Another entirely different form of plow, also constructed by John Fowler & Co., has lately been introduced on the Duke of Sutherland's vast reclamation works in his own country in the North of Scotland. A track of land was cleared (the roots of trees being dragged out by steam engines), plowed, and drained with stone and pipe drains. The plow (of which we give a view, copied from *Engineering*), which has been brought to its present state by successive improvements, may be described as an iron frame, about 10 feet long and 18 inches wide, supported upon six wheels or rollers, and bestridden by the plowman who guides it. Two of the rollers are underneath or within the frame, two are outside of it towards the plowed land, and two are outside of it towards that which is still untouched. The plow is so constructed as to work in both directions, backwards and forwards, without turning, and all its parts are double, except the mold board, which is made to turn upon a hinge, and thus to face either way. Below the center is a strong flat coulter, presenting a sharp point and a concave cutting edge towards each end of the frame, and to the center of this coulter the mold board is hinged. Just beyond the coulter, both fore and aft, there is a flat iron disk, about a yard in diameter, with a cutting edge, and turning freely on a horizontal axis transverse to the frame; and on either side of each disk there is a broad iron wheel or roller, 2 feet in diameter. On the side towards the land as yet unturned these rollers are 2 feet 6 inches broad, and are external to the frame; and on the side towards the furrow they are 18 inches broad, and, together with the disks, are contained within the sides of the frame. The disks rotate on the same axes as these internal rollers, but can be rendered more or less eccentric with regard to them; so that the depth of penetration of the disks can be regulated at will, and may vary from 4 inches to 15 inches. External to the frame on the other side, toward the plowed ground, are two broad wooden rollers, about 2 feet 6 inches in diameter. At each end of the frame its lateral pieces are united by a strong transverse iron bar, which also passes through, and serves as a pivot for, the end of an iron shaft about 6 feet long, which terminates in a large, boldly curved hook, having its point shod with steel. To the nose of this hook is attached an iron ring, and a rod to serve as a traction bar, to which the wire rope of the engine is made fast; while on the top part of the shaft there are two collars to receive one end of a long wooden lever, the other end of which is attached to the wire rope at the trailing end of the plow, and which depresses that hook and forces its point deeply into the soil, while the point of the leading hook is lifted out of the ground by the traction of the engine. Above the center of the frame there is a seat for the plowman, and a simple steering apparatus by which any desired direction may be given to the axles of the disk and of the iron wheels, so as to guide the course of the plow. The traction force is supplied by two steam engines, each of 16 horse power nominal, and working up to about 40. They are furnished with broad wheels, so as to be supported and to move easily on soft ground, and each carries the necessary length of wire rope on a horizontal drum situated beneath the boiler. They are found to work most advantageously when placed about 400 yards apart. Under ordinary circumstances, the plow completes its course of 400 yards in a quarter of an hour. When it reaches the hauling engine the lever is shifted to the other hook, a slight change is made in the steering wheel, and, in about a minute, the other engine takes up the work, and the plow is dragged back again. It traverses both sudden hollows and sharp ascents without losing its hold of the soil, which it penetrates to a depth of from 13 inches to 20 inches; and, although it rolls and flounders over the many hidden obstacles in its way, and gives an uneasy seat to its rider, it seems incapable of being upset. When any impediment is encountered, such as a huge stone or firmly bedded root, the disk acts the part of a wheel, and, no longer cutting its way, lifts the plow bodily over the obstacle, while the trailing hook, in most cases, gets its point underneath it, and tears the stone or root out of the ground.

When the leading disk rises over a stone or other impediment, the point of the trailing hook is buried more deeply than before, and thus very large roots, and masses of stone measuring a cubic foot and sometimes much more, are dragged out and left upon the surface by the action of the plow alone. If the hook does not obtain sufficient hold, the stone or root is somewhat cleared by hand, and a chain is cast around it. When the plow next passes, the chain is made fast to the rope, and in this manner very considerable boulders have been dragged out of the ground and carried away. Sometimes, however, a stone or root is too large, or too firmly fixed, to be so dislodged, and then recourse is had to blasting by dynamite, which has been employed with perfect safety, and has never been found to fail.

Both these plows were exhibited at the recent Royal Agricultural Show at Bedford, England, and attracted much attention.

AMONG the recently patented novelties is a method of mending cracked church bells, so as perfectly to restore their tone. It is done by introducing a furnace within the bell, to warm up and fuse the edges of the crack, at the same time pouring in new metal enough to fill out the crack, the sides of the bell being covered with plates to prevent escape of molten metal.

A BOAT RACE between E. Morris, of Pittsburgh, Pa., and G. Brown, of Halifax, N. S., took place at St. John's, N. B., on September 26. The course was five miles long, on the Kennebecasis. Brown was the victor by only two lengths. Time, 37 minutes.

Correspondence.

