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**UNIFORM-DEPTH PRESS-WHEEL COTTON-
 PLANTER ATTACHMENT¹**

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Throughout the irrigated valleys of the Southwest where cotton is grown considerable difficulty is experienced every year by many growers in obtaining satisfactory stands of the plants. Sometimes this difficulty may be due to immature planting seed, to adverse or unfavorable seasonal conditions, or to several other unforeseen factors, but too often it is due to unsatisfactory planting machines.

¹ The advantage of compacting the soil to give a firm seed bed has been recognized in previous publications of the Department of Agriculture, in 1905 and 1908. (See Redding, R. J., Farmers' Bulletin 217, "Essential Steps in Securing an Early Crop of Cotton"; also Bennett, R. L., Farmers' Bulletin 314, "A Method of Breeding Early Cotton to Escape Boll-Weevil Damage.") Also a description and drawing of a device for placing the seed in moist soil and at a uniform depth was published in a circular of the Department of Agriculture, issued Mar. 27, 1917. (See Hastings, S. H., "A Lister Attachment for a Cotton Planter.") The present improvement goes a step farther by providing a wheel for pressing the seed into the soil and at the same time firming the soil around the seed, so that moisture is held near the surface during the period of germination. The following statement from the annual report of the Chief of the Bureau of Plant Industry for 1925 explains the relation of this improvement to previous investigations of planting problems in the Southwestern States.

"*Planting machinery.*—Further consideration has been given to the problem of obtaining more uniform stands of cotton, especially in the dry regions and irrigated districts of the Southwestern States. The two principal difficulties are the drying out of the surface soil before germination is completed and the failure of the seedlings to emerge from a hard crust if the soil is moistened by rain or by irrigation water. Experiments that were reported in 1916 and 1917 showed some of the advantages of placing the seed closer to the irrigation furrows, but on account of the lack of suitable machinery the improved methods have not been applied. The development of improved machinery was interrupted in the war period.

"Recently it has been possible to return to this problem, and a workable attachment for cotton planters has been devised, for which a public-service patent has been requested. To replace the usual devices for covering and pressing the soil above the seed, a heavy roller is applied directly to the seeds to embed them in the moist soil, with only a light covering of dry soil above. It was recognized as a limitation of existing types of planting machines that the seeds were dropped into the loosened soil of the planting furrow instead of being placed in a regular and effective relation to the soil moisture or to the supply of irrigation water."

The suggestion of using a heavy wheel immediately behind the seed pipe of the drill, to press the seed into the soil, in order to firm the soil under and around the seed and cover lightly with loose soil instead of deeply with packed soil, was made several years ago as a result of the previous experiments reported in 1916 and 1917. The combination of such a wheel with the lister attachment for placing the seed at a uniform depth, as now worked out by Camp and Townsend, is an important step in obtaining better stands.—O. F. COOK, senior botanist in charge, Office of Acclimatization and Adaptation of Crop Plants.

A special planting problem is often encountered on account of the nature of much of the soil. Some soils dry out so quickly that even in a day or two of drying weather there may not be sufficient moisture left to germinate seed placed in the upper inch or two of soil. Also care must be exercised to avoid a crust, which forms on many soils as a result of pressure from the planting tool. Practically all of the commercial planters used in the Southwest are equipped with a type of "runner" shoe which, in opening up the soil, often compacts and glazes the sides of the furrow. Under such conditions the wheel that follows the shoe does not close the furrow properly, but leaves a narrow open track of packed earth along the middle of the furrow, which allows the soil around the seed to dry out quickly. Even where no groove is apparent on the surface, investigations may show that the pressing of the soil, especially if a little too wet, has closed the groove at the surface but has left a

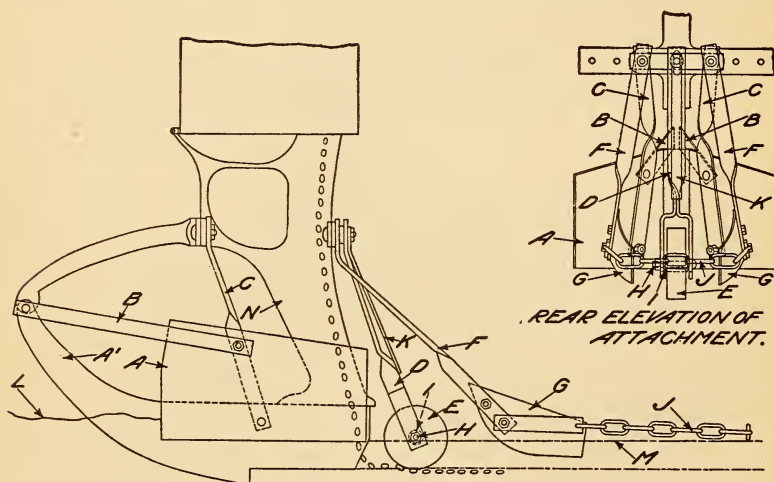


FIG. 1.—Side and rear views of the attachments on the cotton planter

hollow channel underneath, so that the seeds do not have sufficient contact with the soil to start germination.

