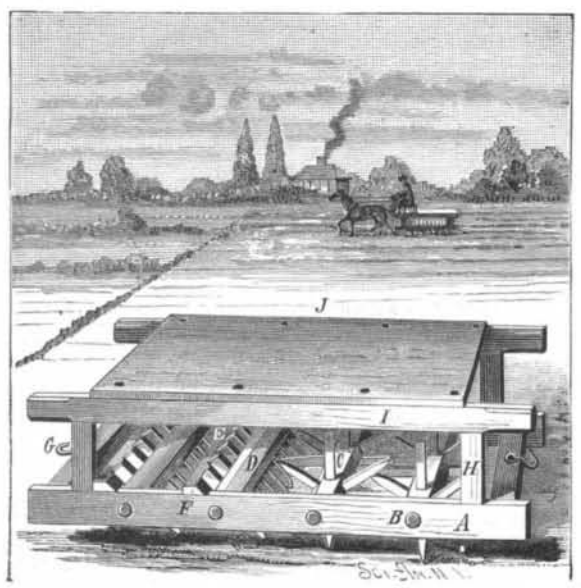
IMPROVED REVOLVING HARROW.

In bearings in the side bars, A, of the frame of the harrow revolve the journals, B, of four octagonal rollers, the two rear ones of which are provided with teeth passing through them and projecting upon the opposite sides. The teeth are arranged in spiral form, and may be varied by inserting the first tooth in the center of one roller and running the spirals in the same direction toward each end, forming a right and left spiral. In the other roller the spiral may be run in the same direction from one end to the other, the teeth of one roller being so arranged that they will pass between the teeth of the other. With this construction the teeth of one roller will clear the teeth of the other of grass,



McCLELLAND'S REVOLVING HARROW.

weeds, etc., the rollers being revolved by the contact of the teeth with the ground.

The remaining rollers, D, are furnished with knives, arranged in rows, the shanks of which pass through the rollers and project far enough to strike against the cross bars, F, which are so placed as to hold the knives at the desired inclination. The lower parts of the knives are made with edges upon their front and rear sides, so that they can be kept sharp by drawing the harrow first in one direction and then in the other.

The rolling and rigid knives are designed for use in cutting in pieces sods, clods, and lumps. When the soil is free from lumps, the knife rollers can be replaced by toothed rollers. A platform for the driver to stand or sit upon is supported by standards above the rollers. This platform can be used as a receptacle for loose stones, stumps, etc. The rollers are journaled in the side bars in such positions that their lower sides are flush with the lower sides of the bars, so that when the harrow is at work they will roll upon the surface of the soil, keeping it smooth and level.

This invention has been patented by Mr. Thomas McClelland, of Waynesboro, Pa.

Exporting American Locomotives.

The *Colliery Guardian*, of London, in noticing that the Baldwin Locomotive Works, of Philadelphia, in 1883, made 557 locomotives, of which 150 were exported, doubts the possibility of much increasing American trade in this direction. Our contemporary alludes to some of the advantages of our locomotives, from their flexibility, for use in new countries, where the roadbed is less solid and massive than it usually is in Europe; but it claims that the very bigness of our country is against us in the competition with English locomotive builders, because there the coal, iron, and labor are concentrated in small limits, and shipping facilities extend to the very doors of the factories. The implication is that here the materials for such work have to be hauled great distances. But the fact is that in many cases there is in this country no greater transportation of material from the coal and iron mines to the placing on board ship of the finished product than there is in England itself.

Cementing Brass on Glass.

Puscher recommends a resin soap for this purpose, made by boiling 1 part of caustic soda, 3 parts of colophonium (resin) in 5 parts of water, and kneading into it half the quantity of plaster of Paris. This cement is useful for fastening the brass top on glass lamps, as it is very strong, is not acted upon by petroleum, bears heat very well, and hardens in one-half or three-quarters of an hour.

By substituting zinc white, white lead, or air-slaked lime for plaster of Paris, it hardens more slowly. Water only attacks the surface of this cement.

Wiederhold recommends, for the same purpose, a fusible metal, composed of 4 parts lead, 2 parts tin, and 2½ parts bismuth, which melts at 212° Fahr. The melted metal is poured into the capsule, the glass pressed into it, and then allowed to cool slowly in a warm place.—*Polyt. Notizblatt.*

Action of Copper upon the Human Economy.

MM. A. Hules and De Pietra-Santa.—The authors give an account of Durfort, a village of Tarn, where the workmen pass twelve hours daily in the midst of an atmosphere of copper oxide. Their skins, hair, and beards are colored with copper. The same metal can be detected in their secretions and excretions, and, after death, in their bones. These people suffer from no special trade disease, and on the other hand they enjoy no special immunity from infectious diseases, and in particular from cholera or typhoid fever.

