energy is economized as one would economize the energy of a locomotive, and his legs and feet are saved from an enormous amount of battering, which proves so fatal on all conditions of road.

In an experiment tried before his audience with his invention, which was exhibited at the World's Fair, at Chicago, Mr. Brigg used a two-seated wagon with ordinary shafts. From the latter a line was carried back seven feet to a small platform bearing a chair on which was seated a man of middle weight. Two people climbed into the seats of the wagon. A strong, heavy man now tried to haul the affair, but failed. The automatic appliance was then attached to the shafts and the wagon was hauled easily, notwithstanding a second man had taken his position on the platform drag. The hauler had been relieved of part of his weight, and the strength in his pull had been added to that much.

PROGRESS AND INVENTION.

In the course of his remarks recently upon the part that had been played by the American inventor in the development of the country, the Hon. Thomas Reed among other things said: "To hear the discussions in Congress you would suppose that invention dropped from Heaven like manna to the Jews. You would suppose that James Watt reached out into the darkness and pulled back a steam engine. It was not so. All invention is the product of necessities and of pressure. When the boy who wanted to go off to play, so rigged the stop-cocks that the engine went itself, he was not only a true inventor, but he had the same motive—his personal advantage—that all inventors have, and, like them, it was urged on him by business necessities. What originated Bessemer steel? Sir Henry Bessemer? No; but the necessities of railroads, which would, every one of them, have been bankrupt without steel rails. If Sir Henry had not invented the process, somebody else would. It detracts not one iota from the fame of Alexander Bell that a dozen men were close on his track. It has been so in every great invention. I say, therefore, that it was the diversification of our industries that stimulated inventions. Otherwise all the inventive power of America would have run to waste; and when a man calculates the wonders of American inventive genius, he knows where some of our wealth comes from.

"As a further proof that invention is born of necessity, tell me why great inventions never come until the world is in such shape as to enjoy them? What would the Crusaders have done with railroads? There was not money enough in the world, or travel, or merchandise to keep them going a week."

A New Sanitary Building.

Dr. W. Van der Heyden, of Yokohama, Japan, in a recently published pamphlet, describes a sanitary building devised by him, which he has occupied for a year, and in which he believes that he has solved the twofold problem of the construction of a dwelling for use in both arctic and tropical climates. The new structure is composed of glass boxes filled with a solution of alum and made air and water tight. The application of glass for building purposes is not altogether new, however, since hollow glass bricks have already been made and houses built of them.

The boxes employed by Dr. Van der Heyden are formed of two panes of 4-10 inch thick glass, fixed in cast iron frames that are screwed together. These boxes, which have thus far resisted the influence of cold and heat, shocks and earthquakes, rest upon cast iron supports. The necessary gaps between two rows are filled with felt and then covered with boards. The series of boxes above each other and next to one another, with as little space between them as possible, and such space filled with felt, form the external walls of the house. The roof, which is flat and is supported by the cast iron pillars that carry the boxes, can be made in exactly the same mould.

In the house under consideration, glass panes pressed against each other, but with strips of rubber between them, form the horizontal ceiling. Above this there rests a thick layer of ashes, upon which there is a light framework of wood, covered over with cement. This, of course, renders the roof non-translucent, but it defends the room well against the radiant heat, and, being made of bad conducting material, the heat of the interior is not lost. As the four walls are totally translucent, there is more light than in any other description of dwelling.

A house built in such a way is an entirely closed hollow space, without windows or doors. As there are no openings and no fissures, it is practically impermeable to air, moisture, heat, cold, dust, microbes and insects. Since the panes are of rough plate glass, objects within the inclosure cannot be seen from the outside. At convenient places, some may be replaced by transparent glass to serve as windows giving a view of the exterior. Doors are not needed, since the entrance can be made through the floor by means of a staircase from an underground room, which receives no direct light from the sun. The walls of this room are made of ordinary bricks, plastered inside and protected outside by a thick layer of clay to exclude moisture. The light is admitted through glass boxes set into the four corners of the ceiling, which forms the floor of the room above. This floor is made of double planks, with a thick layer of sawdust between them. The planks facing the upper room are painted and varnished, but may be saturated with paraffine. Those facing the under room are plastered, as are also the walls. There is a mild, diffused light in the lower room, sufficient to read by. At night, both compartments are lighted by electric lamps.

