# Science and Art.

### Composition and Formation of Steel.

Before a recent meeting of the Boston Natural Historical Society, Dr. Jackson gave an account of some researches into the composition and manner of formation of different kinds of steel. As commonly known, steel is a combination of carbon and iron, made by heating flat bars of pure iron in combination with charcoal. The carbon is first converted into oxyd of carbon, and then unites with the iron as carburet. The result of this process is known as blistered steel, from the bubbles generated by gases upon its surface. Shear steel consists of parallel plates of pure iron and steel welded by folding, and uniting the bars of blistered steel. Cast steel is fused in pots of the most refractory material, and differs from cast iron, which likewise contains carbon, in this respect, that cast iron is a mixture of coarse aggregated matters, graphite and iron, whilst cast steel is a chemical combination of carbon and iron.

From the researches of Berthier it is known that manganese will form an alloy with iron. When iron is mingled with a considerable proportion of manganese, a brittle compound results; but when combined with a very small proportion of manganese, a steel of very fine quality is obtained, which has this advantage over carbon steel; carbon steel becomes coarse when tempered in thick masses, from segregation of the particles of carbon; but no such trouble arises with manganesian steel. Parties in England have lately introduced excellent wire for pianoforte strings, made of this kind of steel, as well as for cutting instruments and other purposes. In the wire, Dr. Jackson has found one and a half per cent. of manganese, and has established the fact that it resists, to a very remarkable degree, the action of hydrochloric acid. Sixteen years since Franklinite Iron was manufactured by Mr. Osborn into very hard and fine steel. This steel required tempering at a lower heat than carbon steel. Many of our manganesian irons might be manufactured into steel by the simple process of fusion, and a steel of uniform character might be made without previous cementation with carbon.

### Machine for Boring and Mortising.

Our engraving illustrates an invention by Mr. Henry Allen, of Norwich, Conn., for boring and mortising timber and wood of all kinds. The principal features of novelty consist in a peculiar formation of the cutting tool, and in certain means of adjusting the movement of the cutter, bed, &c.

The stuff to be mortised, A, is laid on the traveling bed, B, upon which it is secured by the screw clamp, C, and hinged clamps, D D'. The bed is moved by means of crank E, which connects with a rack and pinion on the under side.

