothing to be feared from the Nihilists!

As will be understood, the person in the center is utilizing a sort of bicycle for his police service which rolls upon the rails of a railway track. In reality, the word bicycle is a misnomer for this apparatus, which rests upon three wheels. Through its two principal wheels it rests upon the rail to the right, but is kept in equilibrium by a metallic arm terminating, on the rail to the left, in a small wheel. It is a crude apparatus, moreover, whose two heavy main wheels are connected by a compact body, the various parts of which are roughly shaped, and which weighs no less than 110 pounds.

As primitive as the machine is, however, it exhibits some very original peculiarities. It is actuated both by the arms and legs of the rider, and thus puts one somewhat in mind of the Valere running machine. Here, the rider, not having to occupy himself with the steering of the machine, since the latter, being fitted to the rails, follows all the curves thereof, devotes his entire attention to its propulsion. Two levers, actuated by the arms, are, through a slide at their lower extremity, connected with each of the cranks of the bicycle. It will be remarked that, contrary to the arrangement of the Valere machine, which causes its rider to take an ambling gait (that is to say, causes him to put forward at the same time the leg and arm of the same side), the Russian railway bicycle employs the ordinary gait of man's trot, that is to say, causes the rider to put forward at the same time the right arm and left leg, and reciprocally.

We shall not expatiate here upon the genuine services that may be rendered by this inexpensive and very rapid apparatus, which necessitates scarcely any cost of maintenance and which one man can easily remove from the track, in order to allow a train to pass, and afterward replace upon the rails. It is too evident that the switchmen, inspectors and engineers of railways would find it of great interest to utilize it according to circumstances.

Much is being said about military cycling; we are not so very sure whether in time of war railways would not be the only routes cyclable. We may remark, however, that this homely Russian apparatus is not an innovation, but far from it. Almost from the inception of cycling it has been understood that the railway is the most practical, the surest and best rolling roadway. The oldest example of cycling upon rails that we know of is mentioned in the *Albany Courier* of August 20, 1869, which states that upon the banks of the Mohawk, two landowners had had constructed for themselves, in order to visit their possessions, small cars that they actuated by their arms and legs upon the railways.

This journal adds that one evening, in a fit of jealousy, the two inventors ran into each other upon an embankment one hundred feet in height, in a sort of real Yankee duel, and that the cars were smashed and one of the duelists was killed outright. Without dwelling upon this perhaps fanciful story, we shall further recall that at Paris, on the 28th of December, 1887, the military engineers, represented by Capt. Houdaille, tried a railway quadricycle, constructed by Mr. Vincent, upon the line of the East, near Villette. A speed of 18 miles per hour was obtained. Unfortunately the apparatus weighed 198 pounds, and for this reason was abandoned. Afterward, Truffault, the bicycle manufacturer, who played so important a part in the history of cycling, established after the manner of the Americans a railway quadricycle that weighed but 55 pounds, and gave a speed of 24 miles per hour upon a level. The French state railways began some experiments in 1891. It is now 1894, and the experiments are being carried on without any conclusion as yet. It is fortunately necessary now to rely much in France upon the example of Russia.—*La Nature.*

BICYCLE FOR THE INSPECTION OF RAILWAY TRACKS.

THEODOR BILLROTH.

One of the brightest stars in medical science—the last of the triple star—Langenbeck-Volkmann-Billroth—is extinguished.

Theodor Billroth was born April 26, 1829, at Bergen, on the island of Rugen. His father, who was pastor at Bergen, died early, leaving the son to be brought up by his mother. Later he went to school at Greifswalder, and in the years 1848 to 1852 he studied medicine in Griefswald, Gottingen and Berlin. He carried his studies farther than many, working as diligently at the natural sciences as at medicine.

THEODOR BILLROTH.

