IRON SHUTTER.

Iron shutters are an excellent protection to buildings against fire from adjoining buildings; but on account of the difficulty experienced in opening such shutters from the outside in case of fire, they have been generally condemned.

The engraving shows an improved iron shutter that can be readily opened from the outside, and at the same time more easily operated from the inside than the usual hinged shutters.

The shutters are of ordinary construction, made of two thicknesses of sheet iron, with a space between that may be filled with a non-conductor of heat, if desired. They rest and move upon a crossbar or track of steel, attached at its ends to the wall of the building. The ends of the bar are slotted, and enter loosely through the slotted castings that are attached to the wall. On the bolts and within the slots of the bar are eccentrics, by which the bar is clamped to the castings. This construction allows the bar to expand from the heat without springing, which might prevent the free working of the shutters. The object of the eccentric is to allow adjustment of the shutters if the wall settles or the shutters work too closely to the window sill. The outer end of the bolt is formed square to receive a wrench for the adjustment of the eccentric, and this square end is usually covered by a hollow washer.

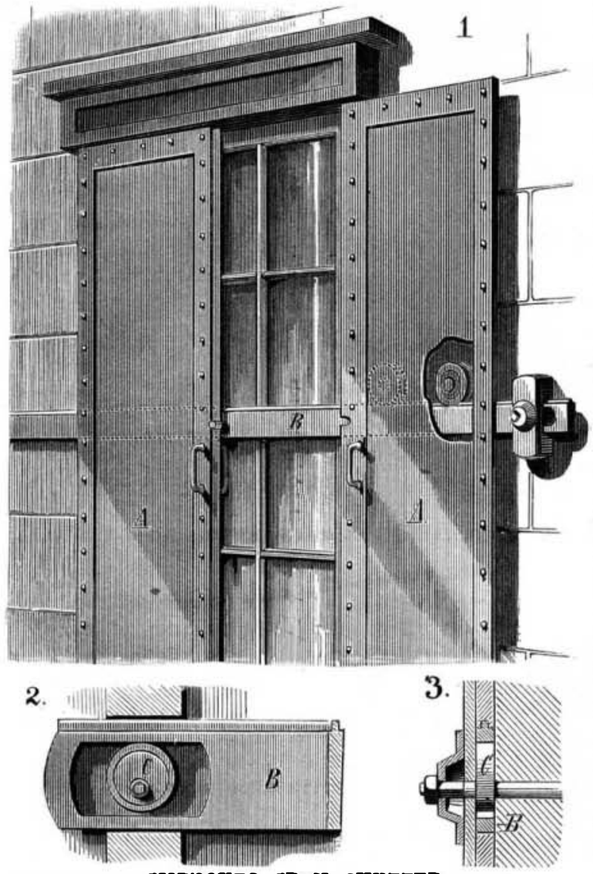
The supporting bar passes between the two sides of each shutter, and through an iron box or casing that is fitted within the shutter. This casing, which is held in place by crossbolts, contains sheaves that are grooved, and roll on the supporting bar.

The shutters are made with their inner edges rabbeted to lap one upon the other, and the supporting bar is provided with a central pin, to prevent each shutter from passing beyond the center. The shutters are also provided with small handles both upon the inside and outside, for convenience in opening and closing them.

The advantages of shutters applied in this manner are as follows: They can be readily opened from the outside of the building in case of fire or otherwise, no fastenings being used, none being required. They can be opened from the inside with perfect ease and safety, even in high winds. The shutters may be applied to either the inside or the outside of the window. They are free to expand in case of fire without preventing their easy operation. They can be closed entirely or partly, as desired, in order to admit more or less light. They are safe in time of storm, cannot become loose or be blown down, and they may be applied to either new or old buildings.

Fig. 1 shows the manner of applying the shutter to a building. Fig. 2 is a detail view of the end support of the bar, and Fig. 3 is a section through the same.

This invention has been patented by Mr. Newman A. Foss, of Gold Run, Montana Ter.



