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UNITED STATES DEPARTMENT OF AGRICULTURE  
Bureau of Agricultural Chemistry and Engineering  
Agricultural Marketing Service  
Bureau of Plant Industry

March 1941

Stoneville, Miss.

DEVELOPMENTS IN ROLLER COVERING FOR ROLLER COTTON GINS <sup>1/</sup>

New Method of Covering Rollers

Since the roller gin has been in use, walrus hide and many kinds of composition, including rubber packing, have been used as a covering on the roller of the roller gin. Of these walrus hide has proven most satisfactory but has been found short-lived and recently very expensive. Efforts to find a longer-lived and more economical material which would do equally good or better ginning have been carried on for some time. Recently an improved method of using rubber packing for covering the roller has been devised.

When the Pima Egyptian cotton was first planted in the Salt River Valley of Arizona, the walrus roller covering was used there exclusively, but the ginners found that the life of this covering was very short, making ginning too expensive.

About 1900 a roller with a strip of friction paper inserted between the strips of walrus hide was shipped to the Valley. This combination doubled the life of the roller, and the Pima Seed Association at Tempe and other ginners in Arizona used this roller for a number of years. About 1918 the paper was replaced by a wider strip of rubber packing, which reduced the amount of walrus, making the roller less expensive and easier to build, but more susceptible to back-lash. <sup>2/</sup>

During the past 10 or 12 years the Arizona ginners have been trying to use an all-packing roller but the back-lashing on this sort of roller prevented satisfactory operation. Static electricity was causing most of the trouble. Two of the all-packing rollers have been used on the gins in Florida for Sea Island cotton. By using the slow-speed "doffer" to take the lint from the roller, perfect results have been obtained there. The "doffer" not only prevents back-lashing but it straightens the fibers and gives smoother ginned lint. <sup>2/</sup>

On account of the static, this "doffer" cannot be used satisfactorily in Arizona or in any hot dry climate as the flaps on the "doffer" take the static from the roller, causing some of the lint to stick to and be carried under the roller and then dropped into the seed. Therefore, it is necessary

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<sup>1/</sup> The material here presented was prepared and the new method of roller covering here described was developed by James S. Townsend, Cotton Technologist, Bureau of Plant Industry, with the assistance of Staff members of the U. S. Cotton Ginning Laboratory, Bureau of Agricultural Chemistry and Engineering and Agricultural Marketing Service, U. S. Department of Agriculture.

<sup>2/</sup> See multilithed report, "Roller-Gin Construction, Maintenance and Operation", August 1940.

to devise some means to place a small amount of moisture on the bottom side of the roller, just enough to dampen the surface but not enough to wet the fabric. Any ginner knows that a damp cloth held on the roller for a few seconds will stop back-lashing promptly. Not only will the moisture stop the back-lashing, but it will allow a continuous bat of cotton to come over the roller; and then, when the bat is taken off by the "doffer", the grade is improved and ginning capacity increased.

If the "doffer" is to be used under present installation conditions, most of the existing roller gins would have to be raised about 24 inches from the floor to allow the ginned cotton to remain under the gin until a sufficient amount collects to make one charge for the press. If this is not done, the lint will have to be moved too often to be practicable, or the "doffer" would accumulate the lint under the roller and thus cause back-lashing.

Since walrus leather is costly and difficult to obtain, the industry has reached the point where it is imperative to replace it with some other material. Indications are that the rubber packing when properly used is the best and most economical substitute.

On account of this need for a substitute for standard walrus leather covering for gin rollers, a number of different makes of rubber packings have been tried out at the U. S. Cotton Ginning Laboratory. The results indicate that two of these packings can be used successfully and that as much or more cotton can be ginned per day with them as is ginned on the walrus covering. The tests also indicate that the packing costing about half as much will last longer than the walrus leather.

Both of these packings can be obtained commercially at any time and in any quantity, the price ranging from 50 cents to 75 cents per pound, depending on the quantity purchased. Both of these packings are 5/8 inch thick x 5/8 inch wide, but the manufacturers will cut the material to any other width desired and, no doubt, they will make it in any thickness. A packing 3/4 inch x 3/4 inch may be preferable as fewer strips could be used and the extra thickness on the roller would insure a longer life to the roller.

