be calibrated to read directly in parts of available phosphorus per million parts of soil. This apparatus seems to be both more sensitive and more accurate than matching colors by eye.

The construction of the apparatus is easily seen from the diagram (Fig. 1). For routine analysis an ordinary 30 watt pink (for contrasting wave lengths) electric light globe in a cheap bull's-eye spot light seems to be a satisfactory source of light. A check with distilled water will show if there is any variation in intensity. A rectangular glass museum jar of 150 ml. capacity makes a satisfactory container for the blue solution. A box to hold the parts in position may be made of wood with an opening at the front for the light, at the rear for reading the dial of the meter, and at the top for inserting the meter and jar.

Experience shows that different exposure meters of the same make and model may differ very widely in their reading, but each meter seems to be quite constant in itself, and the calibration of each meter may be used with confidence for some time.—D. W. Pittman and R. Parry, Agricultural Experiment Station, Logan, Utah.

### SMALL GRAIN BUNDLE TIER

In a previous article\(^1\) a machine for tying rod-row bundles of the small grains was described. During the intervening years it has become apparent that a larger and more flexible piece of equipment would be desirable—a machine that would use a heavier twine, tie bundles tighter, tie several bundles together, and be power driven.

During the past harvest season the assembly described herein was used and proved highly successful. It tied single bundles tightly enough so that slippage was negligible and from two to five bundles were tied together without difficulty. The speed and operation of the machine was only limited by the operator's ability to supply it with bundles. Common binder twine was used and twine cost was reduced to a minimum because the machine uses the minimum length of twine when making a band.

The machine (Fig. 1) was made by mounting the binding mechanism of the smallest new Light Running John Deere binder together with a small gasoline engine on an old Ford chassis. The jackshaft mounted between the engine and the binder was necessary to reduce the engine speed and change from belt to chain drive. No clutch other than that built into the binding mechanism is included on our machine, but it would be convenient to have one in the jack-shaft assembly. In both figures the needle is shown protruding above the table, but in the neutral position it is completely below it.

A close-up of the working table and tying mechanism is shown in Fig. 2. The original needle guide and straw guard were removed and replaced by the iron straps and sheet metal shown in the picture. Also, the knife holder of the knotter assembly was removed and shortened so as to allow the bundle to come closer to the knotter bills and be tied more tightly. The original equipment gave a very loose tie on small bundles.

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