Also the weight of the machine on the covering wheel often causes the soil to pack and crust, making it impossible for many of the young seedlings to push through.

However, it has been found possible to overcome these difficulties by using the attachments herein described, in connection with the commercial cotton planters, and shown in the accompanying figures. Figure 1 represents side and rear views of the attachments on the cotton planter, and Figure 2 shows the individual parts of the attachment. Figure 3 shows a commercial 2-row cotton and corn planter equipped with the attachments. A great many cotton-planting machines in the San Joaquin Valley were equipped with these attachments during the planting season of 1925, and without a single exception the growers were enthusiastic over the results.

Referring to Figure 1, the attachments comprise a scraper or lister attachment (A) designed to push away clods and dry surface soil,

enabling the planting machine to penetrate to a constant depth in the moist earth of the seed bed; a small press wheel (E) operating in the seed furrow just back of the seed spout of the planting machine; a spring (K) controlling the pressure of the press wheel (E) in the seed furrow; two curved knives (G) and scraper arms (F) to cover the seed planted to a constant depth; and a chain, or drag (J).

The lister attachment A consists of a shoe designed to fit over the planter shoe (A') of a standard planting machine, in which the arms C and flanges of A are shown bent outward and backward at an angle which may vary from 20° to 45° in such a manner that the lower edge shall remain approximately parallel to the surface of the ground. This shoe (A), when attached to the standard planting machine, pushes aside clods and loose, dry surface soil, so that the penetration of the point of the planting machine is enabled to continue discharging seeds at a uniform depth in the seed bed.

The small press wheel E mounted on the adjustable holder D is made of a solid casting and when attached to a planter shoe of the standard planter will operate in the seed furrow just back of the seed spout N. Passing over the seed immediately after it is dropped from the planter shoe (A'), this wheel presses the seed firmly into the seed bed.

The spring K is mounted in association with the holder D for the press wheel E, to enable any desired tension or pressure to be transmitted through the press wheel E to the seed in the seed furrow.

The two curved scraper arms (F), equipped with covering blades (G), are so attached to the planter frame of the standard planter, immediately behind the press wheel (E), as to cover the seed to a uniform depth in the seed bed. These blades (G) are curved and follow the planter shoe (A) in such a way as to accomplish a slight firming of the soil; yet this attachment does not exhibit the same tendency to pack as is shown in the case of the covering gear of standard planting machinery, the seed-covering wheel being dispensed with when this attachment is used.

The chain (J) is attached immediately behind the covering blades just described and operates in a slight degree to firm the planted seed row, but its primary purpose is to smooth and finish the planted row and leave a slight dust or soil mulch on the surface.

The several devices are shown as arranged for use when attached to a standard planter.

The drawings of the several parts of the attachment are shown in Figure 2. These, together with the accompanying specifications prepared in cooperation with the Bureau of Public Roads, will supply the necessary dimension details to enable any blacksmith to equip properly a standard planter.

Specifications for planter attachment.—To make scraper A: Take a piece of $\frac{3}{8}$ -inch sheet steel 7 inches wide by 24 inches long. Drill a $\frac{1}{4}$ -inch hole (b) 4 inches from the bottom and midway from each end. With a hacksaw saw along the line from a to b. With a cold chisel or shearing machine cut off the pieces acf and ac'f', leaving the sheet $5\frac{3}{4}$ inches wide at each end. Place the sheet in a vise and bend along the lines eb and e'b until the ends of the sheet c and c' are about 12 inches apart. After this bending, the edges ab should be leveled off with a hacksaw so as to leave a slot that will fit snugly over the runner shoe of the planter with the outside edges flush against the runner, as shown in the two lower diagrams. Drill $\frac{3}{8}$ -inch holes to hold stay C;

top hole 1 inch from the top edge and about 4 inches from the forward end; bottom hole 1 inch from the bottom edge and 5 inches from the forward end. Place the scraper on the runner shoe of the planter and block in such a position that the bottom edge will be $1\frac{1}{2}$ inches above and parallel with the bottom edge of the planter shoe, the back ends extending back in line with the back end of the planter shoe.

Brace B consists of a piece of $\frac{1}{4}$ by 1 inch strap iron 10 to 12 inches long, according to the make and model of the planter.