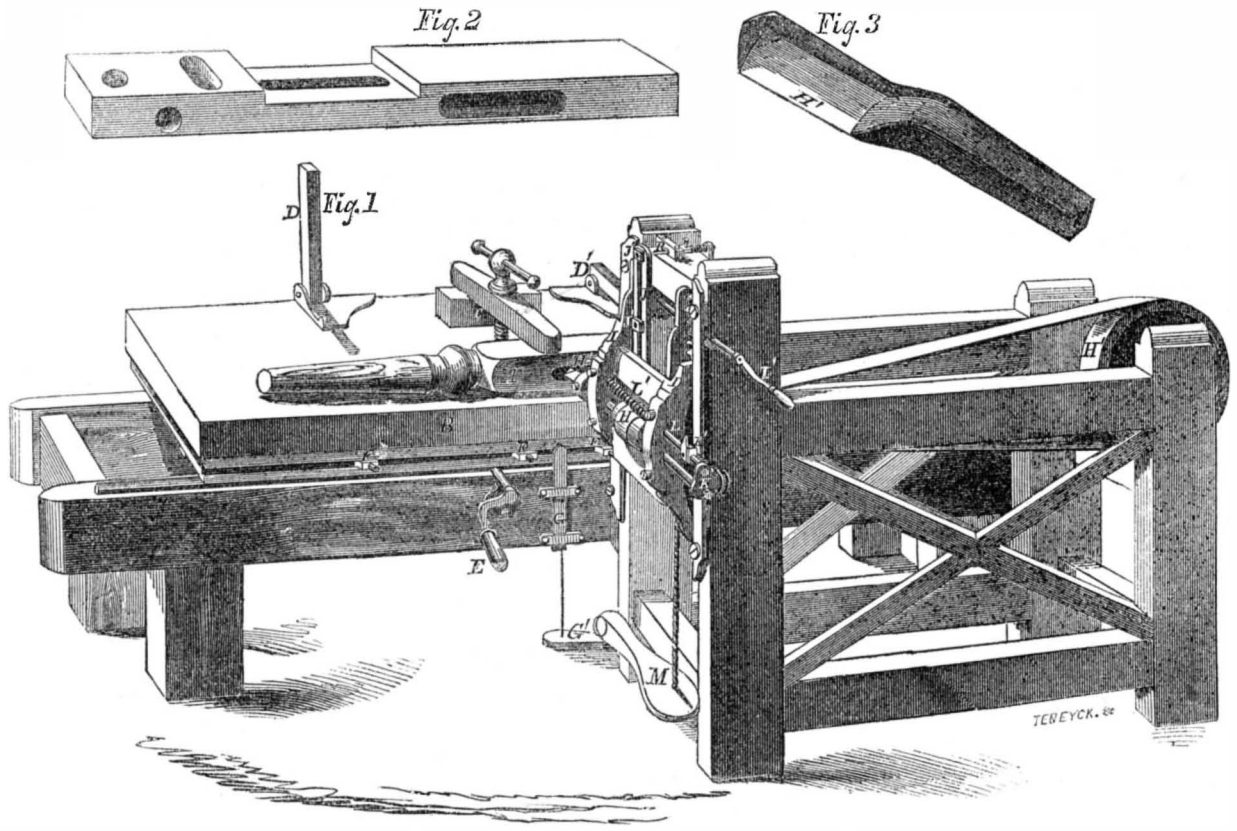
The horizontal length of the mortises is regulated by studs, F F, on the lower edge of bed; these studs are adjustable, so that they may be set nearer or further apart, according to the dimensions of the mortise which is desired to be cut. Between the studs there is a spring bolt, G, which prevents the bed from moving beyond the space indicated by the set of the studs, F; spring bolt, G, may be thrown below the studs by the foot pedal, G', when it is desired to move the bed to a new point. H' is the cutter, put in motion by a belt from pulley H. The cutter, H', is supported in a sliding frame, I, which is moved up and down by means of rack and pinion operated by crank I'. J is a slotted strap, in which are two adjustable stops, J'. The end of spring bolt, R, enters the slot between the stops, and the sliding frame can therefore only move as far as the stops permit; by varying the distance of the stops the vertical dimensions of the mortise may be changed. The cutter, H', also has a lateral sliding movement, by which the depth of the mortise may be regulated; the outer end of the cutter shaft connects, by means of the head block, K, with the spring rod, L; a cord extends from K to foot pedal M; the cutter is made to enter the wood by the pressure of the foot upon M; the spring, L', throws the cutter back out of the stuff when the pressure on M is released. The depth to which the cutter enters the wood is regulated by adjusting the stud, K'.

The cutter, H', seen enlarged in fig. 2, is of the peculiar form shown, and is so made that it cuts equally well either as a borer or mortising tool. It is made to revolve with a speed of about 400 revolutions per minute.

