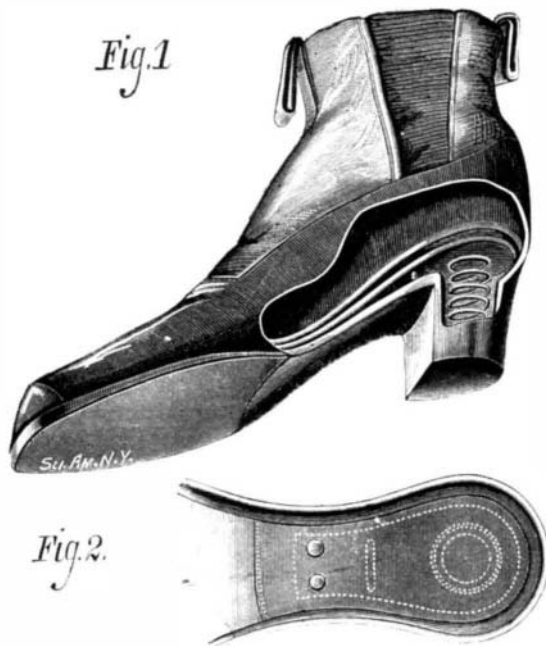


**A NOVEL BOOT AND SHOE HEEL.**

The engraving shows, in perspective in Fig. 1 and in plan in Fig. 2, a spring boot heel recently patented by Mr. Edwin R. Pease, of Poughkeepsie, N. Y. This improvement is designed to furnish a certain amount of elasticity to the heel, so that walking may be made easier, and the heel will be more durable than heels of the ordinary kind.

In the heel is formed a cavity for receiving a spiral or rubber spring, and a stout leather plate or flap is secured to the narrower portion of the sole and extends backward over the spring. A metallic plate is fastened to the under surface of the leather flap, and rests upon a cross bar that projects a

**PEASE'S SPRING BOOT HEEL.**

short distance from the sole. The leather flap is of sufficient thickness to prevent it from being pressed down into the spring or the cavity which contains it. The spring may be used or not, as may be desired.

**AN IMPROVED LOCOMOTIVE SMOKE STACK.**

The accompanying engraving illustrates an improved locomotive smoke stack, which may be readily adapted for either hard or soft coal, or for wood.

The smoke stack has a double conical lining, A, which contracts the exhaust steam and smoke at the lower part of the shaft of the stack, and thus allows a larger exhaust nozzle to be used with a much better effect on the fire, as the "blowing" property of the exhaust steam is thereby extended over a greater area of the flue sheet.

The lining is formed in a straight line from the contraction to the flaring top, leaving no projections upon which cinders, ashes, etc., can accumulate. The danger of the stack becoming rusted is thus avoided, and as the form of the lining is of the truss pattern, the stack is greatly strengthened.

The bonnet, B, and cone, C, are made removable, so that they may be replaced by those of a different form, to alter the stack from a wood to a hard or soft coal burner. When used as a soft coal burner, the form of cone and bonnet shown in Fig. 2 is used, and, in addition thereto, a perforated sleeve is inserted to occupy the space between the cone and bonnet. It is so arranged as to serve as a clamp to retain the bonnet.

When used as an anthracite coal burner, where no cone is required, a sheet metal sleeve, shown in Fig. 3, is inserted to occupy the space between the inside extension pipe, F, and the bonnet.

We are informed that these stacks have been introduced upon twenty-nine locomotives upon the St. Paul and Pacific Railroad, Minnesota, and are being placed upon all the locomotives of that road as rapidly as possible. The inventor states that they give very general satisfaction, and that a great saving of fuel is effected. Another advantage claimed for them is the avoidance of trailing smoke and sparks.

This smoke stack was patented November 19, 1878, by George W. Turner, Superintendent of Machinery, St. Paul and Pacific Railroad, St. Paul, Minnesota, from whom further information may be obtained.

