## NOVEL AIR BRAKE.

It is well known among engineers and engine drivers that in reversing the valves of a locomotive in the usual way to check the speed of the engine the pistons draw in air and compress it in the steam chest and steam supply pipes, until, in some instances, the pressure is greater than the steam pressure in the boiler. Our engraving represents an invention for utilizing this action of the locomotive cylinders for the purpose of operating air brakes for checking or stopping the train, and it also avoids drawing cinders into the cylinders, a thing common to engines working in the ordinary way.

The engraving represents only such parts of the locomotive as are immediately related to the invention, Fig. 1 being a view of the front end of the smoke box with the cylinders left out; Fig. 2 a side view of the same parts; Fig. 3 a sectional view of the exhaust nozzle, and Fig. 4 is a detail view of the safety valve lever.

A and B are, respectively, the exhaust and supply pipes, connected with the cylinders in the usual way, and C is an exhaust nozzle of the ordinary pattern, except that it is provided with a sliding valve or cover, D, and a pipe or nozzle, E, which projects through the cap of the smoke box, and is provided with a flaring mouth. The pipe, E, is provided with a plug valve or cock whose spindle extends through the side of the smoke box and is provided with an arm connected with a rod extending to the cab of the locomotive; on the inner end of the same spindle there is an arm connected by a link with the valve, D, the cock and the valve, D, being arranged relatively to each other so that when the valve, D, is open the cock will be closed, and *vice versa*.

From the top of the steam pipe, B, a pipe extends upward through the top of the smoke box, and has at the top a safety valve, F, of ordinary construction, whose lever extends over the smoke box and is held down by a spring connected with a lever fulcrumed on the top of the boiler, and moved so as to bring more or less pressure on the valve by turning the cam on the shaft, G, by means of the lever attached. This lever is provided with a pawl arranged to engage the teeth of a fixed segment.

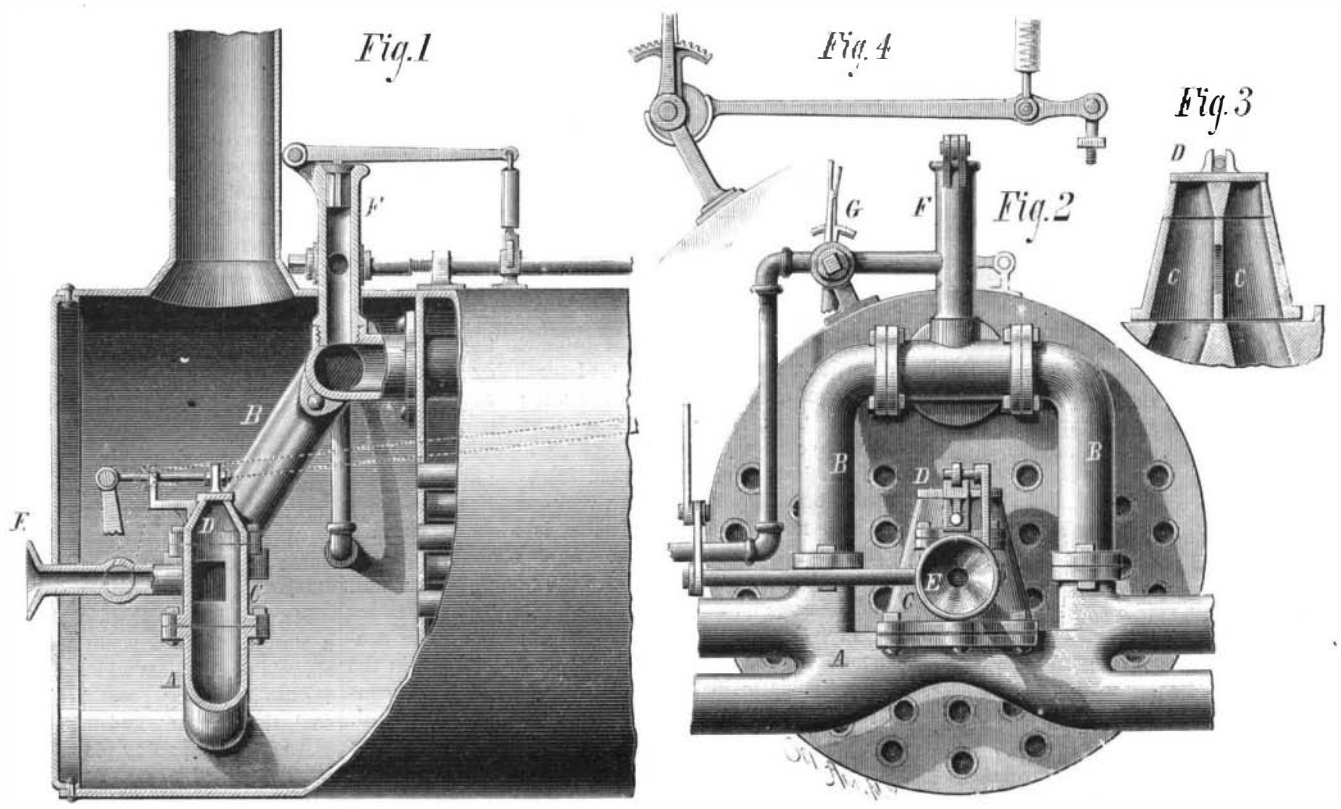
Below the valve, F, a pipe extends a short distance laterally from the vertical pipe, and then passes downward and is connected with the pipe or pipes leading to pneumatic brake cylinders of any approved form. This pipe is provided with a three-way cock, whose spindle extends through the shaft, G, which is tubular and reaches to the cab, where it may be conveniently operated.