IMPROVED SAFETY SWITCH GUARD.

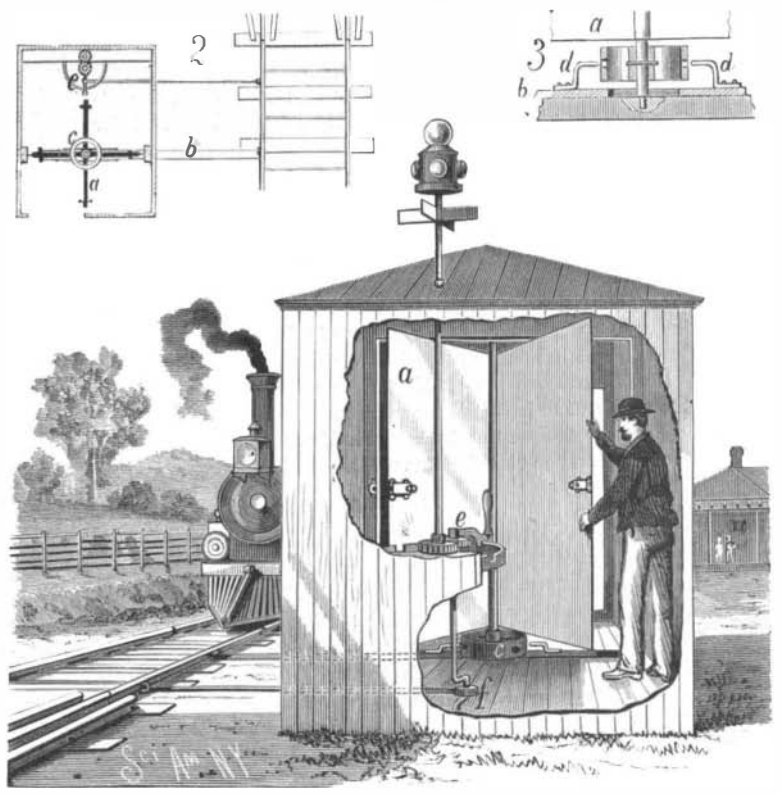
In the invention herewith illustrated the house which is erected over the switch lever is only large enough to permit the switchman to enter, and when inside, to move the switch lever. The egress of the switchman from the house, as long as the switch is open and disconnected from the main line, is prevented by a turnstile carried by a vertical shaft in the central portion of the house. Near the bottom of this shaft and revolving with it is a horizontal wheel, *c*, Fig. 2, containing holes corresponding in position with the doors of the turnstile above. (Fig. 2 is a plan view of the device. Fig. 3 is a vertical transverse section through the turnstile, and the large view shows the switch and house, part of which is broken away to show the interior.)

Connected with the switch is a slide bar, *b*, that is worked by the switch lever, and that is provided with two arms or bolts, *d d*, one of which enters one of the holes in the wheel, *c*, when the switch is opened, and cannot be withdrawn until the switch is closed and reconnected with the main line. So long as the arm on the slide bar remains in the hole in the wheel, *c*, the vertical shaft and the turnstile are immovable.

But when the slide bar is withdrawn, which can only be done by closing the switch—that is, reconnecting it with the main line—then the wheel, shaft, and turnstile are at liberty to revolve, thereby permitting ingress and egress. The slide bar, *b*, is worked by the switch lever, *e*; the construction of these parts will be readily understood from the engraving. When the switch is in connection with the main line, as in Fig. 2, the bar, *b*, is in the position shown in Fig. 3, both bolts, *d*, are away from the wheel, *c*, and the turnstile is free to revolve. Upon the switch being shifted one of these bolts enters one of the holes in the wheel and the turnstile is locked. Applied to each wing of the turnstile is a spring catch which automatically engages with a keeper in the house to hold the turnstile in such a position as to insure one of the holes in the wheel remaining opposite the bolt on the slide bar.

This device, by effectually barring the egress of the switchman until he has connected the switch with the main line, prevents accidents to trains by reason of the switches on the line being improperly left open.

Further information regarding this invention may be obtained from Mr. Frederick Broughton, member of a commission for inquiring into claims arising out of the building of



IMPROVED SAFETY SWITCH GUARD.