**Agricultural Education.**

There is no nation in Europe so advanced in its methods of teaching agriculture as Italy, and in no nation is so much enthusiasm manifested and so much practical good accomplished. Italy possesses at the present time two higher schools of agriculture—one at Milan, and another at Portici; three special schools—a school of forestry at Vallombrosa, a school of horticulture at Naples, and a school of viticulture at Conegliano; two veterinary schools, at Milan and Naples; and twenty-one secondary schools, varying in importance and organization, but which may be

compared broadly to the French agricultural colleges of Grignon and Montpellier. These establishments are largely subsidized, either by the state or by the province where they are situated. Thus, for instance, the province of Lecce pays \$6,000 a year to its agricultural school, which numbers sixty-three students, of from eight to twenty-two years of age. The education which they receive is only elementary, and two-thirds of the pupils become gardeners when they leave the school. The rudiments of agriculture will soon be taught in every village school, without exception, and they have for some time formed part of the course of education in the normal schools, where young men are trained for the duties of teaching.

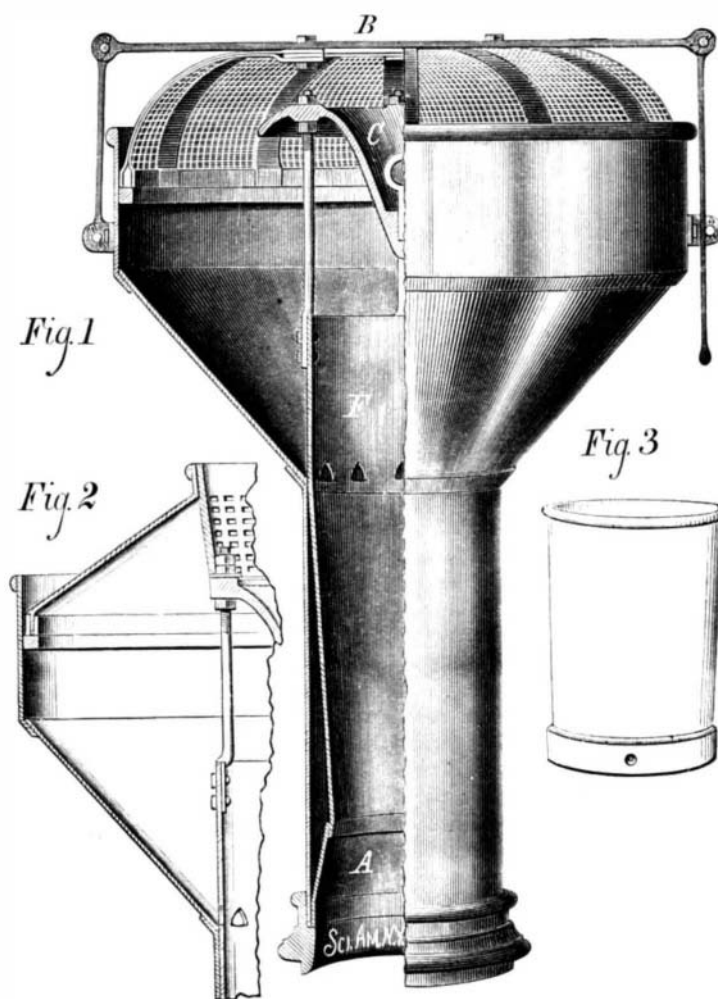
It has long been a matter of surprise to us, says the *Boston Journal of Chemistry*, that we have neglected to teach the principles of agriculture in our common schools. Almost everything else has been dabbled with—music, drawing, elocution, bookkeeping, etc.—but it has never occurred to the wise men who control our schools that a knowledge of husbandry is of more consequence to the welfare of our boys and our country than all these branches combined. The prosperity of a nation rests upon successful agriculture, and the happiness and well-being of thousands of the boys educated at the public expense rest upon knowing how to carry forward farm labors. A vast amount of information respecting how plants grow, how they feed, how to prepare the soil, and how to take care of stock and conduct dairy operations, might be imparted in our common schools. There are good text-books ready at hand, and if any more are wanted they can be prepared speedily.

In a large degree, the hope of educating a class of farmers who can avail themselves of much that science has accomplished for husbandry rests with our public schools, and it would indeed be mortifying to be found in the rear of Italy in this matter of agricultural education.