As in winter the solution in the glass boxes might freeze, and would certainly do so in cold countries when the temperature falls to —18° C., a covering of ordinary glass set in wooden frames surrounds the whole building, so as to form an envelope of air, which is a very bad conductor of heat. This air space can be easily warmed if required. In the summer of moderate climates, and all the year round in tropical ones, the same glass window frames are put within the house, so as to shut off the heat by means of these badly conducting air cushions. The dwelling is entered from the exterior through a staircase leading to a corridor that communicates with the subterranean room, and that can be closed by doors, so as to let in as little cold or heat as possible while a person is entering.

Between the walls and the ceiling, there is a space leading outside to a belt covered with window glass and partially surrounding the building. From this external air space a tube leads to a stove (which stands out of doors) and conveys the air directly under the grate. There is thus a constant withdrawal of air from the house as long as the fire burns. This vitiated air is replaced by pure air that has been warmed in passing through tubes placed around the pipes that carry the heated gases from the furnace to the chimney. This air, before entering the heating space, comes from the lower room, where it has already taken the temperature of the surrounding earth. The heated air rises in a tube laid under the ceiling of the lower room and escapes through openings in the floor of the upper room. The temperature of the air is controlled by valves.

In the summer of moderate climates, and always in the tropics, the renewal of the air is effected in a different way. The vitiated part escapes, as in winter, near the ceiling. From there it enters a prismatic chamber of wood and glass, which is carefully closed in winter by a wooden cover, but is left open in summer. This apparatus, which Dr. Van der Heyden calls a "sun belt," performs the functions of a stove, in causing a useful draught, through the heating of the inclosed air by the solar rays. The expanded air, in rising and escaping freely at the top, is followed by the denser air from the room. The arrangement acts automatically when the sun shines. When it rains, the more the rain and the harder it falls, the greater the draught, while every slight movement in the external air promotes the withdrawal of air from the sun belt and house.

In a hygienic building, it is of great importance to have the fresh air constantly entering the apartments free from dust and microbes. This result is obtained as follows: Both in winter and summer, the air for ventilation is taken from the cellar room. The air to replace this enters through a large glazed earthenware pipe or a plaster-lined brick tunnel extending underground to a distance from the house, and then rising vertically to some height above the surface and opening in the free air. It is here covered with wire gauze to filter the air from insects and rough particles, and is sheltered from direct sunshine by a wooden roof. In the opening that communicates with the lower part of the cellar room there is placed a wire cage filled with loose cotton, which filters the air from the finest particles of dust and from microbes. In front of this cage is placed a pane of glass covered with glycerine or moist glue. The air coming from the pipe strikes this surface, leaves thereon the microbes that may have passed through the cotton, and then expands in the interior of the room. The rooms of such a building are thus made as aseptic as a wound-dressing of Lister.

Dr. Van der Heyden, believing that the air of one's neighbors ought not to be vitiated by allowing the air leaving the house to carry with it bacteria, or poisonous gases due to the expiration of the inmates, purifies the air of his building more fully by having curtains stretched under the ceiling with woolen tassels attached to them by hooks and eyes. Into some of these tassels a strong alkali and into others Nestle's reagent is drawn by capillarity. The air, striking along the ceiling before it leaves the cornice openings, deposits there its carbonic acid and its organic alkaloids, besides the greater part of the dust that may have collected. In this manner an endeavor is made to have the air that leaves the house as pure as it was forced to be on entering.

The wash and kitchen water is rendered innocuous, before it is allowed to enter the drains, by passing it through an unglazed chinaware filter, on the principle of that of Chamberland, but differing in construction. On the same principle of not allowing any matter containing infection to remain in the house or to leave it undestroyed, the water closet used is so constructed as to permit of the quick oxidation of the urine, fæces, sputa and other refuse through the action of sulphuric acid and nitrate of soda. Different organic salts are the result, all the organic matter is destroyed, and nothing that is of great value as a fertilizer is lost.

