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(Illustrations are indicated by an asterisk.)

A SECRET TELEGRAPH.

At the establishment of Mr. Giuseppe Tagliabue, No. 298 Pearl street, New York, there is in operation a telegraph which transmits its messages without allowing them to be read by the operators or any employes of the telegraph company. A merchant or broker in New York is provided with a simple instrument which is furnished with a plain circular alphabet; he moves an index to the first letter of his message, and presses a lever, which punctures a rectangular slot in a roll of paper wrapped upon a cylinder; he then moves the index to the next letter of his message, and punctures another slot; proceeding thus till the message is completed. The roll of paper is then removed from the cylinder and sent to the telegraph office; the boy or girl in attendance wraps it upon the cylinder of the transmitting machine, and starts the machine, which is driven by a weight. As the cylinder revolves, at the opposite end of the line—say in Philadelphia—a narrow strip of paper is carried slowly along through the receiving machine, and the message appears pricked through it in very plain letters. In order that the message may not be read by the employes at the end of the line where it is received, the strip of paper is covered on both sides with very thin black berege, which must be pulled off before the letters can be seen.

This telegraph is the invention of Mr. Robert Boyle, a Scotchman; he commenced work on it in 1852, and for the last three years has given his whole time to it, day and night, as he says, "dreaming about it in the night and working upon it through the day." After all these years of labor and study, the invention is at last completed, and a patent for it, with sixteen claims, has just been obtained through the Scientific American Patent Agency. The patent is granted to Mr. Boyle jointly with Mr. Tagliabue, who took an interest in the invention before its completion.

To make all the details of the mechanism plain would require elaborate engravings; but an idea of the general principle on which it operates may perhaps be given by a brief letter-press description. The punctured paper is wrapped upon a cylinder, which is caused to rotate by a weight. On the same line of shatting with the cylinder, and rotating with it, are two brass wheels, each having fourteen plugs of hard rubber inserted into its periphery. Brass springs, connected with the battery current, rest upon the peripheries of these wheels, the springs being so arranged that the current is reversed twenty-eight times during each revolution of the cylinder. This is the transmitting instrument.

At the opposite end of the line, where the message is received, a permanent horseshoe magnet is delicately suspended between the poles of four electro-magnets connected with the circuit, in such a manner that reversing the current causes the horseshoe magnet to vibrate. Each vibration releases a delicate escapement, and allows the rotation one step—or one twenty-eighth part—of a light steel wheel, on the periphery of which are engraved the twenty-six letters of the alphabet, with the character & and a blank for the space between the words. The letters are formed by rows of fine points.

Before the transmission of the message is commenced, both the transmitting machine and the receiving machine are set at zero, which brings the cylinder, on which the punctured paper is wound, and the type wheel into the same relative position. A brass spring, in connection with a local circuit, has its end pressing upon the cylinder that carries the punctured paper, and the connections are so arranged that while the end of this spring is resting upon the paper the local circuit is broken, but when a slot passes under the end of the spring, allowing it to come in contact with the brass cylinder, the circuit is closed. The closing of this local circuit draws forward an armature, and arrests for an instant the motion of the transmitting machine, thus stopping the frequent reversals of the current, and stopping, at the receiving end, the rotation of the type wheel. At the receiving machine is a magnet, in connection with the main circuit, with its armature so adjusted that the magnetism induced by the momentary reversed currents is not sufficient to overcome the tension of the withdrawing spring, but so soon as the reversals are suspended and the current of the main circuit is allowed to flow continuously in one direction, this tension is overpowered, and the armature is drawn forward. By this motion the paper is drawn down upon the type wheel, and the letter which is uppermost at the time is printed. This motion also breaks for an instant the main circuit, and this break is made to withdraw the stop of the transmitting machine, thus permitting the apparatus to proceed to the next letter.

We have seen this machine in operation on a short circuit, and it worked with perfect success. How it will operate on long lines, and in different conditions of the atmosphere, can, of course, be known only by practical trial.

PISTONS WITHOUT PACKING.

When the first pistons to steam engines were made they were made tight by hemp gaskets—that is, coils of hemp plaited with rope thoroughly slushed or soaked in hot tallow and subsequently driven in as tight as a man striking with a sledge could make them. It was a great step in advance when cast-iron rings were substituted for the hemp and steel springs inserted to keep the rings always up to the cylinder. Quite as much ingenuity and thought have been expended on the pistons of steam engines as upon any other detail, and the variety in shape, form and kind of packing would make an interesting study for the engineer if they were all collected in book form. The pistons of ocean steamers, for instance, have lighter springs than many small engines, and are not packed so tight, by many degrees pressure, in proportion to their areas, as some engines on land. There are few stationary engines in the country which will pass the centers with two or three pounds pressure on the gage, but there are plenty of steamboats that have engines which will do this with ease.