**A CURIOUS INVENTION.**

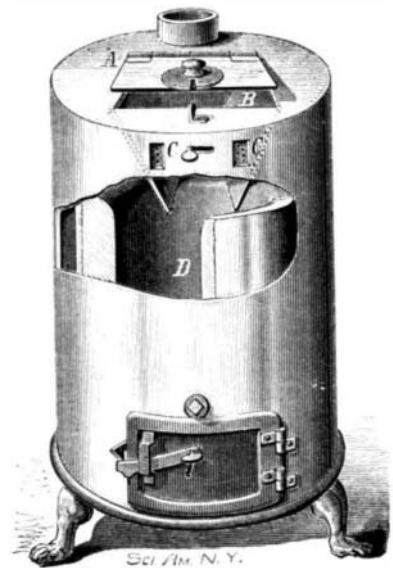
In a recent number of the *Journal of the Franklin Institute* is a description of a remarkable machine, designed and constructed last summer by a student at the University of Pennsylvania, Frank T. Freeland, class of 1879. It is called "an Automatic Tit-tat-to Machine," and with it any one can play that game, as if it were a person. It is a true automaton, that is, there is no one concealed in or around it who governs its move by electrical or any other means, as was the case with all the "automaton chess players." The principle upon which it works is this: There is in it a mechanical table of all the possible games, and two hands having nine fingers each. When the opponent makes a move the machine hunts with its left hand in the table for that move. Opposite it is set down the proper answering move. By pushing a lever the right hand discovers that move and transmits it to the board.

The machine was exhibited at the Franklin Institute. It is now at the University of Pennsylvania, where it has played a large number of games without losing a single one. The problem of designing a machine which would play one of the games of skill was never seriously attempted before but once, when the results arrived at were such as to present serious difficulties to the construction of the machine.

**TURNER'S IMPROVED LOCOMOTIVE SMOKE STACK.****A NEW CAR STOVE.**

We illustrate herewith a novel stove for heating cars which is designed to prevent the escape of fire in case of accident, and it is constructed with a view to durability.

The door, A, through which the fuel is introduced at the top of the stove, is provided with a fastener consisting of a notched disk which is engaged by a hook on the stove top. Below the door, A, there are two doors, B, which are kept open by their own weight, and will close automatically so as to prevent the escape of fire should the stove through accident become inverted. The draught holes which are covered by the damper, C, are provided with a perforated metal covering which prevents the escape of coals. The fire pot, D, is placed a few inches from the top of the stove, and below it there is an ash pit which is tightly closed by the door near the bottom of the stove.

**RICE'S CAR STOVE.**

The draught of the stove is downward through the coal; the products of combustion passing upward around the fire pot to the stove pipe seen at the top of the stove. By this arrangement, it is claimed, the grate is in the cooler part of the fire, and will, therefore, last longer than grates arranged in the usual way, and the hottest portion of the fire being uppermost, renders the stove effective.

For further particulars, address the inventor, Mr. Byron Rice, West Schuyler, N. Y.

**New Mechanical Inventions.**

Mr. Horace Chiazzari de Torres, of Turin, Italy, has devised an improved Automatic Feed Water Heater and Regulator, in which the exhaust steam is utilized for heating the feed water, effecting thereby a considerable saving in fuel and in the wear and tear of the boiler, as well as securing an increase of power by supplying feed water at a uniform temperature.

Mr. George W. Bennett, of Garden Prairie, Ill., has patented an improvement in Connecting the Knees of Sleighs with the beam on which the body is placed. It consists of a metal hub, provided with a groove which receives the beam, and an angular socket for receiving the upper end of the knee.

Mr. Burpee R. Starratt, of Truro, Nova Scotia, Canada, has patented an improved Railroad Frog, which is so constructed that the wing rails and the tongue, when broken or worn, can be removed and replaced with new ones without removing the frog from its bed.

An improvement in Portable Ladder Steps has been patented by Mr. Salvador Ellicott, of Stella-coom, Washington Territory. The object of this invention is to furnish an improved step for ladders which may be easily and conveniently applied to an ordinary ladder and moved up and down upon it.

**The Separation of Silver from Lead.**

The separation of silver from lead has been effected by hand labor; but is now substituted, says *Chambers' Journal*, by applying steam "as an agitator in the pot where the crystallization of the pure lead takes place, and in other respects it produces a chemical change, and facilitates the work." Another process separates the silver "by means of zinc, which is found to wash the melted lead entirely free of the silver contained in it, and the mixture of silver and zinc floats to the top of the pot and is skimmed off. When this is completed, the mixture of zinc and silver is placed in plumbago crucibles in a furnace, and the zinc is distilled off and collected in small metal chambers, where it cools in the form of cake zinc, and is fit for use again." By this means about half of the original zinc is saved, and it is thought that the other half may be recoverable.