Magnetic Iron Ore Sands in the Forge Fire.

In a paper read before the U. S. Association of Charcoal Iron Workers, at Ironton, October 12, 1881, Mr. M. Hoagland, of Rockaway, N.J., gives the following interesting facts.

At the Rockaway Rolling Mill, in New Jersey, four Catalan forge fires are in operation, making charcoal blooms from black magnetic sand, and a very superior article is produced for steel purposes. The product is largely used by the Sanderson Brothers Steel Company, at Syracuse, N. Y., and it is found that crucible steel made from this mineral sand is superior to anything yet produced from any other American iron; in fact, equal in every respect to steel made from the best brands of Swedish iron. The steel made from this sand has been thoroughly tested for cold chisels, turning tools, and miners' drills, and in every instance has given entire satisfaction. The ore is treated by the Wilson process of deoxidizing, and afterward worked in the usual way in the Catalan forge. The deoxidizing, it is claimed, saves one half the charcoal, or, in other words, it takes only one half as much coal to make a ton of iron by the Wilson process as is used in the old-fashioned fires. The waste heat from the fire is used for deoxidizing the ore. It was found difficult to work this black sand, on account of the large percentage of titanic acid it contains, until they adopted a method of clearing it with a powerful magnetic machine invented by C. G. Buchanan, and manufactured by M. H. Hoagland, of the Union Foundry. The machine separates the magnetic sand so thoroughly that none of the titanium is found in the portion which passes over the magnet; in fact, where properly managed, the product of the machine will yield by analysis 71 to 72 per cent of metallic iron.

The results of the separation have been so satisfactory that parties who have other ores than black sand have adopted machinery invented by Mr. Buchanan to reduce their ores to a fine consistency, separating by the magnet, preferring the magnetic process, because the fine ore which is washed away by the jigging process is all saved, the magnet taking out nearly all the ore, leaving less than two per cent in the tailings. Another set of this machinery is to be put in operation as soon as it can be built, at Elizabethport, N. J., where the Wilson process will be used, producing iron by the direct method, using petroleum as fuel in puddling furnaces.

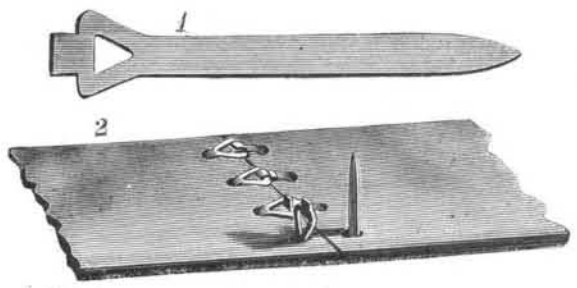
Printing Ink.

The base of our common printing ink, as is well known, is a linseed oil varnish, which sometimes possesses a disagreeable odor, and the ink made from it smells so badly as to make a freshly-printed paper an unpleasant companion for sensitive nostrils. Dr. Brackenbusch, of Berlin, proposes to overcome this disadvantage by replacing the linseed varnish with a solution of colophonium (rosin) in paraffine oil. He dissolves 45 parts of fine rosin in 25 parts of paraffine oil by heating them to 80° C. (176° Fah.) or by mixing them with a machine at ordinary temperature. When the solution is effected, if such it may be called, 15 parts of soot or lampblack are added.

NOVEL BELT FASTENER.

The engraving shows a simple, easily applied belt fastener, recently patented by Mr. Alfred H. Noble, of New Milford, Conn. The fastener is cut from a sheet of brass, as shown in Fig. 1, and has an open head or eye, a tongue or shank projecting therefrom and capable of being inserted through holes in the meeting ends of a belt and through the head or eye, and folded over. A lip projecting from the head or eye opposite the tongue is folded over the tongue to hold it down. The form of the fastener is shown in Fig. 1. The various steps in the operation of fastening the belt are shown in Fig. 2.