On shutting off the steam from the cylinders and reversing the valves, the valve, D, is closed and the valve in the pipe, E, is opened; the cylinders then act as powerful pumps drawing in air through the pipe, E, and forcing it into the steam chest and steam pipe, B. The required pressure is quickly reached, and the surplus air escapes through the valve, F. Should this operation fail to check the engine sufficiently the three-way cock in the air discharge pipe is opened and air is allowed to escape from the steam supply pipe, B, to the pipes leading to the brake cylinders. An abundant supply of compressed air is always ready, and more or less of it may be used in operating the brakes.

When it is desired to let off the brakes the three-way cock is turned so as to shut off the air supply and liberate the air contained in the brake cylinders and pipes connected with them. The inventor proposes also to connect the three-way cock with an air reservoir so that a quantity of air may be stored if desired. After letting the air out of the brake cylinders, the valve, D, is opened, and the valve in the pipe, F, is opened when the engine is in its normal condition.

Another feature of the invention, and a very important one, is that engines commonly used for drawing freight trains can be utilized to stop this class of train without the brakemen getting upon the top of the cars, and it enables railway companies to place such engines on passenger trains and have the advantage of the air appliances on the cars as described.

This invention dispenses with all special pumps and utilizes the momentum of the moving train for braking purposes. To any one doubting the ability of the engine cylinders to act as air compressors we mention the fact that an engine has been made to compress sufficient air in its boiler, while being drawn forward by another engine, to propel itself forward at the usual rate of speed for several miles by compressed air alone, there being neither fire nor water in the boiler. This invention was recently patented by Mr. John Hall, of Hamilton, Ontario, Canada.




HALL'S AIR BRAKE.

