

*You Have What It Takes*

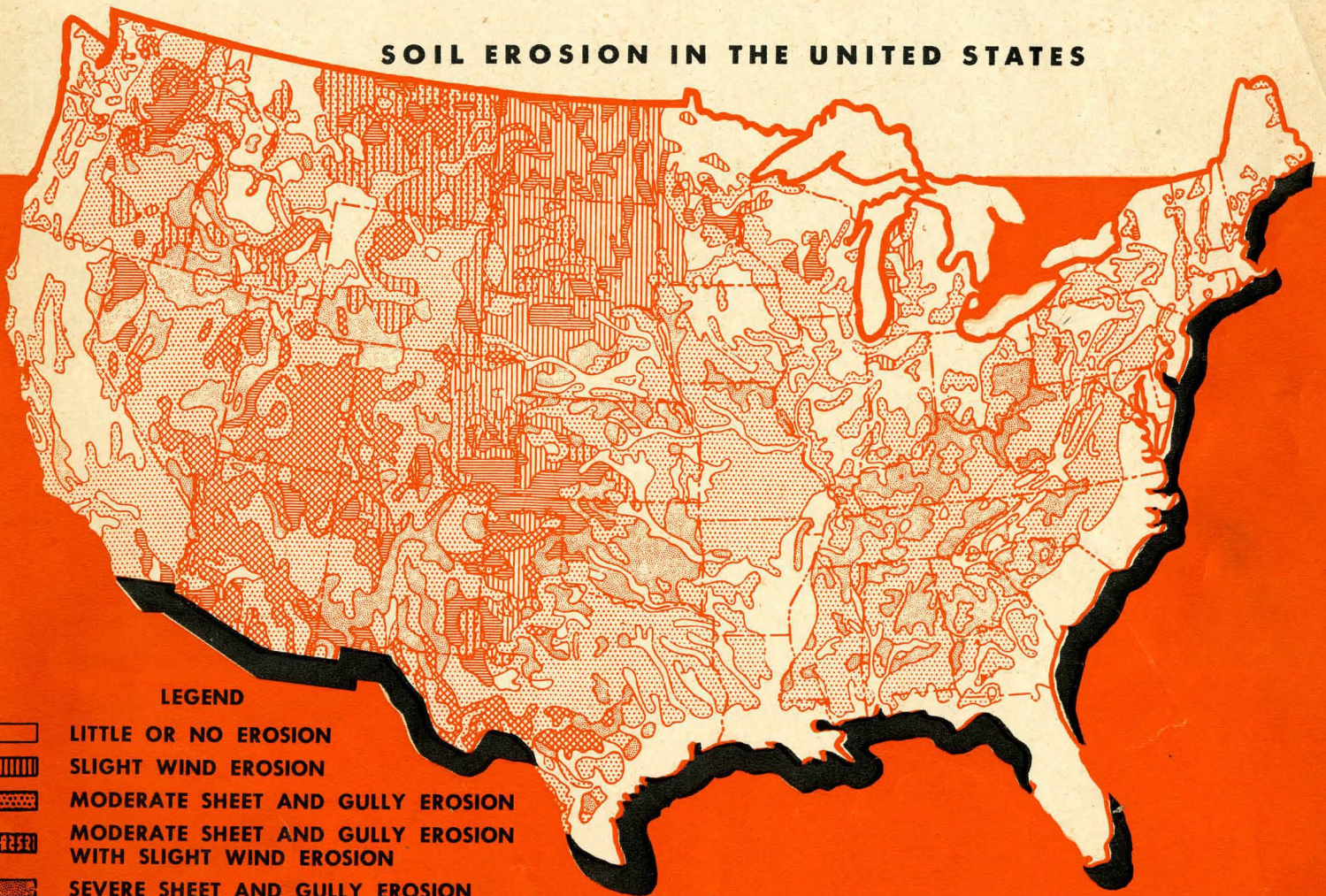
*to*

**CONTOUR**

*and*

**TERRACE**

**SOIL EROSION IN THE UNITED STATES**

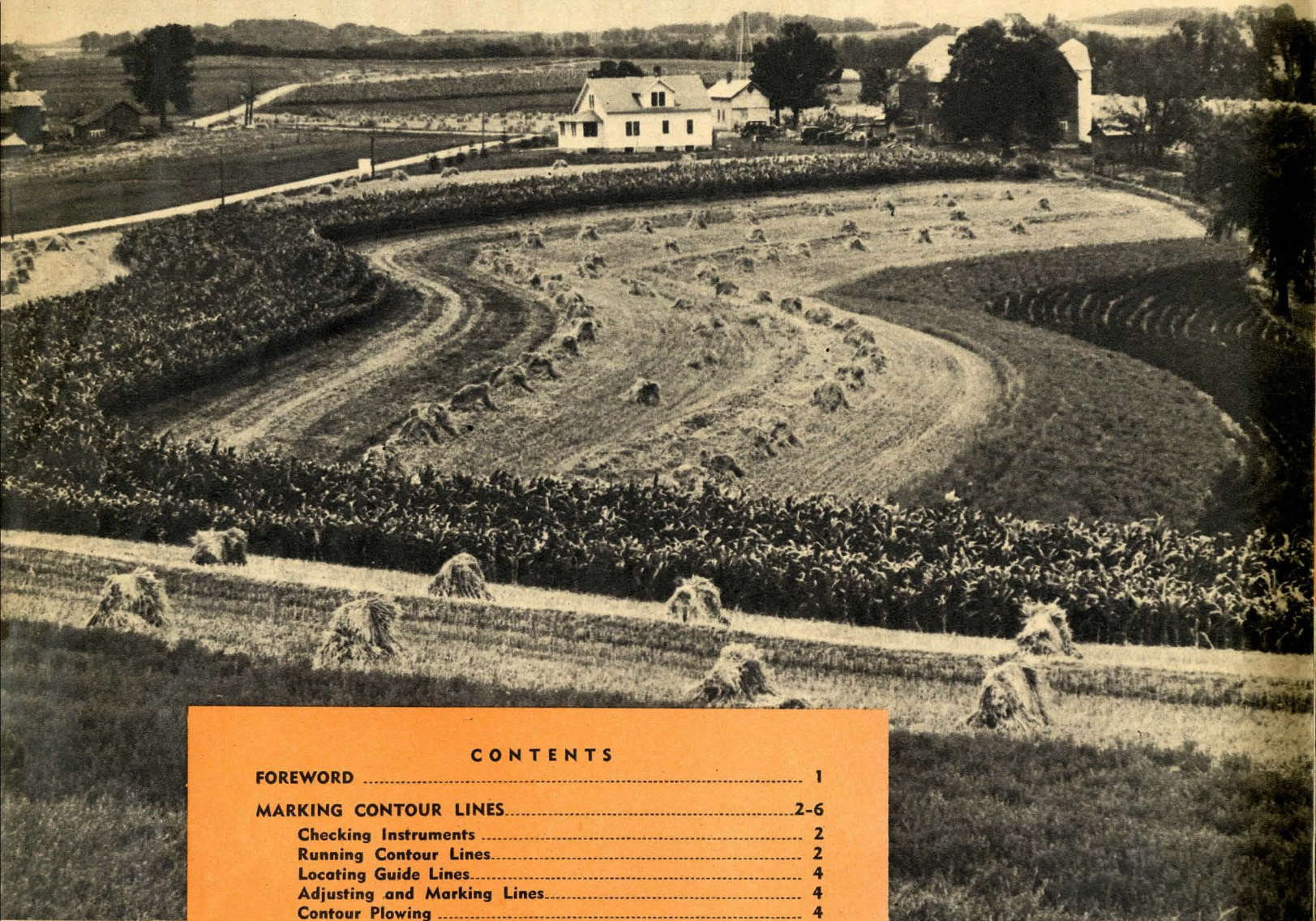


**LEGEND**

-  LITTLE OR NO EROSION
-  SLIGHT WIND EROSION
-  MODERATE SHEET AND GULLY EROSION
-  MODERATE SHEET AND GULLY EROSION WITH SLIGHT WIND EROSION
-  SEVERE SHEET AND GULLY EROSION
-  SEVERE WIND EROSION
-  MOUNTAINS, MESAS, CANYONS, AND BADLANDS