Railroad Development.

To complete the Transandine Railway, which would give uninterrupted communication between points in Chile and Buenos Ayres, the capital of the Argentine Republic, it is necessary to build only 33 kilometers (20½ miles), as trains can now run over 1,189 kilometers out of a total of 1,222 miles. The Argentine section is nearly completed as far as Puenta del Inca, so that in 1894 there will remain to be constructed 15 kilometers, including two tunnels at the summit. Work on this remnant of the Argentine section will be commenced as soon as the line on the Chilean side is sufficiently far advanced to permit the work being prosecuted in such a manner that the two sections—the Argentine and the Chilean—shall be finished at the same time. Thus, the only obstacle to the completion of the road has been the lack of satisfactory arrangements for constructing the Chilean section. The contractors, John and Matthew Clark, having found it impossible to raise money for this link under the guarantee of the Chilean government, asked the Chilean congress to increase the guarantee from 4 to 5 per cent, and this having been done, it is said there will be no difficulty in completing the road.

The Chilean congress has granted a concession for a railway to connect the Southern Line of Chile with the Argentine Great Western, at La Paz. The road will be mostly in Argentine territory, namely, 175 miles from La Paz to the Andine pass of Tinquiririca and 75 miles further to a point on the main trunk Southern Railway, between San Fernando and Curico. The road is expected to be of special use for the valuable cattle trade across the southern passes of the Andes into Chile.

From a report by Mr. C. C. Mallet, British consul at Panama, it appears that steady progress is being made in the construction of the important railway from Cartagena to Calamar, on the Magdalena River, in Colombia. The concession for this road was obtained in 1889 by Mr. S. B. McConnico, representing some American capitalists. The funds for the enterprise were raised in the United States, but work was delayed for nearly three years, because of the difficulty experienced in securing an amount sufficient to complete the road. Construction was commenced in June, 1892, and one year later, June 15, 1893, the first section of the railway, from Cartagena to Turbaco, a distance of 14 miles, was formally opened. The next section, to Arjona, 8 miles, was to have been opened in October, and it is expected that the road will be completed to Calamar by June, 1894. At the time of Consul Mallet's report, in September last, 1,800 men were at work on the road. The road is being built with care and is equipped with the best American cars and locomotives. The distance from Cartagena to Calamar is 65 miles. Most of the land adjacent to the line is suitable for fruit culture and cacao. The trade from the upper Magdalena, a large part of which, it is hoped, will be diverted to the port of Cartagena, is expected to give the road substantial profits.

A Fish with a Rubber Corset.

Forest and Stream speaks of a curious find in the Cape Ann fish market, at Gloucester, Mass. It was nothing less than a mackerel with a rubber band around the body. The band had been put on the fish when quite small, and stayed there in spite of the rapid growth of the wearer. The fish's body under the band did not grow, which caused a depression in the full-grown body of about three inches in depth. The depression was covered with a healthy skin in no way unlike that on the rest of the body. The fish measured in length fourteen inches, diameter of body each side of the depression, seven and three-fourths inches, diameter of depression, five inches. The fish was undoubtedly in a healthy condition, and the band was sound and could be stretched like any other band.

Cleveland's Portable Engine Brake.

In describing this improvement, in our issue of December 16 last, it was inadvertently stated that the brake might be applied to a portable engine "for braking purposes on reaching a down grade." The brake is not intended for such use, but to prevent oscillation of the engine when driving machinery. The illustration clearly indicated its thorough effectiveness for the latter purpose, the simplicity of its application, and the readiness with which the chains could be tightened to lock the wheels immovably, no matter how severe might be the work the engine was called upon to do. The device is strong and durable, and may be stored on the engine when not in use. The improvement was recently patented by Mr. E. W. Cleveland, of Rounthwaite, Manitoba, Canada.