ſtalk of the Y till it paſſes the perpendicular, and it then falls down, outwards from the cylinder, and the claw *l* again drives the fork in the direction *h l,* and opens the ſteam valve. This opening and ſhutting of the ſteam valve is executed in the preciſe moment that is proper, by placing the pins π and Ϭ at a proper height in the plug-beam. For this reaſon, it is pierced through with a great number of holes, that the places of theſe pins may be varied at pleaſure. This, and a proper curvature of the ſpanners *m* and n, make the adjuſtment as nice as we pleaſe.

The injection-cock R is managed in a ſimilar man­ner. On its key may be obſerved a forked arm *s t,* like a crab’s claw ; at a little diſtance above it is the gudgeon or axis *u* of a piece *y u z ,* called the hammer or the F, from its reſemblance to that letter. It has a lump of metal *y* at one end, and a ſpear *u s* projects from its middle, and paſſes between the claws *s* and *t* of the arm of the injection-cock. The hammer *y* is held up by a notch in the underside of a wooden lever DE, moveable round the centre D, and ſupported at a proper height by a ſtring *r* E made faſt to the joiſt above it.

Suppoſe the injection-cock ſhut, and the hammer in the poſition repreſented in the figure. A pin s oſ the plug-frame riſes along with the piſton, and catch­ing hold of the detent DE, raiſes it, and diſengages the hammer *y* from its notch. This immediately falls down, and ſtrikes a board L put in the way to stop it. The ſpear us takes hold pf the claw *t,* and forces it aſide towards *x,* and opens the injection-cock. The piſton immediately deſcends, and along with it the plug-frame. During its deſcent the pin *β* meets with the tail *u z* of the hammer, which is now raiſed considerably above the level, and brings it down along with it, raising the lumpy, and gradually shutting the injec­tion-cock, becauſe the ſpear takes hold of the claw s of its arm. When the beam has come to its loweſt situation, the hammer is again engaged in the notch of the de­tent DE, and ſupported by it till the piſton again reaches the top of the cylinder.

In this manner the motions of the injection cock are alſo adjuſted to the preciſe moment that is proper for them. The different pins are ſo placed in the plug­frame, that the ſteam-cock may be completely ſhut be­fore the injection cock is opened. The inherent mo­tion of the machine will give a ſmall addition to the aſcent of the piſton without expending ſteam all the while ; and by leaving; the ſteam rather leſs elaſtic than before, the ſubſequent deſcent of the piſton is promoted. There is a considerable propriety in the gradual ſhut­ting of the injection-cock. For after the firſt daſh of the cold water against the bottom of the piſton, the condenſation is nearly complete, and very little more water is needed; but a continual acceſſion of some is abſolutely neceſſary for completing the condenſation, as the capacity of the cylinder diminiſhes, and the water warms which is already injected.

In this manner the motion of the machine will be repeated as long as there is a ſupply of ſteam from the boiler, and of water from the injection ciſtern, and a diſcharge procured for what has been injected. We proceed to conſider how theſe conditions alſo are provi­ded by the machine itſelf.

The injection ciſtern is ſupplied with water by the jackhead-pump, as we have already obſerved. From this ſource all the parts of the machine receive their reſpective ſupplies. In the firſt place, a ſmall branch 13, 13, is taken off from the injection-pipe immediately below the ciſtern, and conducted to the top of the cy­linder, where it is furniſhed with a cock. The ſpout is ſo adjuſted, that no more runs from it than what will keep a constant ſupply of a foot of water above the piston to keep it tight. Every time the piſton comes to the top of the cylinder, it brings this water along with it, and the ſurplus of its evaporation and leakage runs off by a waste pipe 14, 14. This water neceſſarily be­comes almost boiling hot, and it was thought proper to employ its overplus for ſupplying the waste of the boil­er. This was accordingly practiced for ſome time. But Mr Beighton improved this economical thought, by ſupplying the boiler from the eduction-pipe 2, *2,* the water of which muſt be ſtill hotter than that above the piſton. This contrivance required attention to many circumſtances, which the reader will understand by considering the perſpective and profile. The eduction pipe comes out of the bottom of the cylinder at 1 with a perpendicular part, which bends sidewiſe below, and is ſhut at the extremity 1, A deep cup 5 communi­cates with it, holding a metal valve nicely fitted to it by grinding, like the key of a cock. To secure its being always air-tight, a ſlender ſtream of water trickles into it from a branch 6 of the waſte pipe from the top of the cylinder. The eduction-pipe branches off at 2, and goes down to the hot well, where it turns up, and is covered with a valve. In the perſpective view may be obſerved an upright pipe 4, 4, which goes through the head of the boiler, and reaches to within a few inches of its bottom. This pipe is called the *feeder,* and riſes about three or four feet above the boiler. It is open at both ends, and has a branch 3, 3, communicating with the bottom of the cup 5, immediately above the metal valve, and alſo a few inches below the level of the entry 2 of the eduction-pipe. This communicating branch has a cock by which its paſſage may be diminiſhed at pleaſure. Now ſuppoſe the ſteam in the boil­er to be very ſtrong ; it will cauſe the boiling water to riſe in the feeding pipe above 3, and coming along this branch, to riſe alſo in the cup 5, and run over. But the height of this cup above the ſurface of the wa­ter in the boiler is ſuch, that the ſteam is never ſtrong enough to produce this effect. Therefore, on the con­trary, any water that may be in the cup 5 will run off by the branch 3,3, and go down into the boiler by the feeding-pipe.

Theſe things being understood, let us ſuppoſe a quantity of injected water lying at the bottom of the cylinder. It will run into the eduction pipe, fill the crooked branch 1, 1, and open the valve in the bottom of the cup (its weight being ſupported by a wire hang­ing from a ſlender ſpring), and it will fill the cup to the level of the entry 2 of the eduction-pipe, and will then flow along 3, 3, and ſupply the boiler by the feeder 4, 4. What more water runs in at 1 will now go along the eduction-pipe 2, 2, to the hot well. By properly adjuſting the cock on the branch 3,3, the boiler may be ſup­plied as faſt as the waste in ſteam requires. This is a moſt ingenious contrivance, and does great hoqour to Mr Beighton It is not, however, of much impor­tance. The ſmall quantity which the boiler requires