ſhows it erect. This is owing to the magnifying power, becauſe the apparent angular motion is greater than what we naturally connect with the motion of the teleſcope. This dbes not happen when we look through a tube with­out glaſſes.

All ſhaking of the inſtrument therefore makes the object dance before the eye ; and this is diſagreeable, and hinders us from ſeeing it diſtinctly. But a tremulous motion, how­ever ſmall, is infinitely more prejudicial to the performance of a teleſcope, by making the object quiver before us. A perſon walking in the room prevents us from ſeeing diſtinct­ly ; nay, the very pulsation in the body of the observer, agi­tates the floor enough to produce this effect, when the te­leſcope has a great magnifying power : For the visible mo­tion of the object is then an imperceptible tremor, like that of an harpſichord wire, which produces an effect preciſely ſimilar to optical indiſtinctneſs ; and every point of the ob­ject is diffuſed over the whole ſpace of the angular tremor, and appears coexiſtent in every part of this ſpace, juſt as a harpſichord wire does while it is ſounding. The more rapid this motion is, the indiſtinctneſs is the more complete. There­fore the more firm and elaſtic and well bound together the frame-work and apertures of our teleſcope is, the more hurt­ful will this conſequence be. A mounting of lead, were it practicable, would be preferable to wood, iron, or braſs. This is one great cauſe of the indiſtinctneſs of the very fineſt reflecting teleſcopes of the uſual conſtructions, and can ne­ver be totally removed. In the Gregorian form, it is hard­ly poſſible to damp the elaſtic tremor of the ſmall ſpeculum, carried by an arm ſupported at one end only, even though the tube were motionleſs. We were witneſſes of a great im­provement made on a four-feet reflecting teleſcope, by ſupporting the ſmall ſpeculum by a ſtrong plate of lead placed acroſs the tube, and led by an adjuſting ſcrew at each end. But even the great mirror may vibrate enough to produce indiſtinctneſs. Refracting teleſcopes are free from this inconveniency, becauſe a ſmall angular motion of the object- glaſs round one of its own diameters has no ſenſible effect on the image in its focus. They are affected only by an angular motion of the axis of the teleſcope or of the eye- glaſſes.

This ſingle conſideration gives us great help towards judging of the merits of any particular apparatus. We ſhould ſtudy it in this particular, and ſee whether its form makes the tube readily ſuſceptible of ſuch tremulous mo­tions. If it does, the firmer it is and the more elaſtic it is, the worſe. All forms therefore where the tube is ſupported only near the middle, or where the whole immediately or remotely depend on one narrow joint, are defective.

Reaſoning in this way, we ſay with confidence, that of all the forms of a teleſcope apparatus, the old faſhioned simple ſtand repreſented in fig. 21. is by far the beſt, and that others are superior according as the diſpoſition of the points of ſupport of the tube approaches to this. Let the pivots A, B, be fixed in the lintel and ſole of a window. Let the four braces terminate very near to theſe pivots. Let the teleſcope lie on the pin Ff, reſting on the ſhoulder round the eye piece, while the far end of it reſts on one of the pins 1, 2, 3, &c. ; and let the diſtance of theſe pins from F very little exceed the length of the teleſcope. The trem­bling of the axis, even when conſiderable, cannot affect the poſition of the tube, becauſe the braces terminate almoſt at the pivots. The tremor of the brace CD does as little harm, becauſe it is nearly perpendicular to the tube. And if the object glaſs were cloſe at the upper supporting pin, and the focus at the lower pin F, even the bending and trembling of the tube will have no effect on its optical axis. The inſtrument is only ſubject to horizontal tremors, Theſe may be almoſt annihilated by having a ſlender rod coming from a hook’s joint in the side of the window, and paſſing through ſuch another joint cloſe by the pin F. We have ſeen an inſtrument of this form, having AB parallel to the earth’s axis. The whole apparatus did not coſt 50 ſhillings, and we find it not in the leaſt ſenſible manner affected by a ſtorm of wind. It was by obſervations with this inſtrument that the tables of the motions of the Georgium Sidus, pub­liſhed in the Edinburgh Tranſactions, were constructed, and they are as accurate as any that have yet appeared. This is an excellent equatorial.

But this apparatus is not portable, and it is ſadly defici­ent in elegance. The following is the beſt method we have ſeen of combining theſe circumſtances with the indiſpenſable requiſites of a good teleſcope.

The pillar VX (fig. 22.) riſes from a firm ſtand, and has a horizontal motion round a cone which completely fills it. This motion is regulated by a rack-work in the box at V. The ſcrew of this rack-work is turned by means of the handle P, of a convenient length, and the ſcrew may be diſengaged by the click or detent V, when we would turn the inſtrument a great way at once. The teleſcope has a ver­tical motion round the joint placed near the middle of the tube. The lower end of the tube is ſupported by the ſtay OT. This conſiſts of a tube RT, faſtened to the pil­lar by a joint T, which allows the ſtay to move in a vertical plane. Within this tube slides another, with a ſtiff motion. This tube is connected with the teleſcope by another joint O, alſo admitting motion in a vertical plane. The side M of this inner tube is formed into a rack, in which works a pinion fixed to the top of the tube RT, and turned by the flat finger-piece R. The reader will readily ſee the advan­tages and the remaining defects of this apparatus. It is very portable, becauſe the teleſcope is eaſily diſengaged from it, and the legs and ſtay fold up. If the joint Q were immediately under A, it would be much freer from all tre­mor in the vertical plane. But nothing can hinder other tremors ariſing from the long pillar and the three ſpringy legs. Theſe communicate all external agitations with great vigour. The inſtrument ſhould be let on a ſtone pedeſtal, or, what is better, a caſk filled with wet sand. This pedeſtal, which neceſſity perhaps ſuggeſted to our ſcientific navi­gators, is the beſt that can be imagined.

Fig. 23 is the ſtand uſually given to reflecting teleſcopes. The vertical tube FBG is faſtened to the tube by finger ſcrews, which paſs through the slits at F and G. This arch turns round a joint in the head of the divided pillar, and has its edge cut into an oblique rack, which is acted on by the horizontal ſcrew, furniſhed with the finger-piece A. This ſcrew turns in a horizontal ſquare frame. This frame turns round a horizontal joint in the off side, which cannot be ſeen in this view. In the side of this frame next the eye there is a finger-ſcrew a*,* which paſſes through the frame, and presses on the round horizontal plate D. By ſcrewing down this finger-ſcrew, the frame is brought up, and preſſes the horizontal ſcrew to the rack. Thus the elevation of the teleſcope is fixed, and may be nicely changed by the finger applied to A and turning this ſcrew. The horizontal round plate D moves ſtiffly round on another plate of nearly equal diameter. This under plate has a deep conical hollow ſocket, which is nicely fitted by grinding to a solid cone formed on the top of the great upright pillar, and they may be firmly fixed in any poſition by the finger-ſcrew E. To the underplate is faſtened a box *c,* containing a horizontal ſcrew C, which always works in a rack cut in the edge of the up­per plate, and cannot be diſengaged from it. When a great vertical or horizontal motion is wanted the ſcrews a and E are flacked, and by tightening them the teleſcope may be