*Keep Your Farm Out of The Red*

# FOR



Soil Conservation Photo

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Terraces, contour rows, and strip crops hold the soil on this hillside farm.

# WORD

You may hold a title to your farm, but can you hold the land itself? Profitable farming depends upon soil quality as well as total acres. Good soil is the result of careful planning and good farming. Today, any farmer can hold his soil and build himself a better living through using information now available on productive conservation farming.

Contour tillage, terraces, and grassed waterways have proved highly valuable in checking erosion and keeping the maximum amount of moisture in the soil where it can be utilized by growing crops to increase production.

Recognizing this, we have brought together in this booklet general information on the practical application of these methods. The following pages give specific information on how to lay out contour lines, and to farm along them; how to establish grassed waterways to carry necessary run-off without erosion damage; and how to build permanent, broad-base terraces with ordinary farm plows.

These instructions are not given in detail, but they should fill your needs in most cases. In any event, we sincerely hope they will show that these farming methods may be applied without special farm equipment or complicated preparation.

Your county agent or the men from your organized soil conservation district will be glad to furnish any additional information you may need in meeting your specific problem.

Although contour farming is discussed first; grassed waterways, second; and terraces, last; the operations do not necessarily come in that order. In many instances grassed waterways are established first, and contour lines or terraces a year or more later.

*You have what it takes to contour and terrace*

## MARKING CONTOUR LINES

The first step in contour farming is the establishing of contour guide lines which run across the slope at a constant level. After these are laid out, all tillage operations are carried on parallel to these lines, making each harrow-mark or plow-furrow a miniature terrace to retain as much water as possible in the soil and retard the speed with which the remainder runs off.

These contour guide lines may be laid out with simple, homemade equipment, or low-cost commercial levels. Two types of homemade levels have proved satisfactory in general farm use—(1) an ordinary carpenter's level

mounted on a staff and fitted with a mirror; and (2) a "T" level with a long vertical pendulum working like a plumb bob. Both types are shown in Figure 1 which also gives construction details.

In addition to the level, a target pole or rod is needed. This rod may be a simple stake, cut square at the bottom so it won't sink into loose ground, and made exactly the same height as the upper edge or sighting line of the level. If a more elaborate target is desired, the stake may be longer with a conspicuous cross mark or a crossbar placed at the correct height, as shown in Figure 1.