A Practical Mechanic at the American Institute Fair.

To the Editor of the Scientific American:

In the machinery department, in which there is a much larger and finer display than usual, one is at once surprised at the din caused by the numerous practical operations being carried on, and especially so at the clang and jar caused by a large gear wheel on one of the air compressors, which wheel has two rows of teeth in the one casting, the teeth of one row being opposite to those of the other instead of the one opposite to the spaces of the other, as should be the case. In addition to this defect, there is considerable backlash or play between the teeth of the driving pinion and the wheel, producing a rumble and an occasional "pound" only equaled by the Blake stone crusher. One would have thought that inserted wooden teeth would have been employed rather than that such a clatter should be made by an exhibited machine. The compressor, it is true, is not doing any duty, and is doubtless more noisy than it would be under its load; but creditable as a piece of workmanship it never can be, under the most favorable circumstances, until that wheel is removed and a better one substituted.

The two engines driving the machinery are very creditable specimens of workmanship, although there are wide variations between the two in matters of detail. The Wright engine has the lugs of its eccentric straps open a quarter of an inch, so that they are not locked together by the bolts at all, and merely hang, as it were, on the eccentric; they are the only ones in the Fair possessing this defect. The connecting rod of this engine has solid boxes instead of straps, being in this respect similar to the side rods used on English locomotives; such rods are not only less expensive to make, but are easier to repair and less liable to suffer from wear. The joint faces of the brasses are, however, left open, instead of being fitted "brass and brass," as they should be; this defect exists in nearly every connecting rod exhibited, the Baxter and the Shapley engines being honorable exceptions. If one asks why such joints are left open, the reply is "well it don't ought to be, I know, but—but they all seem to do it." The movement of a small connecting rod on this engine cannot fail to attract attention; it is about ten inches long and connects one end of the rocker arm to the arm of the shaft working the cut-off, the movement of each end of the rod being part of the circumference of a circle, the plane of one circle being at right angles to the plane of the other, and said rod having the bore of its brasses at each end trumpet-shaped from the center to each face of the brass, so that the rod has a right-about-face and "slantindicular" movement, in all directions, merely hanging on its journals, since its faces will be free, and unconfined by flanges, collars, or other guides common to a respectable connecting rod.

The Hampson and Whitehill engine is an elaborate piece of machinery, but one cannot look upon it without the thought arising: "Are we not, in our rage for variable cut-off engines, traveling in the direction of complicated movements, and a multiplicity of parts with very small wearing surfaces, which, though very perfect in their movements while the engine is new, will, after becoming in a comparatively short time worn, cause so much lost motion as to destroy the relations of the various movements one to the other, and thus seriously impair the action and value of the whole?" The quality of engineer co existent with the common slide valve and link motion era will soon be extinct if such engines are to become the rule. This engine also has its connecting rod brass joints open, and has a thump in its movement (as has also the Wright engine) when the connecting rod passes each dead center, the thump when the rod passes the dead center nearest the cylinder being in each engine the greatest, just as it might be expected to be if imperfect adjustment of the connecting rod brasses is partly the cause. Both engines work expansively to a high degree, and will give, no doubt, very economical results. A Bement axle lathe, exhibited by Geo. Place & Co., is a very superior tool. It is so geared that one pound on the cone is about 40 lbs. on the lathe centers, and it has a 3½ inch driving belt. That part of the bed on which the slide rest travels is raised so that the turnings do not fall upon the slides. The wearing surfaces are broad; the lock nut for the tailstock spindle acts upon the extreme end of the spindle guide close to the dead center, and clamps the spindle all around, avoiding the spring usual in such spindles; in fact the whole lathe evidences that its designer has provided a tool fit for a piece work turner (who generally puts a tool to its utmost capacity). On the tool post, however, is a taper washer, by means of which to regulate the hight of the turning tool. With such a washer, it is impossible to put this lathe to the full duty it will perform, because, the face of the washer not being parallel or level with the face of the holding screw, the tool is not so firmly clamped as a heavy duty will require. The centers are not yet turned up, indicating that it is not intended to put any work on the lathe, which is an omission to be regretted.

ESOR.

Leaf and Flower Impressions.

To the Editor of the Scientific American:

In less than five minutes after reading the article in the SCIENTIFIC AMERICAN of September 12, I culled, inked, and printed the four impressions herewith sent.

Take a small quantity of printer's ink, thinly put it on glass, or on the lid of a blacking box, as I did, evenly distributed. The end of the index finger will serve as the printer's ball, to cover one side of the leaf uniformly; then lay it to the exact place where you wish the print to be; lay over it a piece of thin, soft paper large enough to cover it; then, without moving the leaf, press all parts of it with the end of the thumb firmly, and you will have a perfect impression, that no engraver can excel; and by adjusting the leaves at the proper points, accurate prints can be taken, and, aided with the brush or pen, the stem and whole plant can be shown. I have excellent specimens of impressions of barks of trees, made by slicing the bark; and with a little care, the stems can also be taken, as well as flowers. I have many such; and when colored with the aniline colors, they are like colored engravings.