The first fastener is shown as merely inserted in the holes in the adjoining ends of the belt. In the second fastener the tongue is drawn through its hole in the head of the fastener, and is bent upward at right angles and cut off at the required length. In the third fastener the tongue is bent



NOBLE'S BELT FASTENER

down on the lip projecting from the head, and in the fourth the lip is bent over the end of the tongue.

This fastener, besides being simple and easily and quickly applied, is cheap and strong, having all of the advantages of the best leather lacing with none of its defects.

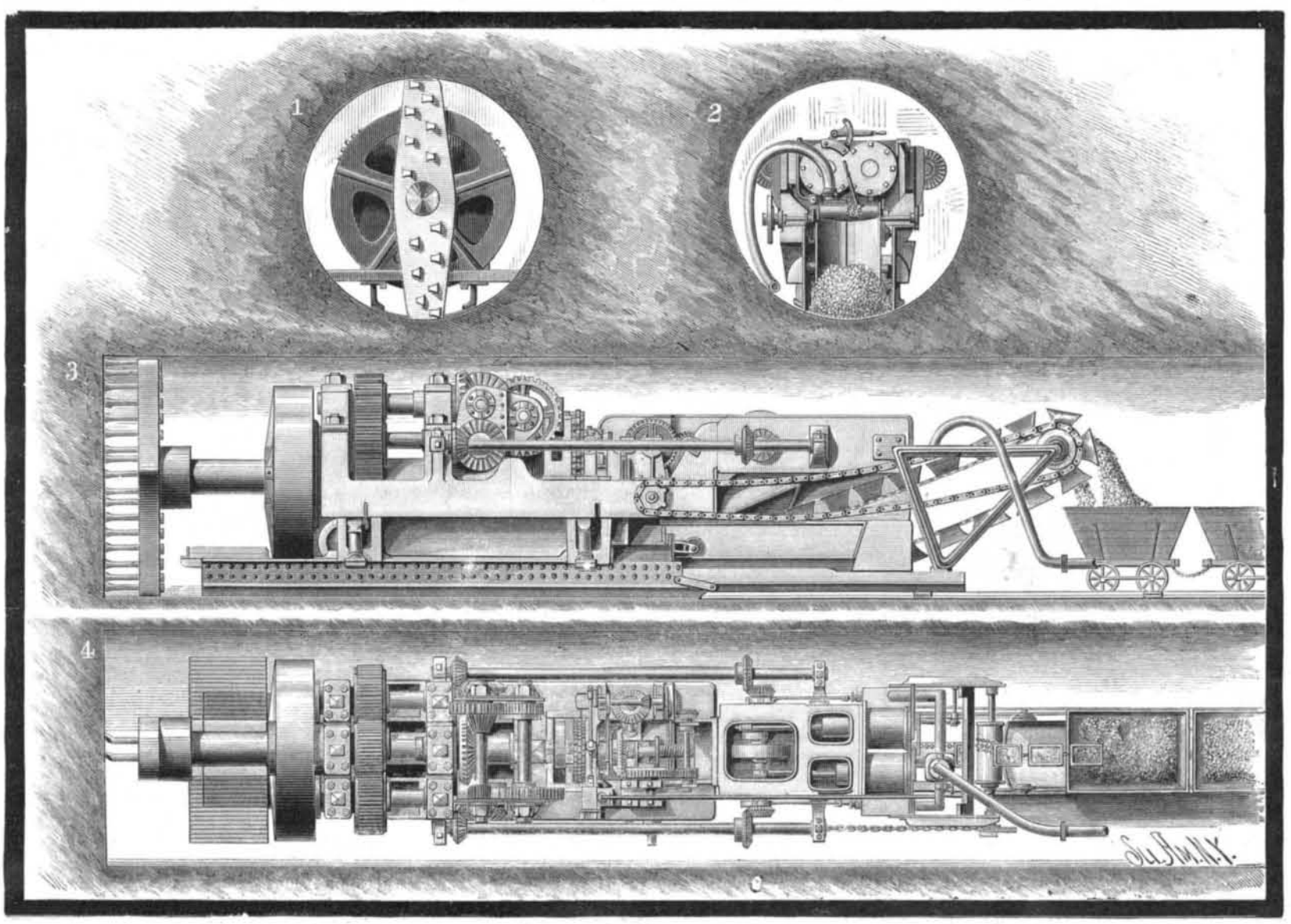
Further particulars may be obtained by addressing the inventor, or Messrs. Greene, Tweed & Co., 118 Chambers street, New York city.