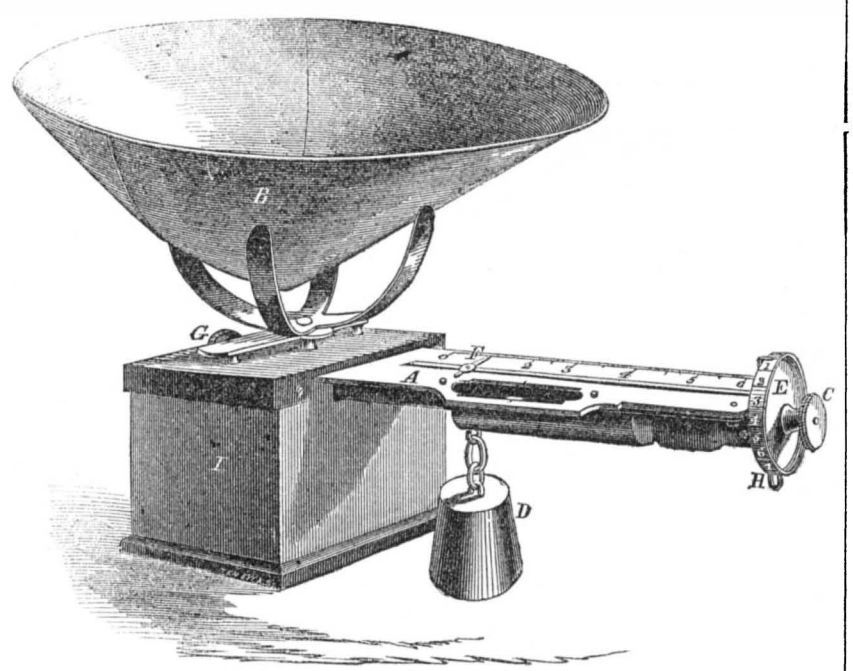
The method of adjusting the movement of the cutter and stuff, thus altering the dimensions of the mortise at pleasure, is very convenient and accurate. It also permits the boring and mortising of any number of pieces of stuff, such as bed posts, car frames, &c., all exactly alike, without new adjustment for each. The cutter makes clean and finished work. Any desired number of studs, F, may be introduced on the bed, B, and the number of slots to be mortised in the stuff increased accordingly. Fig. 2 shows a piece of wood with several different forms of mortises capable of being done by cutter H'.

This machine is quite simple in its construction, and durable. We have seen testimonials from prominent car-builders and railroad companies, who have the invention in use; they all speak in the highest terms of its practical success and excellence. The machines cost from $320 upwards, according to size. Address the inventor for further information. Patented April 11th, 1854.

## IMPROVED BORING AND MORTISING MACHINE.




## WEIGHING SCALES.




### Improvement in Scales for Weighing.

In the invention illustrated by the accompanying engraving the weighing lever, A, is balanced much in the usual manner; the pan, B, in which the article to be weighed is placed rests upon one end of the lever, the weights, and graduated scale, being on the opposite end. The improvement consists in making the weighing lever, A, hollow, and providing its interior with a screw rod, which, on being turned by the thumb screw, C, moves a nut to which the weight, D, is attached below, and the index pointer, F, above. The pointer, F, shows the number of pounds, and the small figured wheel, E, exhibits the ounces and fractions. At the opposite end of the lever is another thumb screw, G, by which the scales are balanced to allow for tare. If it is wanted to increase the weighing power of the lever, an extra weight may be hung at the eye, H. I is a box or standard which supports the apparatus.

It must be obvious that the method of moving the weights by thumb screw is exceedingly accurate, and, at the same time, very convenient. For drug and shop uses, and indeed for all weighing purposes, the invention is well adapted. It is neat in appearance, compact, quickly adjusted, simple, durable, &c. It is one of the best improvements of its class with which we are acquainted. Mr. James Kelly, of Sag Harbor, N. Y., is the inventor and Mr. John Sherry, of the same place, owner and assignee of the patent. Address Mr. Sherry for further information. Patented March 4th, 1856.

### Conductor and Engineer Indicted.

The Jonesville, Mich., *Independent* learns that the grand jury indicted Parsons, the conductor, and Keegan, the engineer, for manslaughter, in causing the loss of several lives by the collision between that place and Hillsdale; on the 7th of February last. They started the train from Jonesville out of time.

### Swallows.

As a proof of the valuable services rendered by swallows, it is estimated that one of these birds will destroy at a low calculation, 900 insects per day; and, when it is considered that some insects produce as many as nine generations in a summer, the state of the air but for these birds may be readily conceived.