“ The working perpendicular beam is in figure 24 represented in the whole, with all its contrivances for opening and shutting the regulator and injection-cock, and marked QQ.

“ Between two perpendicular pieces of wood on each side of P, there is a square iron axis, which has upon it four iron pieces subservient to the turning of the regu 1ator, by shooting forward and drawing back the fork fastened to the hand of the regulator ; it is marked LNO in fig. 25, and represented separately in fig. 27. There is a slit in the perpendicular working-beam contrived in such manner that its pins work on the fore part, middle, and back part, to raise and depress the levers 5, 4, (fig. 25,) that move the iron axletree abovementioneα as far about its centre as is necessary. But the reader will conceive the thing better by a view of the pieces in figs. 26 to 29, and then be enabled fully to understand the same things in fig. 25.

“ Figure 26 represents the iron axletree already mentioned, and marked by the letters A B in figure 25. There is a piece c e D E, called the Y, from its representing that letter by its two shanks, only hanging down in an inverted order, with a weight F to be slipped on upon its upper part, where it is made fast, higher or lower, as is convenient, with a key or wedge. This Y being slipped on over the end of the iron axle is made fast by driving

in a key after it at *e* : then there is a sort of a stirrup, I K I, with a long pin to be fixed occasionally into the holes on each side of K : this, by its hooks I I, is hung upon the axle at *i i*, then a spanner or handle G 4 is driven on upon the axle from the other end, so ns to come and be fast at *g* at right angles to the Y : then a shorter lever or spanner at half right angles to this, (that is, between the long shank of the Y and G 4,) is forced on to Λ, upon the axle, where it is made fast. All these pieces, as they are fixed together on the axle may be seen at figure 25 ; where you may observe, that when the working beam goes up, by a pulley held in its middle by a pin, it lifts up the spanner H 5, which turns the axle so far as to throw the V with its weight F from C to 6, in which direction, after passing the perpendicular, it would continue to move towards Q, if it was not stopped by a strap of leather fixed to its top and made fast at the points *m n,* in such manner as to allow the Y to vibrate about a quarter of a circle, in falling forwards and backwards, alter it has passed the perpendicular.

“ Figure 27 represents the horizontal fork LNO to be joined, at its end O, to the spanner or hand(e of the regulator P Q 10, there

being several holes in these pieces, that any part of the end O may be kept in any part of the slit in the spanner, as may be requisite for the better motion of the two pieces. This may be seen in figure 24, where the other end of the fork is fastened to the bottom of the stirrup at K N L, by the long horizontal pin L, so that the fork may continue horizontal, as it is shot forward, and drawn back by the strokes that K and D, the shanks of the Y, make alter­nately on the fore part or back part of the pin L, in order to push forward, or draw back the spanner P 10, to shut or open the regulator in the manner that shall be further explained. We will only take notice now, that there is an horizontal piece *ul,* so placed, that the end 10 of the spanner may bear upon it, and be supported, as it slides backward and forward.

“ Before we proceed, it will not be improper to give a full description of the regulator. See fig. 28.

“ A cock of four inches waterway, big enough to let the steam out of the boiler into the cylinder, would have so much friction, if made tight, as to require a great force to turn it, especially as it must open and shut 32 times in a minute; therefore the regulator has been contrived instead of it. The brass plate R, which you see here at RR in the middle of the top of the boiler, is cast with the pipe S S S of four inches’ bore, and worked

smooth at its hole under the plate, that it

may be closely stopped by another smooth

plate *y* ***Y*** *y* applied under it, (where the

pressure of the steam will hold it the

closer when shut.) There is also, in the

plate RR, a short pipe or conic hole T,

smallest downwards, to receive the piece V W X, which being ground into it can move round without letting air or steam pass by. There is a square shank ZZ, which is put through this last piece when it is Jet down into its hole, and pinned tight to it at the upper Z Then the spanner of the regulator being put on, and made fast at V and W, as may be plainly seen in fig. 25, where the whole regulator is put together. This regulator opens very quick, and ten times easier than a cock of the same bore: and to help the whole, the weight F of the Y, when it has passed the perpendicular, falls with a good force, which makes the shank under it give a smart stroke, either within the fork or without, to drive the fork, and draw the handle of the regulator contrary to the way that the weight is falling ; the weight causing the regulator to be shut when it tumbles towards it, and be open when it tumbles from it.

“ When the regulator is shut, the next thing is to open the injection-cock to make the vacuum, and immediately to shut it when the piston begins to come down, (for the vacuum is made in a second of time.) ***n*** (fig. 29,) represents the adjutage of the injecting pipe within the cylinder ; *a b* part of the pipe coming from the injecting-cistern, *c b* the cock, and e the key of the cock, that has a narrow, long, upright hole instead of a round one, that it may be the sooner opened. Upon the top of this key is fastened on a quarter of a wheel with

teeth Z, to be turned by another quarter of a wheel t hanging down from the axis *h g,* which ig moved by the lever *h k,* common­ly called the F. Examine fig.

25, where they are working tυge

ther, and you may see how the perpendicular beam moves them by its pins.

“ The present situation of the machine, as now represented by the 24th figure, is as follows. The regulator is open, ns appears by its plate TY being removed from under the communication or throat-pipe S, that goes into the cylinder. The piston is now up about the place CM, at top of the cylinder in figure 24; consequently