fit into a recess, so that the contact between the abutment and cylinder is always maintained. The reversing gear, by which steam is admitted to either port by means of a common D valve, is operated by the hand lever shown.

The most important points in the rotary engine are no clearance and tight joints which, while avoiding friction, are slow to wear. An English contemporary, speaking of the sliding abutment plan, and allowing the abutment to have the same velocity as the piston, says that, in an engine 9 feet 8 inches in diameter, having 86 square inches of piston surface and making 60 revolutions, such an abutment could not completely close until the piston had moved four inches away from it. This four inches represents clearance, which is waste, for in rotaries there is no compression.

In the Myers mechanism, there is no clearance. The abutment is always closed; the instant the piston clears the port, steam enters and immediately exerts its useful effect, and there are no springs, cams, valves, or other devices, save the simple three working parts, to produce this highly important result.

The packing difficulty is a stumbling block for an immense number of rotary engines. In the present machine, the broad bearing surfaces are of metal, face to face. There is no packing at all inside the cylinder, and it only exists in the stuffing boxes about the shaft. So far as the development of friction in the engine is concerned, it might be supposed that the steam, pressing against the broad flukes of the piston, would force the same into too close contact with the cylinder, bending the shaft. Such is evidently not the case, for the steam must enter between the piston and cylinder, so balancing the former at every point, except during the instant it passes the exhaust port, exactly, in fact, as the ordinary slide valve is balanced. Friction and wear are thus prevented. Finally the aggregate friction of the various parts of this machine, as compared with that of the parts of a reciprocating engine (the piston, the rod, the gibs, the crank pin, etc.), is, as is apparent from the very fewness of the working portions, the less.

The operation of the Myers engine is perfectly noiseless; there is no pound or clack whatever, and the 50 horse power machine at the Fair runs and reverses instantly under half a pound pressure of compressed air or steam. The arrangement of pistons, as shown in Fig. 2, forms really a double engine, the pistons being 180° apart, thus ensuring even motion, while it suggests the possibility of any number of engines and pistons being thus combined.

The particular form of engine represented in our engravings, through its prompt reversing and capability of holding the load, is especially adapted as a hoister for mines, elevators, and like uses. It is besides well suited for the working of steering gear, or the driving of propellers in vessels. As it is remarkably compact, occupying a minimum of floor space, it will doubtless prove valuable in establishments where economy of room is an object; and in instances in which, for example, it is desirable to attach a circular saw directly to the shaft.

A word may be added with reference to economy of steam, to point out that the tendency of the pressure within the cylinder is to force the abutment up and so obviate leakage. If the other leakage about the piston edges is prevented, there seems no valid reason why the engine should not be as economical as a reciprocating machine at full stroke. All that is necessary to provide for expansion is to arrange a cut-off at the reversing valve. Of this, however, more hereafter. For the present, we dismiss the subject with the opinion that the engine is of unquestionable merit; and if future tests prove this probable economy of steam, we can predict for it a well deserved success. The inventor is Mr. Edward Myers, and further information regarding the machine may be obtained by addressing the Myers Engine Company, No. 6 Cortlandt street, New York city.

Breathing through the Mouth.

A fact which cannot be too frequently impressed on the mind, says the *Science of Health*, is "that the pernicious habit of breathing through the mouth while sleeping or waking is very hurtful. There are many persons who sleep with the mouth open, and do not know it. They may go to sleep with it closed, and awake with it closed; but if the mouth is dry and parched on waking, it is a sign that it has been open during sleep. Snoring is another sure sign. This habit should be overcome. At all times, except when eating, drinking, or speaking, keep the mouth firmly closed, and breathe through the nostrils, and retire with a firm determination to conquer. The nostrils are the proper breathing apparatus—not the mouth. A man may inhale poisonous gases through the mouth without being aware of it, but not through the nose."

The editor should, in this connection, have directed the attention of his readers to the patent anti-snoring device illustrated in these columns some time ago. By its use, the above troubles are all obviated.

Crystalization of Tin.

A fine crystalization of tin is obtained as follows: A platinum capsule is covered with an outer coating of paraffin or wax, leaving the bottom only uncovered. This capsule is set upon a plate of amalgamated zinc in a porcelain capsule. The platinum is then filled completely full of a dilute and not too acid solution of chloride of tin, while the porcelain is filled with water acidulated with $\frac{1}{20}$ of hydrochloric acid, so that its surface comes in contact with the surface of the liquid in the platinum. A feeble electric current is set up, which reduces the salt of tin. The crystals formed after a few days are well developed. They are washed with water and dried quickly.

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RAPID TRANSIT IN THE CITY OF NEW YORK.

We recently called attention to the appointment of a special committee of the American Society of Civil Engineers, to receive, consider, and report upon the best plans for providing rapid transit in this city. The Committee have held several meetings, and examined a variety of plans; but only a few new ones have been presented.

Mr. Davis proposes a cheap elevated single track railway, of narrow gage, like that used in some of the mining districts of England. Mr. Nolan has a two story iron bridge railway. Mr. De Puy's plan is an iron framework placed over the street, with sidewalk for passengers and railway in the middle. Mr. McGonegal would have an arch of iron over the street, with tracks within the arch. Peter Cooper suggests an elevated railway with endless propelling rope and cars. Mr. Speer presented his chain of flat cars, with little houses and chairs set thereon, forming what he terms a traveling sidewalk. Mr. Schuyler exhibited his canal railway, through private property, estimating the cost at eight to ten millions of dollars from City Hall to Harlem, eight miles. Mr. Church advocated an arcade railway, four tracks, to cost a million and a half per mile. Mr. Gardner urged his elevated railway along the rivers, with warehouses. Our readers are familiar with most of these plans, as they have heretofore been illustrated and described in the SCIENTIFIC AMERICAN.