COMPRESSED-AIR MACHINE USED IN THE CHANNEL TUNNEL.

The length of the Submarine Continental Railway Company's Tunnel, under sea, from the English to the French shore, will be twenty-two miles; and, taking the shore approaches at four miles on each side, there will be a total length of thirty miles of tunneling. The approach tunnel descends from the daylight surface by an inclosed gallery, with an incline of 1 in 80, toward Dover, to a point on the Southern Railway Company's line, about two miles and a half from Folkestone. The exact point is at the western end of the Abbot's Cliff tunnel, at which point the gault clay outcrops to the sea level. Half a mile of heading has been driven, by machinery, from this point; after which the works were suspended to enable them to be resumed at a point nearer to Shakespeare's Cliff, where the tunnel passes under the sea. The shaft at this point is 160 feet deep. It is sunk close to the western end of Shakespeare's Cliff. The shaft passes through about 40 feet of overlying *débris;* it then just touches the white chalk, which is pervious to water, after which it goes down to the beginning of the tunnel, which is here 100 feet below the surface of the sea. A heading, now three-quarters of a mile long, has been driven in the direction of the head of the Admiralty Pier, entirely in the gray chalk, near its base, and a few feet above the impermeable strata formed by the gault clay. The idea of the projectors is so to localize the tunnel, not only in the part already made, but also when it passes out under the sea, that it shall have the body of the gray chalk above it, and that of the gault clay below it, both these strata being in themselves impervious to water, and both alike having heavily watered strata on each side of them; namely, the white chalk above the gray chalk, and the lower greensand below the gault clay. This condition, together with that of providing sufficient roof between the top of the tunnel and the sea, which roof has a thickness of 150 feet, will necessitate the tunnel being turned in a curved line.

The present heading is 7 feet in diameter. Machinery is being constructed by which this 7 foot hole can be enlarged to 14 feet, by cutting an annular space, 3 feet 6 inches wide, around it. This will be done by machinery similar to that already described, but furnished with an upper bore head, suitable for dealing with chalk, to make an annular cutting, instead of acting like the first machine, which makes the 7 foot cutting. The one machine will follow the other, at a proper interval; and the *débris* from the cutting by the first will be passed out through the second machine. The compressed air, likewise, which is necessary to work the advanced machine, will be similarly passed through the machine coming behind. There will be no difficulty in speeding the machines so that they shall work along the tunnel at the same rate of progress; and the larger machine can, as well as the smaller one, do its work with a minimum of manual labor; only two men are at present needed for each machine.

The engraving shows the Beaumont & English compressed-air boring machine at work. The length of this machine from the borer to the tail end is about 33 feet. Its work is done by the cutting action of short steel cutters fixed in two revolving arms, seven cutters in each, the upper portion of the frame in which the borer is fixed moving forward five-sixteenths of an inch with every complete revolution of the cutters. In this way a thin paring from the whole face of the chalk in front is cut away with every turn of the borer. A circular tunnel is formed having a diameter of 7 feet. A man in front shovels the crumbled *débris* into small buckets, which, traveling on an endless band, shoot the dirt into a "skip" tended by another man. The skip, when filled, is run along a tramway to the mouth of the shaft. At present these trolleys, each holding about one-third of a cubic yard, are drawn by men, but before long it is hoped that small compressed air-engines will be used for traction. The rate of progress made with the machine is about one



BEAUMONT & ENGLISH'S COMPRESSED-AIR TUNNELING MACHINE EMPLOYED IN THE CHANNEL TUNNEL.