the plunger with an area double that of the plunger. Water is admitted behind the piston while the front is placed in communication with the pressure-pipe. Thus, in the out-stroke, the water contained in front of the piston is driven back into the pressure-pipe, which absorbs half the force exerted, while the remaining force is transmitted to the crank-pin. In the in-stroke the force expended in driving the water back into the pressure-pipe during the out-stroke is brought into action, while the water at the back of the piston is exhausted. The slide-valve derives its motion from the oscillating of the cylinder, and is of the ordinary shape. These engines run at a very high velocity, and give much satisfaction.

Sole Sewing and Nailing Machine.

A recent number of the *Shoe and Leather Reporter* says:—"The sole-sewing machine has no strength of tension, no power of 'pull', if we may so express it, and added to this defect is the very faulty distribution or incorporation of wax with the thread, which, it appears, is a part of the business of the machine to attend to. Little or no wax is applied. This sole-sewing machine necessitates another defect. The upper has to be nailed to the inner sole. In a week after wearing, these nails begin to work through the shoe, and cut the stocking, and generally in thirty days, if there has been wet walking, the outer sole rips, although scarcely worn, and the shoe is ruined; for no ordinary shoe repairer can well re-sew a machine-sewed sole. He must own just such a machine to do it, and not one shoemaker, so called, in a thousand, can afford it."

The *Mining and Scientific Press, San Francisco, California*, says:—

"Mr. E. T. Barlow of this city, has submitted to our inspection a machine of his invention, designed for nailing boots or shoes. The machine takes a small coil of wire into its embrace, and with the boot or shoe firmly placed upon an iron last, makes its nails as they are driven, The nails are forced firmly and squarely into the leather, and headed upon both sides by the upsetting power of the machine. It can be set to make and drive any desired length of nail from a sixteenth of an inch to a foot or more in length. If the nail by any small inaccuracy in setting the machine, happens to be a trifle too long for the thickness of the leather designed to be fastened together, the excess of length is taken up by upsetting or kinking, which latter always occurs in the center of the leather, at equal distances from the two points of contact. The sole of the boot is readily directed by adjustable guides, and the nails may be driven at any distance apart, so that the same machine may be used for both the finest or the coarsest work. The machine is also applicable to harness or any similar work, or for nailing small boxes, such as cigar-boxes, etc., where great accuracy or speed is desirable in driving the nails. The entire machine is so simple in its construction that it may be operated by a child, and may be driven by hand or the application of power. It is worked by a crank or by pulley motion. Only one other machine devised for this kind of work has ever been invented, and that is a French invention, which was exhibited for a few days during the last fair of the Mechanics' Institute. There are many defects in that machine which are entirely obviated in this, to say nothing of the fact that Mr. Barlow will be able to sell his machine for less than half the price of the French invention. Mr. Barlow's machine will work two or three times as fast as the French, and requires no after-finishing, as is the case with that. The French machine, we are informed, is not allowed to be manufactured in this country; the inventors, holding patents both here and in Europe, manufacture in France only. This machine may be seen in operation on and after Monday next at the residence of the inventor near the railroad machine shops on Brannan Street."

[These are both ingenious inventions, no doubt, although the character of the work done by them is very questionable. No machine work in putting on the sole of a boot is equal to good hand-work, either for durability, appearance, or comfort; and as for sewing machines in general, a large portion of the work done by them is far inferior to good hand-sewing, in every particular, Ed.]

Gun Paper.

Mr. G. S. Melland. of Lime street, London, who has distinguished himself among British makers of fire-arms, has recently invented a *gun paper* to supersede the old gunpowder. The invention consists in impregnating paper with a composition formed of chlorate of potash, 9 parts; nitrate of potash, 4½; prussiate of potash, 3¼; powdered charcoal, 3¼; starch, 1-12th part; chromate of potash, 1-16th part; and water, 79 parts. These are mixed and boiled during one hour. The solution is then ready for use, and the paper passed in sheets through the solution. The saturated paper is now ready for manufacturing into the form of a cartridge, and is rolled into compact lengths of any required diameter. These rolls may also be made of required lengths, and cut up afterwards to suit the charge. After rolling, the gun paper is dried at 212° F.; and has the appearance of a compact grayish mass. Experiments have been made with it, and it has been reported favorably of, as a perfect substitute for gun powder, superseding gun cotton and all other explosives. It is said to be safe alike in manufacture and in use. The paper is dried at a very low temperature. It may be freely handled without fear of explosion, which is not produced even by percussion. It is, in fact, only exploded by contact with fire, or at equivalent temperatures. In its action, it is quick and powerful, having, in this respect, a decided advantage over gunpowder. Its use is unaccompanied by the greasy residuum always observable in gun barrels that have been fired with gunpowder. Its explosion produces less smoke than from gunpowder; it is said to give less recoil, and it is less liable to deterioration from dampness. It is readily protected from all chance of damp by a solution of xyloidin in acetic acid. The xyloidin is prepared by acting on paper with nitric acid, one part thereof being dissolved in three parts of acetic acid of specific gravity of 1·040.

In experimenting with this new explosive substance, six rounds were first fired with cartridges