the feed-rollers, strips the epidermis and tissue away from the fibre, means being provided for adjusting the beating drum to a proper distance from the roller or bar against which the flax leaf is stripped, so that the leaf may neither, on the one hand, pass through without being crushed, nor on other, have the fibres cut. Another contrivance common to all the machines is vulcanized india-rubber cushions or spiral springs placed over the journals of the upper feed-roller, so as to allow different thicknesses of leaf to be passed through.

The first essential of a flax machine is, of course, the quality of the fibre it produces. This depends to a certain extent upon the shape and velocity of the beaters, but more particularly upon the ease and accuracy with which the machine can be kept in adjustment. The length of that portion of the tip of the leaf which is left undressed by the machine, depends upon the firmness with which the feed-rollers grip the thin point of the leaf, and the distance of the place where the leaf is crushed from the place where it is held by the rollers.

We know that, on the one hand, simple percussion with a hammer on a block of wood, and on the other, scraping with a knife or shell, can each be made to yield good fibre, so that the limits of the speed at which the beaters strike the leaf, which is necessary for making good fibre, are probably very wide. The velocity with which the beater scrapes the flax is of course the difference of velocity between the beater and the leaf as it passes through the rollers; and as the blow is delivered not at right angles to the leaf, but at first at an acute angle, which rapidly changes to the same direction as the leaf as the beater passes round with the circumference of the drum, it follows that the greater the velocity of the beaters the more will their action be one of scraping, and the smaller the velocity the more will their action be one of percussion, or more properly detrusion.

In Fraser's old machine, and in Price's smaller one, the beating drum is thirteen inches in diameter, armed with fourteen beaters, consequently, when making 1,260 revolutions a minute, the velocity of the beaters is 71·5 feet per second. The velocity of the circumference of the feed-rollers, or, in other words, the velocity of the leaf, is about 2·7 feet a second, thus leaving a velocity of 67·8 feet per second with which the beaters pass the leaf. In Gibbons' machine the beating drum is seventeen inches in diameter, armed with thirty-eight beaters, and revolves at only half the speed of that of Price's and Fraser's smaller machines, the feed-rollers of all moving with the same angular velocity. Consequently, when Gibbons' drum is making 630 revolutions per minute, the beaters have a velocity of 46·7 feet per second.

The feed-rollers of this machine being slightly larger than the others, the velocity is 2·8 feet per second, making a velocity of 43·9 feet per second with which the beaters outstrip the leaf, so that the velocity of the beaters to the feed is as 1.17 in Gibbons', and as 1.26 in Price's and Fraser's old machines. In Price's and Fraser's old machines there are fourteen beaters on each drum, the feed-rollers are 2·5 inches in diameter, and the drum makes five revolutions to one of the feed-rollers, so that each blow of a beater is on an average (as the beaters are not equi-distant), rather more than one-ninth of an inch from the one before it. In Gibbons' drum there are thirty-eight beaters, the feed-rollers are 2·6 inches in diameter, and the drum makes two and a half revolutions to one of the feed-rollers; consequently, each blow is delivered rather more than one-twelfth of an inch behind the former one, and the power saved is proportionately great.

Notwithstanding these differences in velocity and in number of blows to an inch, we are of opinion that all the machines when in proper adjustment make equally good fibre. In Price's and Fraser's old machines the beaters were placed diagonally across the face of the drum, sloping alternately in opposite directions, and the spaces between them were filled with wood. Gibbons' new machine has the beaters set on the angle, but all running parallel, which allows them to be placed nearer together. In Price's new machine the drum is fifteen inches in diameter, with twenty-six beaters, which are of the same kind as in the smaller machines, but being placed closer together increases the rapidity of the blow. Messrs. Price tried the chevroned beaters, but afterwards abandoned them. In all these larger drums the wood between the beaters is omitted. We are of opinion that the position of the beaters on the drum matters but little as far as making good fibre is concerned, provided that the velocity is sufficiently great, and the striking edge of the beater round and smooth. It may here be remarked that Captain Hutton thinks that the beaters on the drum should be hard, but that the bar or plate against which the flax is crushed should be soft. Mr. Booth, of Dunedin, has endeavoured to carry out at least a portion of this idea, but has abandoned it.

The adjustments of the different machines vary considerably, but all are capable, with more or less ease, of adjustment while the machine is in motion; a point of the greatest importance. In Price's machine the flax is crushed between the beaters and the lower feed-roller; and in his earlier machines the distance between the two was regulated by means of screws, which moved the journals of the beating drum forwards and backwards on a sliding bed; now the drum is fixed, and the whole of the standards carrying the feed-rollers is moved in the same way, which allows the feeder to adjust his own machine without moving from his place.

In Fraser's new machine the flax is stripped against a thick plate rounded at the end, which is slipped under the feed-rollers; the back of the plate has a flange, which is pressed forwards by two screws against india-rubber, the elasticity of which pushes the plate back when the screws are loosened. This adjustment is very easily made by the feeder. In Gibbons' machine a round bar with square ends takes the place of the plate, and, being near the beating-drum, it leaves very little of the leaf undressed. The adjustment is given by pinching-screws, which act through the boxes carrying the journals of the beaters.

The wear upon both the surfaces of metal between which the flax is dressed is very great, while a very slight wear prevents the machine from dressing the flax properly, so that the surfaces have to be constantly filed up or changed. In Price's machine the lower roller, against which the flax is dressed, is a cast-iron hollow cylinder. As their roller is three inches in diameter, and by constantly revolving always presents different surfaces to the beaters, it lasts much longer than any other of the machines; but when it is too much worn, the machine has to be stopped, taken to pieces, and the old cylinder ground up, which is a work of considerable time, but they give a spare roller with each machine.