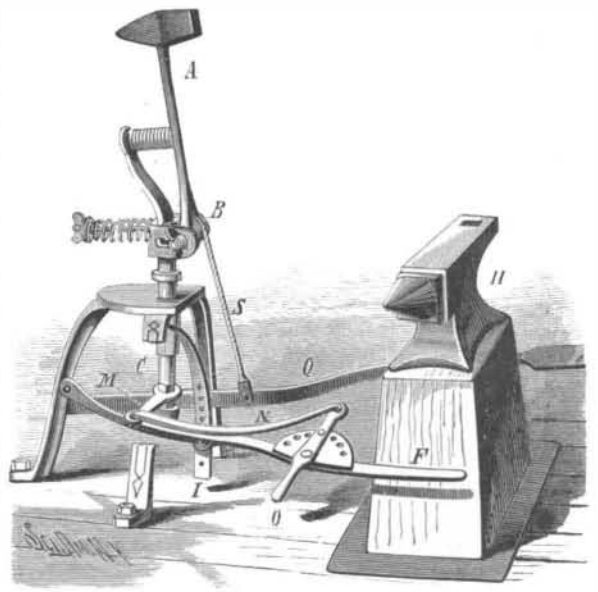
the Inter-colonial Railway, whose address is P. O. Box 38, Hamilton, Ontario, Canada.

Five New Comets.

Dr. Gould, Director of the Observatory at Cordova, Argentine Republic, telegraphs to the Minister of Instruction at Buenos Ayres, December 15, that he observed five comets, all small ones. The Buenos Ayres *Standard* supposes that this may explain the unprecedented heat felt in the River Plate, 101° Fahr. in the shade at Buenos Ayres, where the glass rarely marks over 92° in midsummer (December-January).

IMPROVED FOOT POWER HAMMER.

The hammer handle is pivoted at B to the head of a vertical shaft, C, that is fitted in a socket in the top of the stand, so as to rise and fall, and to turn freely. The lower end of the shaft has a step in the lever, F, which is pivoted to the hind leg of the stand, and extends forward and alongside of the anvil block, where its free end is to be used by the operator for raising and lowering the hammer, as the work may demand. A bar, I, having a series of holes is attached to the stand and arranged in a slot through the lever, F, for fastening the lever at any point by a pin, in order to set the hammer at the required height. An arm, M, is attached to the lower end of the shaft, C, over the lever, and is connected



PAINTER'S FOOT POWER HAMMER.

by a rod, N, to a lever, O, pivoted to the lever, F, near the anvil block within easy reach of the operator. By moving the lever, O, which is held in any position by a pin passing through holes in a plate on the lever, F, the shaft is turned and the hammer swung along the face of the anvil.

The hammer handle is connected to a foot lever, Q, by which it is worked, by a cord, S, which passes through a slot in the handle and connects by a ring with a rod, on which a coiled spring, W, is fitted, to be contracted when the hammer is forced down, for raising the hammer again. The spring bears against the head of the shaft, C, and the rod connects with the free end of the spring by an adjusting nut, which serves to regulate the tension of the spring. The shaft, C, has a vertical, curved extension which supports a coiled buffer spring that arrests the hammer at the end of the up stroke without shock or jar. The hammer handle is adjustable forward and backward with relation to the anvil, by placing the pivot of the handle in slots; a thumb screw clamps the pivot in any desired position in the slots. This invention has been patented by Mr. John L. Painter, of Bellevue, Ohio.

Drilling and Turning Glass.

Glass may be readily drilled by using a steel drill hardened, but not drawn at all, wet with spirits of turpentine. Run the drill fast and feed light. Grind the drill with a long point and plenty of clearance, and no difficulty will be experienced. The operation will be more speedy if the turpentine be saturated with camphor gum. With a hard tool thus lubricated glass can be drilled with small holes, say up to three-sixteenths, about as rapidly as cast steel. A breast or row drill may be used, care being taken to hold the stock steady, so as not to break the drill.

To file glass, take a 12 inch mill file, single cut, and wet it with the above solution—turpentine saturated with camphor—and the work can be shaped as easily and almost as fast as if the material were brass.

To turn in a lathe, put a file in the tool stock and wet with turpentine and camphor as before. To square up glass tubes, put them on a hard wood mandrel, made by driving iron rod with centers through a block of cherry, chestnut, or soft maple, and use the flat of a single cut file in the tool post, wet as before. Run slow. Large holes may be rapidly cut by a tube-shaped steel tool cut like a file on the angular surface, or with fine teeth, after the manner of a rose bit; great care being necessary, of course, to back up the glass fairly with lead plates or otherwise, to prevent breakage from unequal pressure. This tool does not require an extremely fast motion. Lubricated as before, neat jobs of boring and fitting glass may be made by these simple means. The whole secret is in good high steel worked low, tempered high, and wet with turpentine standing on camphor.

EIGHTY-THREE per cent of the population of the United States is composed of white natives and the immigrants from Germany and Great Britain, leaving four per cent from other countries and thirteen per cent for those of African descent.