It was formerly the custom to pack locomotive cylinders with brass rings, which had a central lining of Babbitt metal let in. This also is done away with, and the largest works and the heaviest engines on the Erie Railroad, and others, for aught we know, have cast-iron rings.

In many instances pistons have been used without any packing in them—being simply solid disks fitting tightly, yet easily, to the bore. Some concession has been made to prejudices and conventional ideas by turning grooves in the solid piston and depending on the partial condensation of the steam to fill these grooves with water, and thus interpose an obstacle to the passage of steam between the piston and cylinder. It is probable that the evil of a leaky piston has been much exaggerated, for, although it will show on the indicator diagram when very much out of repair, it is a question whether any great amount of fuel is wasted by such a loss. There is no question, however, but that much damage is done to steam cylinders by bad packing, and many can testify to the scored and seamed cylinders that were made so by forcing in the springs.

Air pumps have been made for compressing air with solid pistons, and, reasoning from analogy, there seems no objection to making the pistons of steam engines of a moderate diameter of cylinder entirely solid; in fact, many are now working so made, and those who built them, as well as the owners, find no fault with their performance. On the contrary, rings are frequently a source of trouble, and, taken altogether, with their springs, followers and follower bolts, the piston with metallic packing is a costly detail. If lessening the cost of construction and retaining the vital qualities of any part is an important feature, then the pistons of small steam engines should be made solid.

SODA WATER—WHAT IT IS AND HOW IT IS MADE.

It is, doubtless, understood by most of our readers that the term "soda water," as applied to the sparkling beverage drawn from the numerous fountains in apothecary shops, is a misnomer—the liquid being pure water saturated with carbonic acid under pressure, with not a particle of soda in its composition. Water has the property of absorbing its own volume of carbonic acid at all pressures; and as by doubling the pressure twice the quantity of the gas is compressed in a given volume, the quantity which water will absorb is in direct proportion to the pressure.

The gas is usually obtained by decomposing carbonate of lime, which is a combination of carbonic acid and lime. A quantity of marble dust is placed in a strong cast-iron cylinder, and the opening is closed air-tight by a screw plug, when a quantity of sulphuric acid is let down upon the marble from a vessel opening into the cylinder. The lime, having a stronger affinity for sulphuric than it has for carbonic acid, abandons the latter to combine with the former; the carbonic acid, on being set free from its combination with the lime, takes the gaseous form and becomes carbonic acid gas. The gas thus liberated is compressed in contact with water, when the water is saturated with it, and becomes the mis-named "soda water" of the fountains.

There are two plans for compressing the gas; in one form of apparatus it is done by an air pump, and, in the other, the gas is generated in a close vessel in communication with the water, the pressure being obtained by liberating a sufficient quantity of the gas in a confined space.

The vessel containing the sulphuric acid is lined with lead—that being the only cheap metal which is not acted upon by sulphuric acid. The vessel in which the marble dust and sulphuric acid are mixed together is usually lined with block tin. The gas, before being conveyed to the beverage, is passed through clean water, to remove any impurities with which it may be mingled.

At the fair of the American Institute there is on exhibition a soda-water apparatus, in which the vessel for impregnating the water is lined with glass. As the pressure in this vessel is between 200 and 300 pounds to the square inch, the glass lining would, of course, be bursted, unless effectual means were taken to restrain the pressure. The plan adopted in this case is to open a communication between the interior of this glass lining and the space between this and the inclosing cast iron, so that the pressure is equal on the outside and inside of the glass. It is a very neat and effectual device, and would be perfect if the inventors would carry it a step further, and line the whole apparatus with glass. It is the invention of Messrs. Schultz & Walker, and the apparatus is manufactured by John Matthews, Nos. 437 and 439 First avenue, New York.

On another page, under the heading "Notes on New Discoveries," will be found a description of a new and cheap method of producing carbonic acid, which may be worthy of attention by our soda-water manufacturers.

COAL IN PRUSSIA.—The total production of the colleries of Prussia, in 1864, was estimated at 42,394,500 tuns.