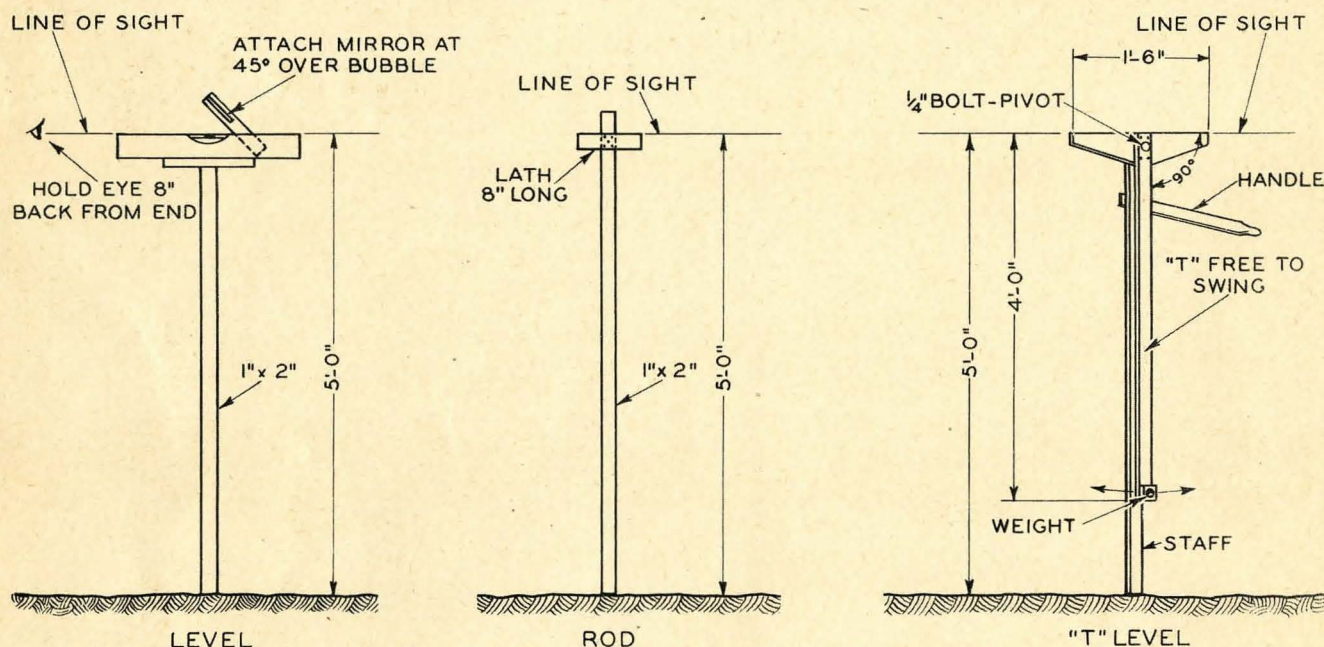


Fig. 1.—Homemade instruments for running contour lines.

### Checking Instruments

Accuracy is important in the construction of both level and rod, since the contour lines established on a hillside can be no more accurate than the instruments used.

A simple way to check the accuracy of level and rod is by setting two stakes 50 feet apart on a hillside; locating the second stake by sighting from the first with the level. Then the level is moved to the second stake and the rod is held at the first. From this position the line of sight should again hit squarely on the target. Any variation, either up or down, indicates that much inaccuracy in the instruments.