Stay C consists of a piece of $\frac{1}{4}$ by 1 inch strap iron 12 to 14 inches long, depending on the make and model of the planter. It is bent and drilled to fit

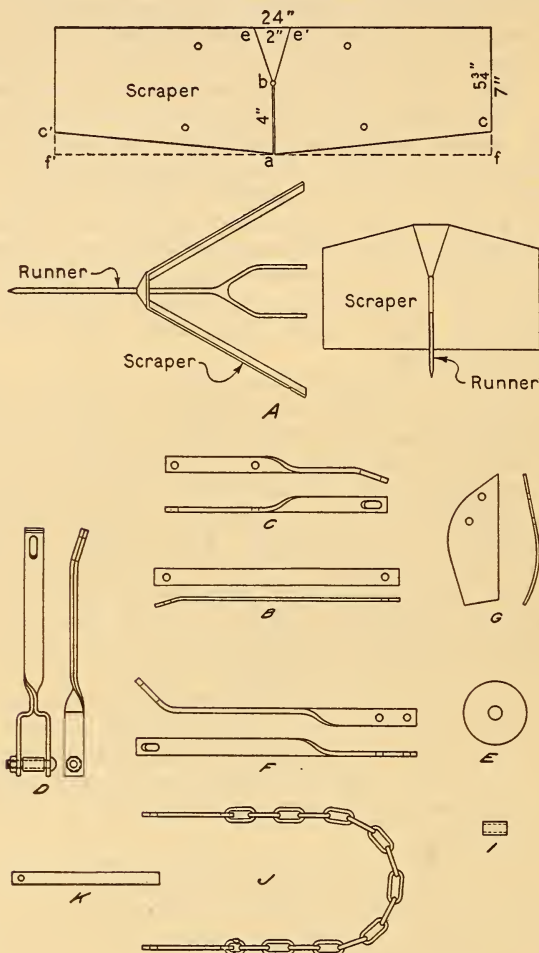


FIG. 2.—Individual parts of the attachment

holes in the frame of the planter and in scraper A so as to hold the scraper in position. Use flathead plow bolts for bottom holes and machine or carriage bolts for top holes.

Bracket D consists of two pieces of $\frac{1}{4}$ by 1 inch strap iron 15 to 16 inches long, each piece being bent separately and then riveted together, as illustrated.

The original planter wheels of a standard planting machine ordinarily follow upon the seed row and act as a covering tool in addition to carrying the weight of the machine. However, as previously mentioned, this often causes a hard crust to form on the

surface through which the seedlings can not push, thereby seriously impairing the stand. To avoid this difficulty, when the combined attachments as described above are used, the planter wheels are moved to one side of the seed row. For narrow rows the wheels should operate on the outside of the seed furrows, in which case it may be necessary to install a longer axle in some makes of planters, but for wide rows the wheels can come inside the seed furrows.

Where this method is used, it has been found that the seed can be covered somewhat more deeply with the loose surface soil; but experiments have also shown that, where the small press wheel was used in conjunction with the shoe attachment, the seed germinated and a perfect stand of cotton was obtained with only about one-quarter inch of soil over the seed. Examination showed the soil on top of the seed to be dry, but the seed itself, being pressed firmly into moist soil, was kept in contact with sufficient moisture to insure proper germination. Although the use of this planter attach-

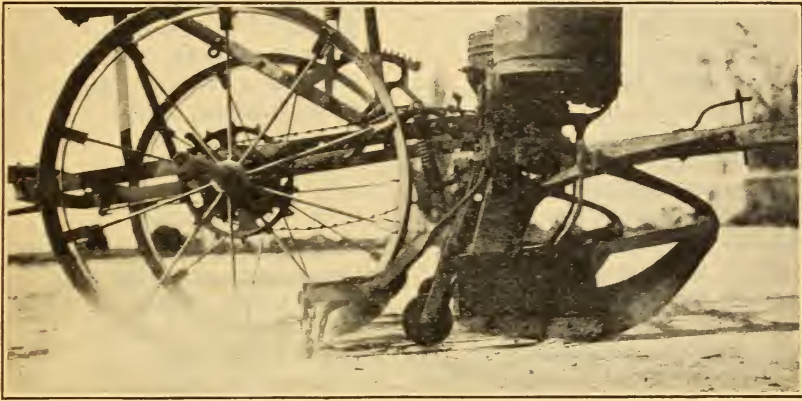


FIG. 3.—A commercial 2-row cotton and corn planter equipped with the attachments described in this circular

ment seems to give more leeway or margin in specifying the exact depth of covering, yet it has been found that under average conditions a covering of 1 inch to 1½ inches gave most satisfactory results and insured a perfect stand.