When using this packing for roller covering, the most important thing to consider is the method of attaching it to the roller. At present the usual method with all-packing is to "spool wind"; and since this is the quickest and easiest way, it is used by some of the ginner who are trying it out. However, the Laboratory has found that "spool-winding" is not the best method for several reasons. The pressure roller gin's "fixed" knife against the roller produces extreme heat, which tends to soften the rubber in the fabric, after which the constant pressure which is lengthwise on the strips will cause them to stretch and become loose from the stock. When this occurs the strip may bulge and be torn from the roller by the moving knife, or at least be lumpy and irregular. It has also been observed that when the packing encircles the roller, the knife is directly in contact with the rubber which is between the layers of fabric, causing considerable back-lashing, and at the same time making the roller difficult to "break in".

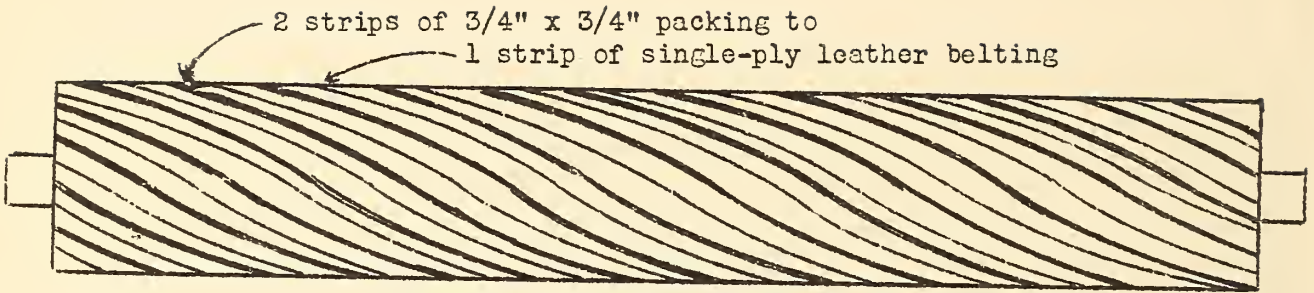
After several methods of attaching the packing to the roller had been tried, the most satisfactory one found was to make one turn per full length on the roller, which places the packing almost at right angles to the knife so that the pressure of the knife is against the side of the strip; and as each strip is backed up by another strip, it cannot be stretched lengthwise as is the case in "spool-winding". Also, when the knife is in this position, it tends to push the fabric over the rubber and prevents sticky rubber from coming in contact with the lint, thereby reducing the back-lash.

Although there are enough good reasons for using the "one-turn" method of attaching the packing to a roller, "spool-winding" will undoubtedly be practiced by those ginners and gin manufacturers who seek the easier and quicker methods, because the "one-turn" requires more time and skill to do a good job. However, if the "spool-winding" method is used, it is suggested that the strip be stretched tightly on the stock and that a lot of glue be used under the strip. Also, the wood pegs should be driven through the strip into the stock every three or four inches. This will help to hold the packing on the roller should it tend to stretch and become loose.

A packing roller will gin as much or more cotton per day than will the walrus-leather or half-and-half combination, but in order to do so, and at the same time obtain good ginned lint, it is necessary to cut V-shaped grooves on the surface of the roller. These grooves should make one diagonal turn and should be spaced from  $1\frac{1}{2}$  to 2 inches apart, about  $1/8$  inch deep and  $3/16$  inch wide. The purpose of these grooves is two-fold, namely: they prevent abortive seeds and motes from sticking under the knife; and they provide a place for the fiber to enter readily under the knife, assuring a constant flow of fiber over the roller, thereby increasing production.

Some ginners claim that it is not necessary to groove a roller and assert that if the knife is set below the center of the roller the lower edge will gap or open sufficiently to allow the abortive seeds and motes to pass under and be carried over with the lint. This may be quite true if all the working parts of the gin would remain in the same position after they have been set, but there is a constant wearing of both the roller and knife which must change the vertical position of the knife and cause the gap to close and the knife to rest tightly against the roller. It is also true that the knife may be opened too much when setting and thereby cut or chip the seeds.

To meet this covering and grooving problem, a packing roller designated as a "semi-self-grooving-roller" has been designed and developed at the U. S. Cotton Ginning Laboratory. This roller is constructed with a strip of  $3/16$  inch to  $1/4$  inch leather belt between every two strips of packing; and since the leather is softer than the packing, it will wear down faster than the packing and its surface will stay just below the packing surface, thereby serving as a groove to clear the knife of abortive seeds and motes or other foreign matter which may be in the seed cotton.