### Running Contour Lines

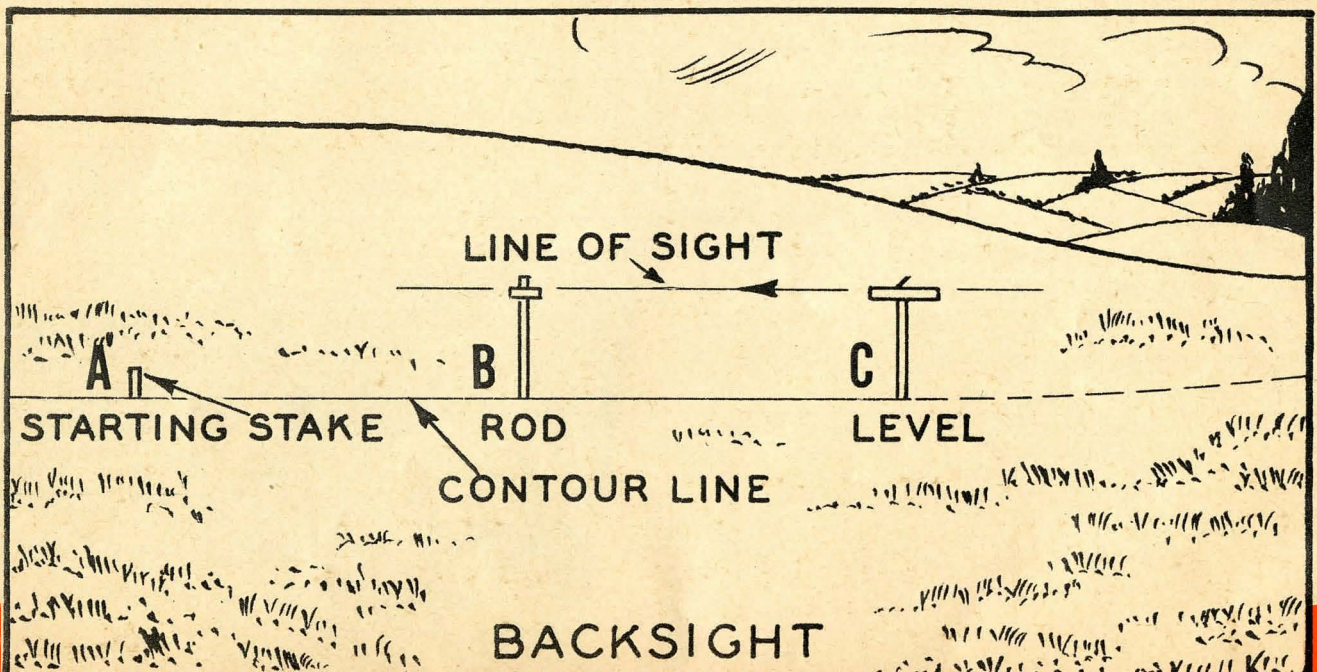
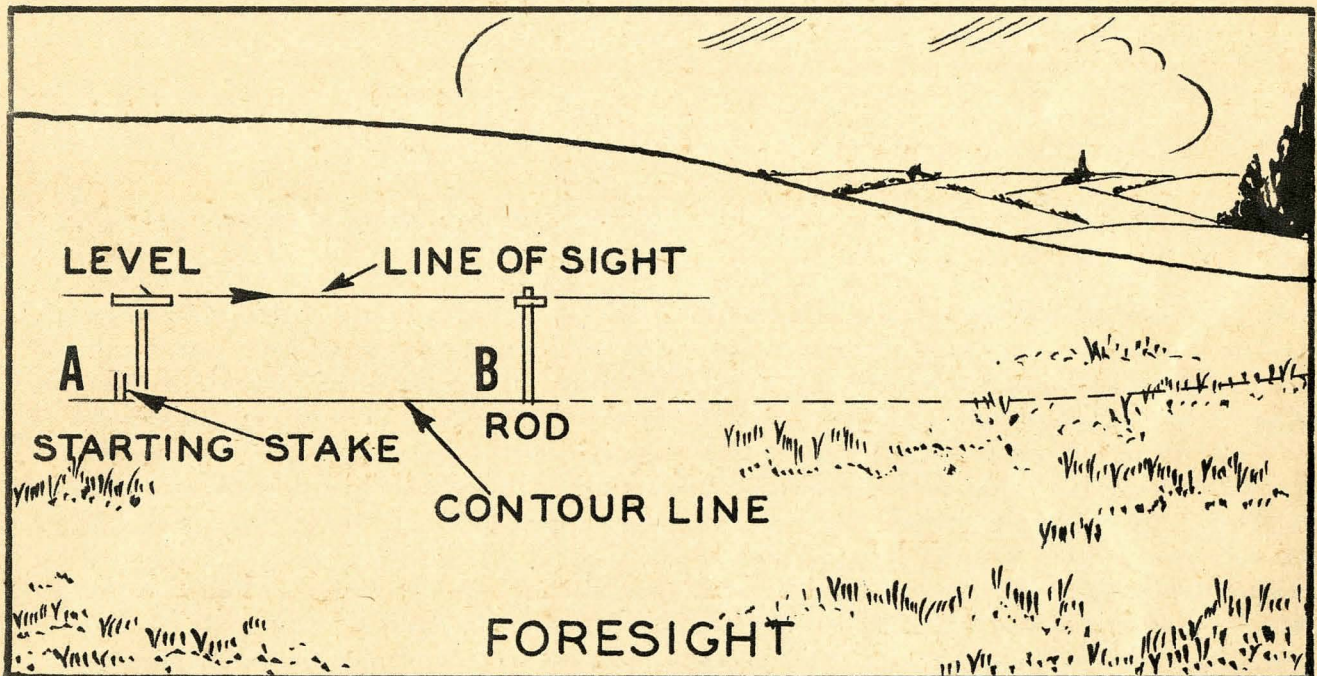
A contour or horizontal line across a hillside is established by sighting with the level from a marked point to the rod which is held some distance away, usually 50 to 100 feet. The man with the rod moves up or down the slope until the line of sight falls squarely on the target when the rod is vertical with the lower end resting on the ground. See Figures 2 and 3. This location of the rod, "B", is marked, usually with a stake, and another sight is taken using this as the reference point. In making it, the man with the level moves forward 50 to 100 feet and locates point "C" by sighting back to the target at "B".