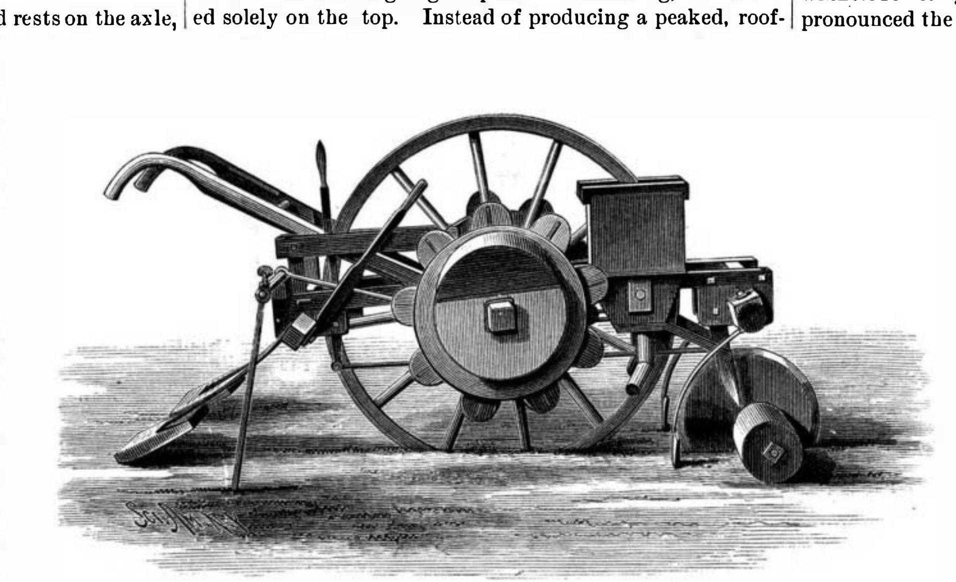
IMPROVED IRON SHUTTER.

IMPROVED COTTON PLANTER.

A machine capable of planting cotton seed or corn and distributing a fertilizer at the same time is shown in the engraving. While this machine is small, compact, and simple, it is very efficient, doing with one horse and one man the work usually requiring four horses and six men. It is in use by many of the prominent planters in the South, giving great satisfaction.

In this machine a narrow frame of wood rests on the axle, supported at its center in a single truck wheel. Thills are attached to the frame at the front end, drawing and supporting the machine. There are handles at the rear end, by which to guide and control the machine. Near the front is a crossbar arranged in bearings so as to oscillate, and projecting considerably beyond the frame on each side, and carrying the plows for opening the furrows.

The crossbar is connected by an arm and rod with a shifting lever at the rear of the frame, by which the plows may be swung up or down to regulate their height from the ground. A ratchet bar holds the plows as required. Behind the plows are the guano hoppers, supported on iron rods adjustable toward or from the frame. Vertical slides in the hoppers rise up and carry the fertilizer down to discharge below, the slides being pushed down by tappets on the seed-dropping wheels, and they are forced up by a spring.



PATERSON'S COTTON PLANTER.

The seed-dropping drums are hollow sheet metal cases mounted on the projections of the main shaft. Near the periphery the sides converge for a short distance, and in the periphery are large openings as far apart as the required distance between the droppings.

Behind the seed-dropping wheels are suspended the covering scrapers from a crossbar, to drag along the ridges turned up by the plows and scrape back the earth into the furrows. They are notched or grooved in the front and under sides for facilitating the gathering of the earth into the furrows. They are also adjustable along the crossbar, and they are raised or lowered by a hand lever.

The plows and the scrapers do not extend so low as the bottom of the truck wheel, because they are to act on the ridges, while the wheel runs in the hollow between them; and the dropping wheels do not extend as low as the plows and scrapers because they are not required to touch the ground at all. On the contrary, they are kept above it to prevent the discharge holes of the pockets from being clogged by the earth. They will not be clogged by the seed because their shape is such that all the seed will fall out into the space below as soon as they rise high enough, so as to completely clear each discharge at every revolution of the wheel.

The relative arrangement of the guano-droppers and the seed-droppers is such that the seed and the guano will be dropped together. A great economy of labor will be effected by the use of this machine, which combines eight separate and special machines in one, requiring only one horse or mule and one attendant. This invention has been patented by Mr. George Paterson, of Waynesborough, Ga.

McAdam Roads.

John Loudon McAdam, according to his own account, came to Scotland from America in 1783, when the Scotch Turnpike Acts had been about twenty years in operation and roads were still being made everywhere. He got appointed a Commissioner of Roads, and afterward removed to Bristol, where he obtained a similar post and was made a magistrate. Gifted with a mania on the subject, he began about 1794 to travel over the country at his own cost; and these labors he continued from Inverness to the Land's End for six-and-twenty years, apparently to search for a well made road.