The Committee, we understand, are not pledged to any particular plan, but are so convinced of the paramount necessity of having some sort of rapid transit road immediately built, that they will recommend a hard times railway, one of the economical plans, believing that the cheaper it is in first cost the more quickly it will be erected.

In the meantime, while the many inventors are planning and the Committee considering, it is gratifying to know that rapid transit in this great city is making real progress. The magnificent line of solid and substantial underground railways on Fourth avenue, between the Grand Central Depot, 42nd street, and Harlem river, 4¼ miles, authorized by the State Legislature of 1872, is now almost completed, and will open for traffic in January next. The continuation of these tracks down town to the southern limit of the city, at the Battery, 4½ miles, by the Broadway Underground Railway Company, was finally authorized by the Legislature, May 10, 1874; and although but a brief time has elapsed, it is believed that the construction will soon begin. These great works, having a total of 8¾ miles in length, built in the strongest manner, under the direct supervision of the most eminent engineers, will form a rapid transit railway of which the citizens of New York may well be proud. Our engineers will do well to lend all possible influence in favor of their early completion. Over these tracks, passengers may be safely conveyed, at high velocity and for low fares. Nothing about these roads will be experimental or uncertain. Their capacity for traffic will be enormous; they will in all respects be adequate, convenient, and satisfactory to the public.

We commence on another page a series of articles descriptive in detail of the Harlem section of the Underground Railway, from which our readers will gain some idea of the magnitude and importance of the work. As the most recent specimen of American railway engineering, the plans are worthy of study, and will undoubtedly command the attention of civil engineers everywhere. Our articles will not only embrace sectional views and dimensions of the tunnels, viaducts, open cuts, and bridges, but will also exhibit the construction of the underground passenger stations and other peculiar features. These papers will possess special interest and value, owing to the many different forms of construction that are involved along the line of the work.

HINTS TO INVENTORS AND CAPITALISTS.

As a general rule, the man who makes an important invention has not the necessary capital to manufacture and place it in the market; hence he is obliged to seek assistance from others, giving up some part of his invention in return for the means of development which was furnished to him. Indeed, many valuable inventions are abandoned before being fully perfected, on account of the poverty of the inventors. It is eminently fitting that capital should lend its aid to intelligence, in cases of this kind, since the original outlay will be more than returned when the public appreciate the value of the new idea. It is not true, however, that every new idea is a good one, and a useless or imperfect invention forms one of the best devourers of money that can well be imagined. There are many capitalists who are ready and anxious to furnish means for the advancement of new projects, if assured they will be useful and profitable; but they have been deceived so often by schemes that promised well, that it is difficult to induce them to listen favorably to anything that is presented. It would seem, then, that there should be some middle ground upon which inventors and capitalists could meet, making and receiving propositions by means of a third party who is well versed in business matters and also fully acquainted with technical details. The capitalist, for instance, although a good business man, generally has not the experience and the technical knowledge necessary to enable him to form a thorough opinion in regard to the value of a mechanical device or process. The inventor, even allowing that he is fully acquainted with all the matters to which his invention relates, can hardly be considered the most suitable person to expatiate upon its merits. There is a trait in human nature that causes most men to have a pretty good opinion of their own ideas, and our readers must have noticed that the inventor of the most worthless article is apt to consider it of as much value to the world as anything that can be desired. In listening to the enthusiastic talk of the inventor, one is apt to be carried away by his remarks, unless he is thoroughly acquainted with the subject. Many inventors, however, before approaching a capitalist, carry their designs to experts and obtain opinions from them. But even with a score of such recommendations, the capitalist will not be safe in investing money to develope a design. Many experts are not as careful as they should be in giving opinions on inventions, and no one, however honest and capable he may be, can assert positively, without a trial, that a new machine will be successful. He can frequently discover fatal defects by simple inspection, but he cannot safely assert that none exist. A little incident, which lately occurred, will illustrate these points more fully. A mechanic had invented a new cut-off, which he asserted would save at least 25 per cent of the fuel, on being attached to any engine that had a plain slide valve. Like many other inventors, he had exhausted his means in obtaining his patent and building one machine; but it had been examined by several engineers, who thought very favorably of it, and expressed these favorable opinions in writing, so he considered that it would not be difficult to obtain what money he needed. After interviewing a few capitalists, he met one who seemed quite favorably impressed. The latter, however, rather distrusting his own judgment in a matter with which he was so little acquainted, sent the inventor to an expert, promising to accept his report as final. The expert was a man who was accustomed to dealing with such matters, and was moreover rather cautious in expressing an opinion in cases in which he could readily discover facts. So he addressed the inventor, somewhat after this manner: "My friend, you say that you have a cut-off which will save 25 per cent of the fuel, and you have also letters from a number of well known engineers, in which they state that they believe the invention will effect this saving. If it really does, it is a valuable device, and I shall not hesitate to recommend the gentleman, who sent you to me, to invest his money. I will propose a plan to you, by which the matter can be definitely settled. There is a plain slide valve engine, near here, that has been running for nearly twelve months, and a careful record has been kept of the coal consumed and the power developed each day. Attach your cut-off to this engine, and let the record be taken for a month."

The attachment was made; and for several days, as the coal account did not seem to diminish, the inventor kept making slight alterations when the machinery was stopped, but without any apparent benefit. After two weeks his fa

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