In addition to the usual journeys to Vienna and Paris for the purpose of study, Billroth had a thorough drill in the surgical clinic in Berlin, where he acted as Langenbeck's assistant in 1853. The master soon recognized the ability of the youth in working out microscopic, anatomical and histological questions, and the importance of such fundamental investigations for practical surgery. Thus we see him here occupied chiefly with study of an anatomical and physiological nature, and with experimental pathological work which paved the way for a new era in surgery. With wonderful adaptability he studied many subjects during his seven years in Berlin. Embryonic studies led him to an understanding of the development of the blood vessels and a careful study of unhealthy formations. He also produced at this time an excellent work on "Umwandlung von Muskel- und Nervengewebe" ("Transformation of Muscle and Nerve Tissue"), an historical study of the treatment of gunshot wounds from the fifteenth century to the present time, and his "Beitrage zur Pathologischen Gewebelehre" ("Contributions to the Science of Pathological Histology"), an especially important work that brought to light much that was new.

It took him only ten years to rise from the position of student to that of professor and scientist. In 1859 he was called to Greiswald as professor of pathological anatomy. Fortunately for surgery, he refused this flattering call, but two years later he accepted a call as professor and director of the surgical clinic in Zurich. He left here in 1867 for a similar position in Vienna. When in the Swiss high school his great industry and brilliant surgical talent showed to advantage, and his methods of work here, following up the questions of the day in his studies and his teaching, are set forth not only in his "Clinical Reports," but also in his "Fifty Lectures on General Surgical Pathology and Therapeutics," a work of classical value and universal importance that lived through many editions and was translated into all civilized languages. In Vienna he continued to publish his experiences in "Clinical Reports," and he and Pitha produced the great compilation "Handbuch der Allgemeinen und Speciellen Chirurgie" ("Handbook of General and Special Surgery"), which is prized by physicians in all parts of the world as a mine of surgical experience.

Lister's epoch-making discovery of the use of antiseptics in operations, which opened to surgery heretofore unsuspected paths, was not without its effect on Billroth. He was one of the first in Germany to acknowledge and appreciate the importance of the antiseptic method. With his accustomed zeal he undertook the study of the suppression of surgical fevers and diseases, but he was not tempted even by his great success to perform unnecessary operations. Step by step he followed up carefully the branch of surgery which had been so suddenly opened, and we have to thank him for many operations in internal surgery that are of the greatest importance in saving life, and such as no one had dared to perform before. Among these we may mention the removal of the larynx and the resection of the pylorus end of the stomach, which added new leaves to his crown of laurel. This was before the time of Koch; but Billroth was then a pioneer. By his work on the vegetable nature of the septic coccus bacteria, he increased the knowledge of wound infection so that he might be called the apostle of antiseptic surgery.

His ability in two other branches should be mentioned here, viz., that of military surgery and popular authorship. As a result of his voluntary service in the Franco-German war, he presented the medical world with "Chirurgischen Briefen aus den Kriegslazarethen von Weissenburg und Mannheim," 1872 ("Surgical Letters from the Hospitals of Weissenburg and Mannheim"), as well as with his dissertations on the transportation by railroad of those wounded and taken ill on the field (1874). As a teacher of the people he published, in 1881, a handbook on "Die Krankenpflege im Hause und im Hospital" ("Care of the Sick at Home and in the Hospital"), that has been universally translated, and shows how a true German savant can present questions of hygiene in a form that is agreeable and at the same time comprehensible to the uninitiated.

Billroth has taught many famous pupils, and the students' thorough appreciation of his ability as a teacher is shown by the document which they presented to him on the occasion of the anniversary of his fiftieth term at Vienna (1892). In his "Lehren und Lernender Medicinischen Wissenschaften" ("Teaching and Learning Medical Science"), 1876, he made a valuable gift to those who are interested in reform in medical instruction.

Billroth was a person of the greatest charm; his finely formed head, clear eye, and brilliant oratorical gifts will long be remembered by all who knew him. He was a real "path finder" for his associates, his bold and successful methods of performing operations restored thousands of suffering people to health, and being extremely self-sacrificing and magnanimous, he was a true benefactor to the sick and a fatherly friend to the student. — *Illustrirte Zeitung.*

THE strongest animals in the world are those that live on a vegetable diet. The lion is ferocious rather than strong. The bull, horse, reindeer, elephant and antelope, all conspicuous for strength, choose a vegetable diet.