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THE ROLL MILL

Charles E. Vaughan^{1/}

No manufacturer has yet claimed to have developed an all-purpose machine that will remove all objectionable weed seeds and foreign material from all lots of legume seeds. The application of the principles of seed cleaning in which components of a mixture differing in dimensional characteristics may be separated by screens, indented cylinders or discs and those differing in weight and specific gravity by aspirators or gravity tables, are well known through the trade.

The roll mill is useful in separating mixtures where crop seed and contaminants differ in the texture of the seed coat. In some instances seeds of different shapes can also be separated on this machine.

The roll mill is always used after the basic cleaning machines in the processing line. It is often used to finish lots that contain dodder, dock, flat or immature seed and inert matter that passed the previous machines.

The rough seed are separated from the smooth seed by the action of the rolls. A pair of rolls covered with a velvet-like material are placed side by side close enough to touch lightly. The rolls are mounted in an inclined position and turn in opposite directions, outwardly when viewed from the top (Figure 1).

The seed mixture is fed onto the rolls at the high end of the machine. As the seed travel downhill between the revolving, inclined rolls, the rough seed are caught by the velvet-like rolls and thrown against the baffles, deflected back against the rolls, etc. until they have been thrown out. The smooth seed continue bouncing downhill between the rolls and discharge off the end. The seeds thrown over the sides are caught in graduated grade hoppers underneath the machine. The

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grades of seed from these hoppers vary from a high percentage of rough seed from one nearest the feed end of the machine, to a very low percentage of rough seed from one nearest the discharge end. The intermediate grades can be re-run to recover the smooth seed that were thrown out with the rough seed.

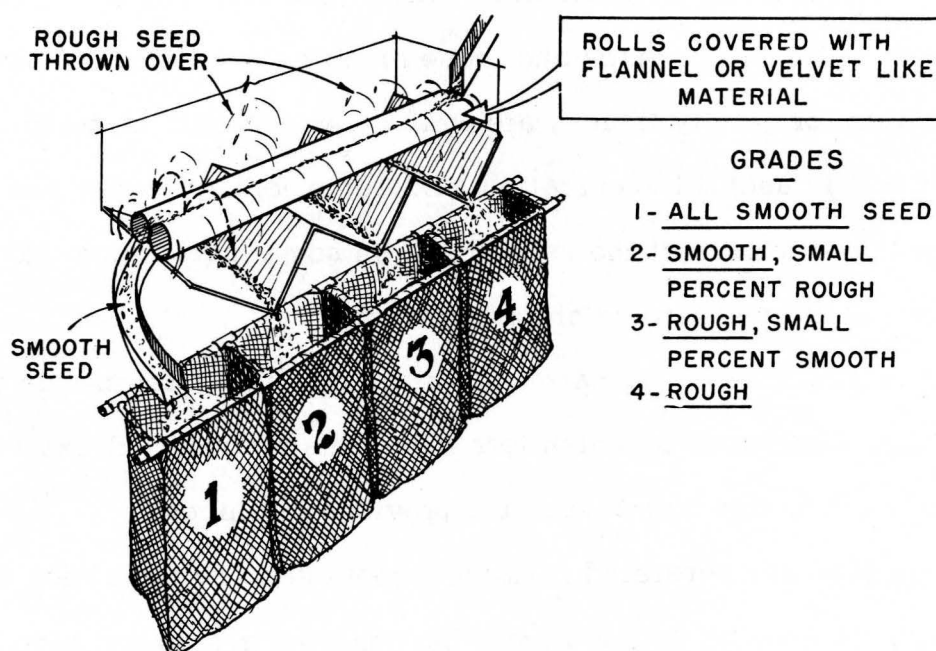


Figure 1. Diagrammatic section of roll mill showing method of operation.

The feed hopper of many machines consists of a vertical shaft from which individual feed spouts lead directly to each pair of rolls. This vertical shaft is equipped with a fast, complete clean-out pull slide. The rate of feed is adjusted by opening or closing the feed slide in the vertical shaft underneath the feed hopper. This increases or decreases the size of the opening in the shaft through which the seeds flow into the individual feed spouts.

The rate of feed is adjusted and controlled for two reasons. First, the effectiveness of the separation may be controlled somewhat by the rate of feed.

If the space between the rolls and the baffles becomes crowded the agitation necessary to make an effective separation is reduced or prevented. Second, the capacity may be increased by opening the feed slides.

The rolls are the separating parts of the machine. They are covered with a velvet-like material and placed side by side close enough to touch lightly. The rolls are always used in pairs and each pair of rolls is a separate cleaning unit.

The length of rolls may vary with different machines, as a certain length is not absolutely necessary for maximum cleaning. The number of rolls may also vary from machine to machine. An increase in the number of rolls does not increase efficiency but merely increases capacity.

The speed of the rolls is the most important adjustment on this machine. In general, the faster the rolls revolve, the cleaner the seed. However, too fast a speed is not recommended, because it results in unnecessary throw-over of good seed. The recommended way of making the adjustment is to start with a minimum speed and the desired rate of feed, then increase the speed of the rolls until the product is clean.

The tilt mechanism is located at the bottom of the feed end of the machine. On some machines it is a large hand wheel screw; whereas on other machines it is a combination lever-screw device. This variable tilt mechanism permits quick, easy adjustment of the machines pitch for various types of seeds. A continuous incline range from 7° to 13° may be obtained. This adjustment is used less by most operators once a desirable tilt has been established. Increasing the tilt has the effect of shortening the rolls and also reduces the amount of throw-over.

The baffles are shields that conform fairly close to the shape of the rolls as viewed from the top and are positioned directly over each pair of rolls. Rough-coated seed lifted by the turning rolls are deflected by the baffles back on the rolls with the result that these seed are removed rapidly from the smooth-coated seed which are not lifted. The baffles are independently adjustable at either end

of the machine. The range of separation possibly may be increased by changing the distance between the rolls and the baffles. For most cleaning problems, a 1/4 inch spacing seems to be best.

Below are listed a few rough-coated seeds and objects which are thrown out by a roll mill.

Dodder	Catchfly	Wild Winter Peas
Mustard	Cockle	Wild Carrot
Foxtail	Timothy	Pieces of Clay or Stones

These rough-coated seeds or objects may be removed from clovers, alfalfa, hulled lespedeza, hairy vetch and other smooth coated seeds. Because of its triangular shape and sharp corners, dock is commonly and easily removed from the clovers.

The removal of buckhorn can be accomplished with this machine if prior treatment has been given the seed lot containing buckhorn. This prior treatment involves adding a foreign material such as wood dust to the buckhorn which creates a rough surface. Separation is then an easy matter.

The roll mill is a very economical machine because the cost of operation and maintenance is extremely low. The minimum attention needed to operate the roll mill, once it is adjusted, is also a point to remember when considering this machine.