NEW SEMI-SELF-GROOVING ROLLER

Two of these rollers were operated intermittently for four weeks on a Sea Island gin in Florida, each roller ginning approximately 70 bales before it was necessary to open the grooves, which was quickly done by cutting out a small piece of the leather strip. These leather strips, alternating with the packing, are spaced just the proper distance apart and the soft leather makes an ideal place for grooving and can be easily and quickly cut with a parting chisel. An important fact is that this method of grooving leaves the surface of the roller smooth, in which condition it remains until worn out. This leather-strip method of grooving does not cause any extra wearing of the roller as is the case when the roller is grooved across the strips on the surface.

#### Application of Covering to Roller

It is important to understand the proper construction of the wood core or roller "stock" to which the packing is attached. In some gin plants a number of rollers have been laid aside, which if properly constructed, had sufficient packing left on them to gin forty or fifty more bales. These rollers were discarded on account of a loose spindle or mashing on the ends, which caused the roller to wobble. If a little more time and care were spent in constructing a roller "stock" it would save both money and time later when the roller is needed most.

Specifications for building a roller "stock" have been released by the U. S. Department of Agriculture. <sup>2/</sup> This stock should be built of well seasoned red or black gum or any cross-grained wood that does not split. It should be fairly hard so that the spindle will not mash the wood on the end and cause the roller to wobble. However, the ideal roller "stock", and the one which has given the best service is a black gum stock which is constructed by boring a 1-1/2 inch hole through a piece of green black gum and driving a steel shaft through the center. This rough roller with the bark still on is stored in a dry place until the wood dries and shrinks on the spindle. This drying may take three or four months before it is ready to be turned.

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<sup>2/</sup> See multilithed report, "Roller-Gin Construction, Maintenance and Operation". August, 1940.

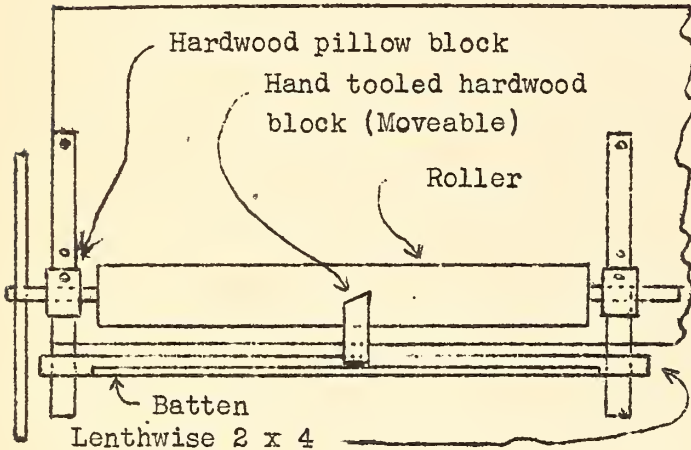
In order that the strips of packing will lie close together on the roller it is necessary to bevel the sides of the strips. This can be done either by grinding or by cutting down with a jack-plane. When the plane is used the strip is stretched and nailed to a work-bench having a batten fastened at the back of the strip to keep it in place.

Instead of making the bevel only on one side of the strip as most do, it is suggested that both sides be beveled to make a symmetrical wedge-shaped strip.

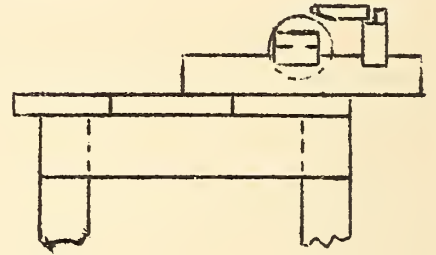
A home-made rig can be built with which to hold the roller firmly while each strip of packing is being stretched and pushed tightly against the next one. This is very necessary when a thin strip of leather is to be inserted between the strips of packing, because the leather can be held in place only by being squeezed between the packing strips and by being glued on the bottom where it lies upon the stock. On the left-hand end of a good work-bench, a short 2 inch x 4 inch cross-wise runner is secured to the bench, and a similar one is fastened at a spacing to allow the roller stock to lie between. Two hard-wood pillow blocks are bolted to these cross-wise runners, and the ends of the roller shaft are clamped in place in the blocks. A 24-inch pulley is placed on the left end of the shaft, overhanging the work-bench so that the roller can be pulled forward against the friction of the clamped boxes as the work proceeds. On the bench in front of the roller, a lengthwise 2 x 4 is fastened down so that its top is level with the center line of the roller, and kept about 1-1/2 inches from the stocks. On top of the 2 x 4 is placed a hardwood 3/4 inch x 2 inch batten whose back edge is flush with that of the 2 x 4. The batten may be screwed or bolted to the 2 x 4. A hand-tool hardwood block, 3/4 inch x 2 inch x 4 inch should be made, having one end slanting to fit the curve of the covering strips on the roller and the other end square to rest against the batten. This hand-tool is used to push each strip tightly against the one which has been previously placed upon the roller stock.