JACOB STAUFFER.

Lancaster, Pa.

[For the Scientific American.]

COAL BURNING LOCOMOTIVES IN THE SOUTH.

Burning coal in the locomotives on the railroads in the Southern States is an improvement of recent date. The plan was first tried by the Nashville and Chattanooga Railroad, which has specially good facilities for use of that fuel, there being a number of mines directly on its line. Later it was tried by the Atlantic and Western Railroad (from Atlanta to Chattanooga) with marked success. This road has no coal on its line, but gets its supply from the Dade Company's Mines, thirty miles up the Nashville and Chattanooga road. The company have adapted twenty locomotives for the purpose of using coal, and intend changing them all. As soon as an engine is brought into the shop for any important repairs, it is changed to a coal burner. They consume at this time about 50 tuns of coal per day; it is supplied to them at 9 cents per bushel, and 25 bushels are counted to make a tun. Aside from the time and labor saved, the actual economy is about $5 per day to the locomotive. The coal they use is as good a steam coal as any in the United States.

Stimulated by the operations of others and the absolute need to make better time with their trains, the Eastern Tennessee, Virginia, and Georgia Railroad has also tried the coal burners, and the report to the company at its late meeting says: During the month of July, the coal burners ran 17,600 miles and consumed 6,600 bushels of coal, which cost $660, making cost per mile of 3¾ cents. Wood burners running the same number of miles burned 569½ cords of wood at a cost in tenders of $2.50 per cord, making $1,423.75 or 8$\frac{1}{10}$ cents per mile run. The saving will make a fair dividend on many of the Southern roads. The cost of changing to coal burners, they show to be $190 each engine, and they have now changed fourteen. The coal issued by this road is not so good a steam coal as the Dade coal used by the Western and Atlantic Railroad, and costs them 10 cents per bushel; while the latter road gets the Dade coal at 9 cents. The mines are little over 20 miles from Knoxville, and the coal should be cheaper.

The East Tennessee, Virginia, and Georgia Railroad has just finished its business year; and, as an instance of its good management and the prosperity of this section of the South, has declared a six per cent dividend from actual earnings. The summary of shipments from this point shows that, during the past 12 months, 468,469 lbs. bacon and lard, 1,122,174 lbs. flour, 4,809,882 lbs. corn, 1,602,781 lbs. wheat, and 327,348 lbs. hay were transported. Of coal and coke 59,142,000 lbs., of manufactured iron 1,608,187 lbs., of nails and spikes 723,077 lbs., and of marble 312,216 lbs., were shipped. From the shipments of articles, manufactured or produced in and around this place, the road received as freight $103,471.70.

The region of country through which the road runs is one of the finest grass, grain, and fruit sections to be found anywhere; and ample manufacturing facilities are found in the abundance of good water power and cheap coal.

Knoxville, Tenn. H. E. C.

New Jersey Minerals.

Several thousand specimens have been quarried from the serpentine and trap Ridges in New Jersey, under the direction of Professor Leeds of the Stevens Institute. They consist of nemalites, occurring in translucent masses made up of long, silky fibers; marmolites of beautiful colors and polished surfaces; exquisitely tufted aggregates of crystals of of hydromagnesite; globular masses of delicately tinted prehnite; clusters of sparkling datholite crystals; star-like aggregations of pectolite, apophyllites, molybdites, natrolites, and other species too numerous to mention. They have been collected both with a view of developing the mineral treasures of the district in which the Institute is located, and to obtain, by exchange with the cabinets of other colleges, a much enlarged cabinet for the Institute itself.

New and Powerful Iron-Clad.

The Brazilian iron-clad Independencia, of which we recently gave an engraving, has been successfully launched on the Thames. The vessel has sustained no injury and will probably be in the possession of the Brazilian Government by the end of the year. She is one of the most powerful iron-clads in the world; is of 5,200 tuns burden; will be fitted with Penn's expanding trunk engines of 1,200 indicated horse power, working up to about 8,000 horse power; has a prominent gun metal stem, forming a ram; will draw 24 feet 6 inches forward and 25 feet aft, when fully armed and in sea-going trim; is 300 feet in length between perpendiculars, and has 63 feet of extreme breadth. Her armament, which is to be partly in two turrets and partly in bow and stern batteries, will consist of 35 tun Whitworth guns, and she will be bark-rigged. She is expected to make fifteen or sixteen knots an hour with a single screw.

EFFECT OF SOAP WATER ON INCANDESCENT METALS.—A red hot copper ball, plunged beneath the surface of water containing soap, remains quiet, being surrounded with a thick envelope of vapor.—*Moniteur Scientifique*.