It is suggested that the adjustable bracket that holds the press wheel might be held in place with a coil spring. Also the covering arms might be carried the same way. This would allow for safe and uniform adjustment even on rough land.

The adjustable scraper, or furrow opener, is recommended for use in connection with the commercial planter in planting many field crops, even in nonirrigated districts, while the press wheel has proved exceptionally well adapted to planting beans, cowpeas, and corn, especially on land somewhat deficient in moisture.

Application has been made for the issuance of a public-service patent covering the attachments described herein, thereby making them available to all without the payment of royalties necessary with privately owned patents.

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April 22, 1926

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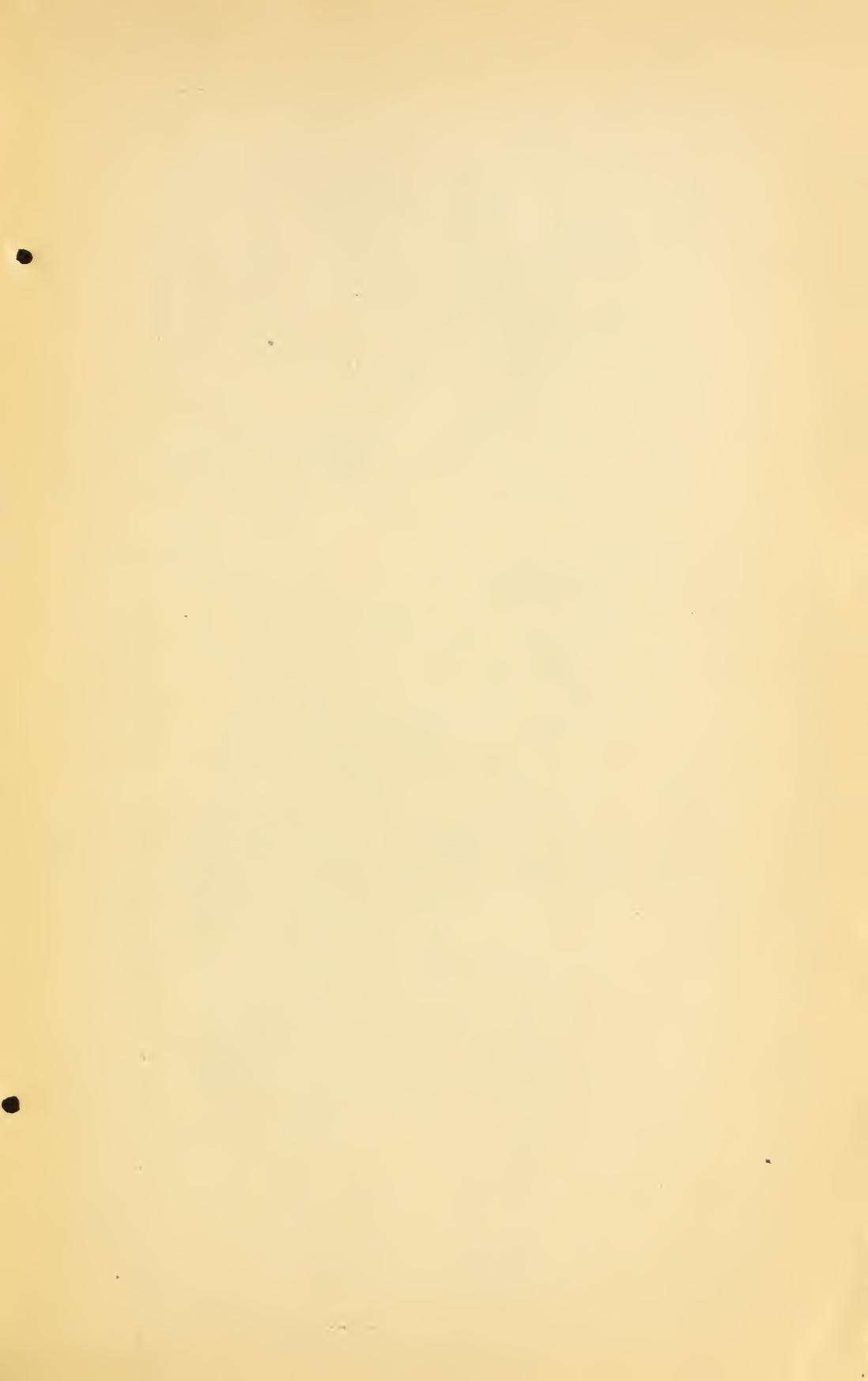
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