McAdam's plan of road making differed as much from the old way which he found in operation as a bridge does from a ford. Instead of going deep for a "bottoming," he worked solely on the top. Instead of producing a peaked, roof-like mass of rough, soft rubbish, he got a flat, smooth, and solid surface. In lieu of a road four feet and a half through, he made one of at most ten inches in thickness; and for rocks and bowlders he substituted stone broken small. His leading principle was that a road ought to be considered as an artificial flooring, so strong and even as to let the heaviest vehicle pass over it without impediment. Then people began to hear with wonder of roads thirty and forty feet wide rising only three inches in the center, and he propounded the extraordinary heresy that a better and more lasting road could be made over the naked surface of a morass than over solid rock. Another of his easy first principles was that the native soil was more resistant when dry than when wet, and that, as in reality it had to carry not alone the traffic but the road also, it ought to be kept in a condition of the greatest resistance; that the best way of keeping it dry was to put over it a covering impervious to rain—the road, in fact; and that the thickness of this covering was to be regulated solely in relation to its imperviousness, and not at all as to its bearing of weights, to which the native soil was quite equal. Instead of digging a trench, therefore, to do away with the surface of the native soil, he carefully respected it, and raised his road sufficiently above it to let the water run off. Impermeability he obtained by the practical discovery that stones broken small and shaken and pressed together, as by the traffic on a road, rapidly settled down face to face and angle to angle, and made as close a mass as a wall. Mankind in general now believe that this last is all that McAdam invented: the rest is forgotten. That important fraction of his discoveries is what has given to us the verb *to macadamize* ("To pave a road with small broken stones."—Skeat), and to the French their nouns *macadam* ("Nom d'un pavage inventé par un Anglais."—Littré), *macadamisage*, and the verb *macadamiser*. If a man is knocked down by an omnibus in the middle of the boulevard, a Parisian bystander will nowadays say: "Je l'ai vu tomber sur le macadam."

Surprise followed surprise. Roads which were mere layers of broken stone, six, four, and even as little as three inches in thickness, passed through the worst winters without breaking up, while, as the coachman used to say, they "ran true; the wheel ran hard upon them, it ran upon the nail." Commissioners could not believe their eyes when they saw new roads made for much less than it had cost them yearly to repair their old ones. When an old road was given into McAdam's charge, he often made a new one of it for £88 a mile, while round London the cost of annual repairs had been £470 a mile. For he knew that the roads—such had been the ignorant waste—generally contained materials enough for their use for several years if properly applied. Unless the road was hopeless, he went to work in a practical, cheap way; first cutting off the "gridiron" of ruts in the center "to a level with the bottom of the furrows," then "picking" the road up to a depth of four inches, removing all the chalk, clay, or mud, breaking the large stones small, and simply putting them back again, and one of his directions to his workmen was that "nothing is to be laid on the clean stone on pretence of binding." But too often the road was so bad, as at Egham, that it had to be removed to its foundations.

For the repairs of his roads, when once made, he always chose wet weather, and "loosened the hardened surface with a pick" before putting on the fresh broken stone: things familiar enough to us now, but paradoxes then to all the confraternities of the roads. In this way he had the greatest success with the freestone near Bath, and on a road out of Bristol toward Old Down, where everybody had always said a good road never would be made with the materials available. This impossible road of eleven miles, which the Post-master-General, as a last resource, was about to indict, he perfected in two months, in 1816, for £55 a mile. Indeed, as to materials, they were to some extent a matter of indifference to him, provided they were stones, and stones only. Flint (Essex and Sussex), he said, made an excellent road, if only broken properly small; limestone (Wilts, Somerset, and Gloucester) consolidates soonest of all, but is not the most lasting; the pebbles of Shropshire and Staffordshire were also good, and the beach pebbles of Essex, Kent, and Sussex were some of the best materials in the kingdom; but the whinstone or granite of the north and of Scotland he pronounced the most durable.

Even in the breaking of stones McAdam made a revolution. He saw that able-bodied men standing up with heavy hammers wasted the greater portion of their strength. He made his stone-breakers sit, so that all the force of the blows took direct effect on the stone; and the result was that he found small hammers did the work perfectly well, and thus was enabled to confine it to old men past hard labor, women, and boys, which reduced the cost of the broken stone by one-half. The size to which the stone should be broken he determined in a practical way by the area of contact of an ordinary wheel with a smooth road. This he found to be about an inch lengthwise, and therefore he laid it down that "a stone which exceeds an inch in any of its dimensions is mischievous," that is to say, that the wheel in pressing on one end of it tends to lift the other end out of the road. In practice he found it simplest to fix a weight of six ounces, and his surveyors carried about scales to test the largest stones in each heap. He would allow no large stones even for the foundation of his roads, for he found they constantly worked upward by the pressure and vibration of the traffic. The whole road was small broken stone, even over swampy ground.—*St. James's Gazette.*

The Manufacture of Milk Sugar.

It is reported that the manufacture of milk sugar has been begun by newly invented processes at an Ohio cheese factory. Hitherto the $100,000 worth of milk sugar used in this country in compounding medicines has been imported from Europe, mainly Switzerland, Germany, and France. It is to be hoped that the new industry will prove successful and applicable at least to all our large cheese factories. At present this element of milk is in large measure wasted.

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