The roller is laid off for the first strip by driving small nails part way in at each end of the roller, both being in line parallel to the shaft. A string is tied to one nail and passed around the roller to the other nail, making one complete spiral turn. A marking line is then drawn along the string and the string is removed. This line is the position of the first strip. A one-inch glue brush is used to paint a band of glue along the line for the first strip and to apply glue for the succeeding strips. A strip of packing is started by driving a 6-d common nail through the end of the strip at the end of the roller, stretching the strip along the line until it reaches the other end of the roller and fastening it with another nail, then starting at the first end and driving a nail every 3 or 4 inches along the strip. After two strips of packing have been attached, the leather strip is then placed alongside the packing and held in place by driving a small nail in each end. Then a strip of packing is started at the left end of the roller by placing the angled end of the push block against the packing and the other end against the hardwood batten and by pulling the roller forward, the packing and the leather strip are forced tightly against

the two strips which are on the roller. This is followed with another strip of packing which is pressed on in the same way and after two of these have been attached, another leather strip is used. This procedure is repeated until the roller is covered.



PLAN



END VIEW

OUTLINE OF HOME-MADE RIG

The following table gives the relative quantities and costs of different methods of covering rollers for roller gins and shows that the new packing-beltting roller covering is inexpensive as compared to any form using walrus leather.

COST OF MATERIAL  
FOR COVERING A 40 INCH GIN ROLLER ON A STOCK 5 INCHES IN DIAMETER

Type of Roller	Material	Amount	Unit	Cost	Cost	Total Cost
All packing	:Packing 5/8" x 5/8"	18.0 lbs.	:\$ .75	\$13.50		\$13.50
	:Packing 5/8" x 5/8"	16.5 lbs.	.75	12.38		
Packing and Belting	:Single ply leather belting	44 ft.	.06	2.64		15.02
1/2 walrus and 1/2 packing	:Walrus	11.5 lbs.	1.80	20.70		
	:Packing 5/8" x 5/8"	9.0 lbs.	.75	7.29		27.99
All Walrus	:Walrus	23 lbs.	1.80	41.40		41.40

NOTE: 6-d common nails, glue and hardwood pegs are also needed, but the amount of these materials required will be the same regardless of type of roller.



ADDENDUM #1.

Pull of 60 lbs.