## NEW LINE-THROWING GUN.

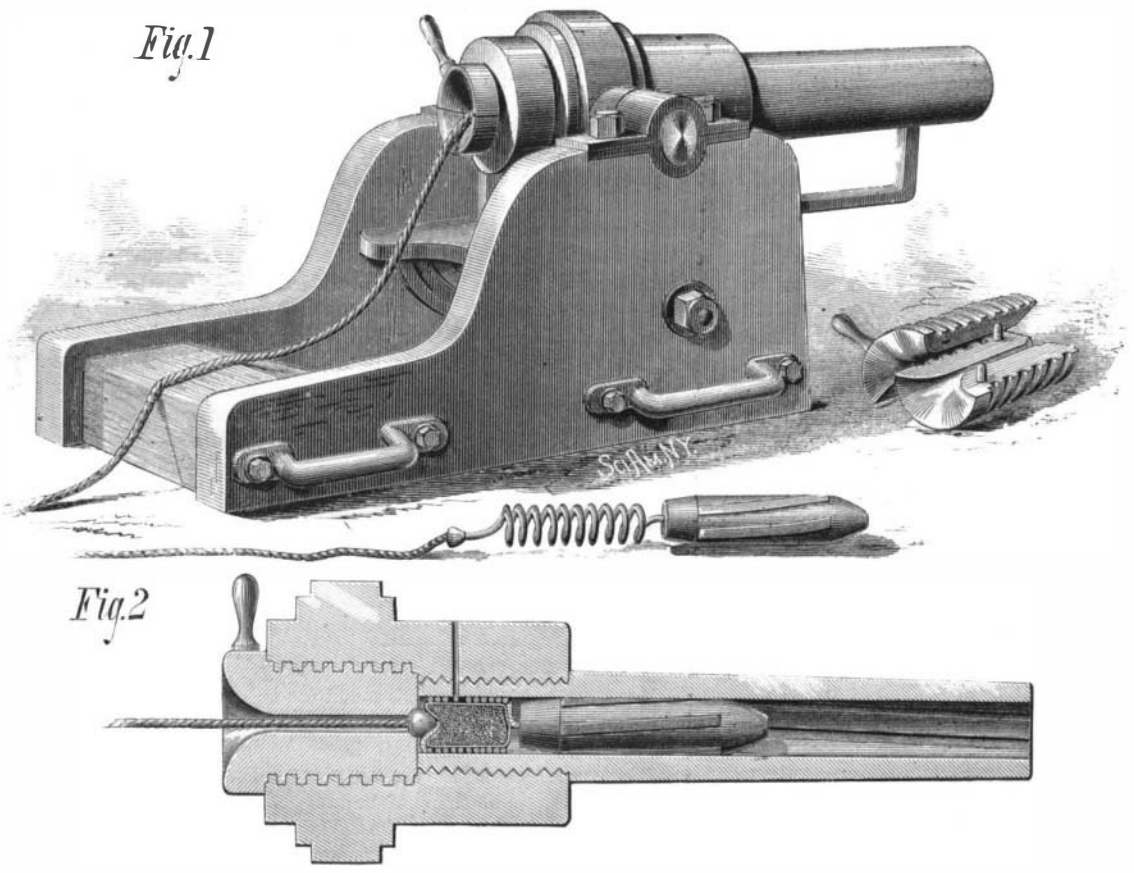
The engraving shows a breech-loading line-throwing gun lately patented by Mr. L. W. Spencer, of this city. In some respects this gun differs materially from others designed for the same purpose. It is rifled to insure accuracy and to increase the range. It is breech-loading, and the projectile carries the line through the center of the breech.

Fig. 1 shows the gun in perspective, a detail view of the split breech piece being shown on the ground under the muzzle of the gun. Fig. 2 is a longitudinal section of the gun, showing the position of the line and load, and the projectile is shown at the side of the gun

The gun is mounted on the carriage by means of trunnions in the usual way, and is secured in any desired position by the clamping screws at the sides of the carriage. The breech block is made in two parts, with a central longitudinal opening for the line, and it has a heavy screw thread which fits the threads in the chamber in the breech of the gun. The projectile has attached to it a tail piece of wire rope or other material that will resist the action of the exploding charge which is enveloped by it. The tail piece is attached to the life line, and carries a valve which closes the opening in the breech block through which the line passes and prevents the backward escape of gas.

When the gun is fired the shot passes straight out of the gun, the elastic tail uncoils, and the life line is drawn through the opening in the breech block, in a direct line, so that it does not in any way interfere with the course of the projectile.

With this gun the projectile is thrown out with no retardation except that caused by the weight of the life line. By the ordinary method, when the life line is fired out of the gun ahead of the projectile, the weight of the line compels the projectile to turn over, greatly retarding the speed of the projectile and line and affecting the accuracy of firing.




SPENCER'S LINE-THROWING GUN.

## MECHANICAL INVENTIONS.

An improved wagon brake lever has been patented by Mr. Edward S. Plimpton, of Denison, Iowa. This invention consists in a novel arrangement of a double jointed lever, with a pawl and ratchet and a rod connecting with the brake shoe, whereby provision is made for locking the brake by the engagement of the pawl with the ratchet, and for disengaging the pawl to release the brake.

Mr. Israel Erickson, of Whitehall, Mich., has patented a simple and effective device for feeding sawdust, shavings, etc., to a fire and spreading them thereon. The invention consists of spreading bars or spreaders, having outwardly curved rear ends, and pivoted at about the center of their lengths to the under side of a reciprocating plate or frame supported on rollers, and works in a spout or conductor fixed in front of a fire door, the spreaders being opened or spread laterally by contact of their curved ends with fixed rollers, and being closed by a connecting spring.

An improvement in car couplings, invented by Mr. Philo B. Williams, of Edgerton, Ohio, relates to that class of couplers with which cars can be coupled without the brakeman going between the cars for that purpose; and it consists of a spear or dia-