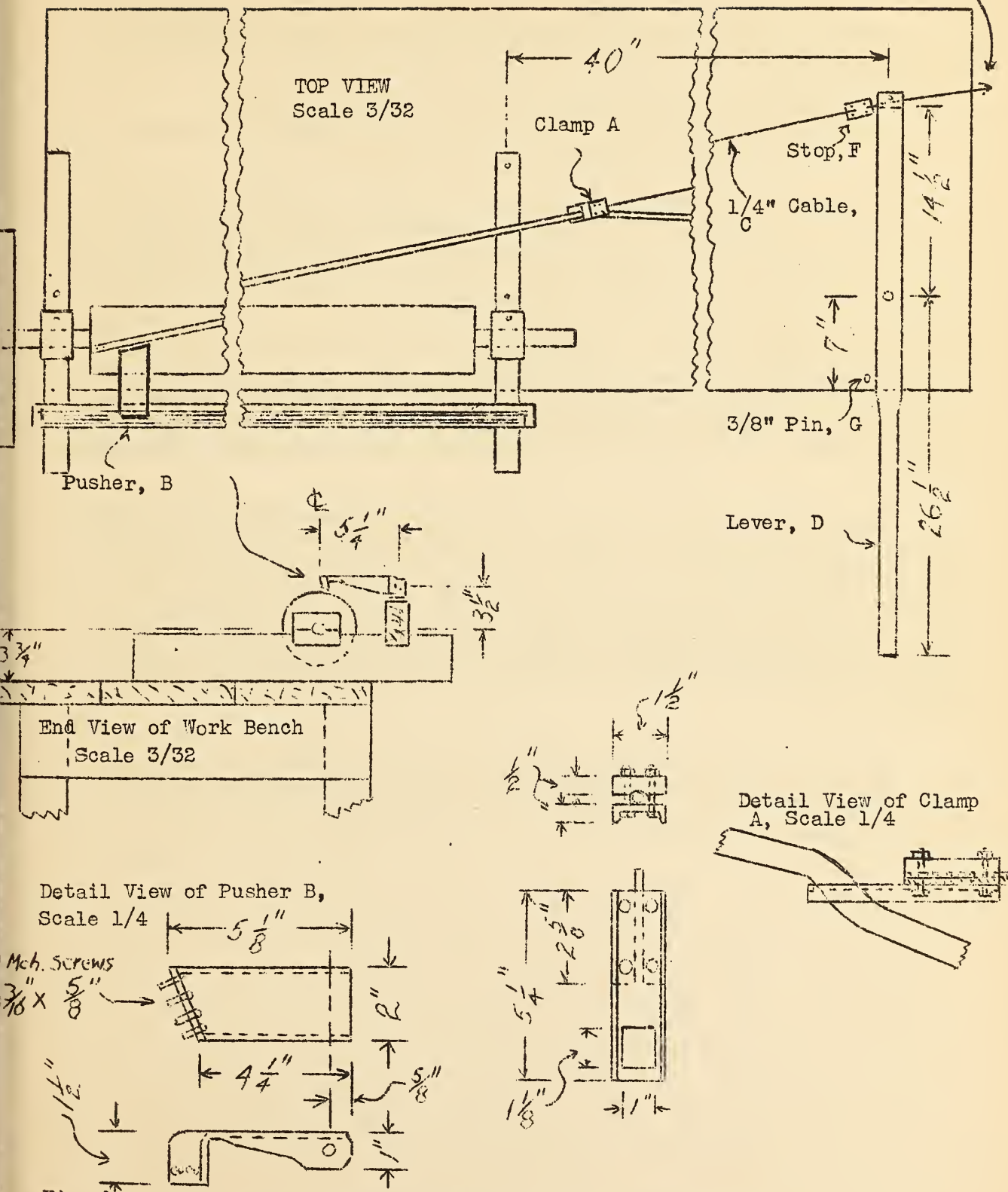


Fig. 1.

IMPROVED FORM OF COVERING RIG WITH STRETCHER

Fig. 1 shows an improved and more elaborate roller covering rig which is recommended for ginners having several rollers to cover. Its advantages are:

- (1) A uniform stretch can be secured on packing, and
- (2) One person is enabled to cover a roller without assistance in turning roller or stretching packing.

The first improvement is pusher "B". This was added by placing on top of the lengthwise 2 x 4 a piece of 1-1/2 x 1-1/2 x 1/8" angle iron with one flange on the ends turned up and welded so as to form box ends through which a 5/16" rod is bolted. A short piece of 2" x 1" x 3/16" channel iron is placed on this 5/16" rod so that it will slide. The flanges on the other end of this channel iron are so cut out and the back bent straight down to a right angle and on such an angle that it will fit up against the packing which lies on the roller at approximately 24 degrees from the center line. On this part of the pusher that is bent down four holes are drilled and tapped for 3/16" x 5/8" sharpened machine screws, inserted so that their points make contact with the packing.

The second improvement is in the method of stretching the packing by means of a clamp, cable, weight and lever. Clamp "A" is attached to cable "C" which passes over a small pulley and is fastened to a weight which is free to move up and down. The arm of lever "D" is moved to right and fixed with pin "G" raising weight and allowing clamp "A" to be slipped on packing about 6" from right end of roller. Pin "G" is then removed to allow the weight to exert its force on packing. The roller is then turned one revolution and packing is nailed to the right end of roller.

The arm of lever is then moved back to the right releasing the pull of the weight, and the packing is cut off. Then strip which has just been laid on is nailed to the roller using pusher "B" to press it firmly against the previous strip.

ADDENDUM #2

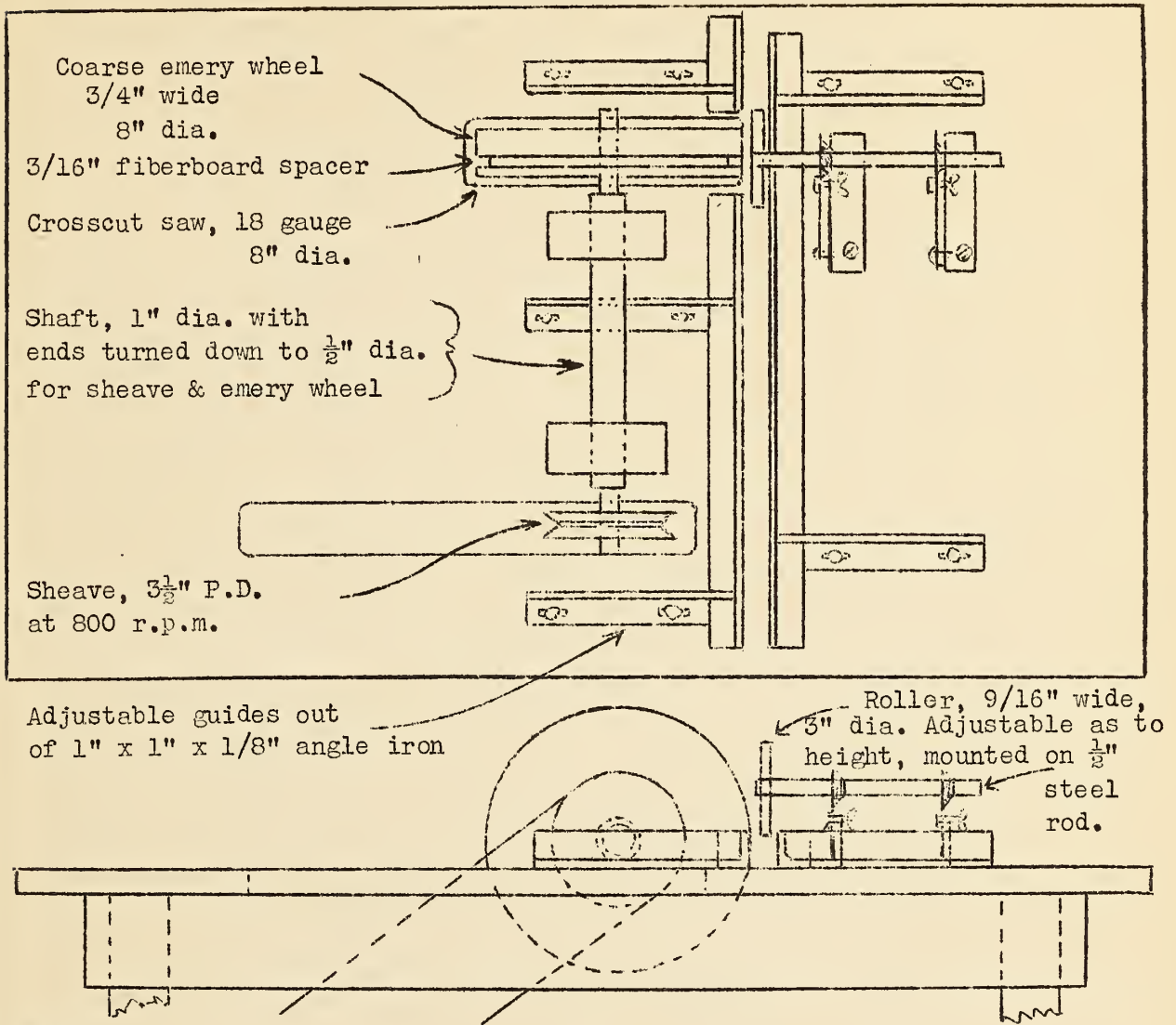


Fig. 2

A MACHINE FOR CUTTING A BEVEL ON PACKING

In order to place the packing on the roller so that the strips will lie close together, it is necessary to bevel the sides of the strips. Since this is a tedious and difficult job with a jack plane, the Laboratory has developed a beveling machine as shown in Fig. 2. It consists of a coarse emery wheel, an adjustable guide, and a small wheel to press down on the packing so that it will not be displaced when the emery wheel strikes the side of the strip. The machine can be improved by placing a circular saw on one side of the emery wheel. If this is done the packing is fed in so that it will be hit first by the saw which should be slightly smaller in diameter than the emery wheel. The saw takes off most of the material and the emery wheel finishes and gives a smooth cut. This results in faster work and less clogging of the emery wheel. The saw cannot be satisfactorily used alone as it leaves a rough jagged cut. A low speed is recommended because the emery wheel has a tendency to clog up and burn the material at high speeds. Satisfactory results were secured at 800 to 1000 r.p.m. with an emery wheel of 8" diameter.

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