The third sight is taken *forward* again with the level at "C". This process is continued until the contour line of marks or stakes extends across the field.

Since the sighting line on the level is the same height from the ground as the target on the rod, the ground line between the stakes will also run horizontally, that is, across the slope at a continuous level.

In running a contour line of considerable length, sights are generally taken every fifty to one hundred feet, with

each point being marked with a stake. *Foresights*, in which the rod man walks ahead and the level man sights ahead to him, as shown in Figure 2, are alternated with *backsights*, in which the level man walks ahead and sights back to the rod, as shown in Figure 3. This prevents any inaccuracy in the instruments from accumulating as the line is extended. To insure greatest accuracy, foresights and backsights should be of approximately equal length.



Figs. 2 & 3.—Sighting a line across a field, alternating foresights and backsights for greater accuracy.

## Locating Guide Lines

In locating the first contour guide line on a slope, the common practice is to go to the highest point in the field and then walk straight down the general slope from this point a distance of from 80 to 100 feet, depending on the steepness of the hillside. See Figure 4. On long gentle slopes the first contour line may be 150 feet or more from the top of the hillside.

After the first contour guide line is established, as many additional guide lines as are needed are run across the slope below, allowing not more than 150 to 200 feet between the lines. The lower line in Figure 4 shows the position of a second guide line in relation to the first. On steep or irregular slopes, the distance between guide lines should not exceed 150 feet. Most difficulties in contour farming arise when guide lines are spaced too far apart.

## Adjusting and Marking Lines

After all of the necessary contour guide lines are staked out, the last three stakes marking each line as it extends away from the grassed waterways, which carry the run-off, are usually moved slightly down the slope so the contoured furrows will drain toward waterways. Usually the stakes at the edge of each waterway are moved down about 9 feet; those 50 feet back, 6 feet; and those 100 feet back, 3 feet. This practice also modifies the short curve where the contour lines cross the waterway, simplifying farming operations. See Figure 4.

When the contour lines have been established, they are permanently marked by plowing a back furrow along each line. Any sharp turns in the contour lines are rounded out as these furrows are made. To make this line more prominent, the first furrow is turned uphill and the second rolled down on top of it. This makes a ridge which is easily followed during tillage and planting operations.

The ends of contour guide lines are usually indicated by permanent markers placed in the fence lines. These markers make it easier to accurately follow the contour during succeeding seasons. If care is used, the same guide lines should serve for several years. However, if the true location of a contour guide line becomes doubtful, it should be rerun before row crops are again planted.

## Contour Plowing

In plowing a field on the contour, one of two common practices is to continue driving around the back furrows, which mark each contour line, until the plowed land extends half way up or down to the next guide line, at the narrowest point in the area between lines. Then the process is repeated around the succeeding guide lines. Finally, any angular or odd areas in between the two finished lands are plowed out. This places the dead furrow half way between the contour lines, and makes it follow closely the true contour at this point. See Figure 5.

Another method is to plow around each back furrow until the plowed land extends from one back furrow a quarter of the way to the next. This is repeated around succeeding back-furrows, leaving a full-width land to be finished between the two plowed areas.

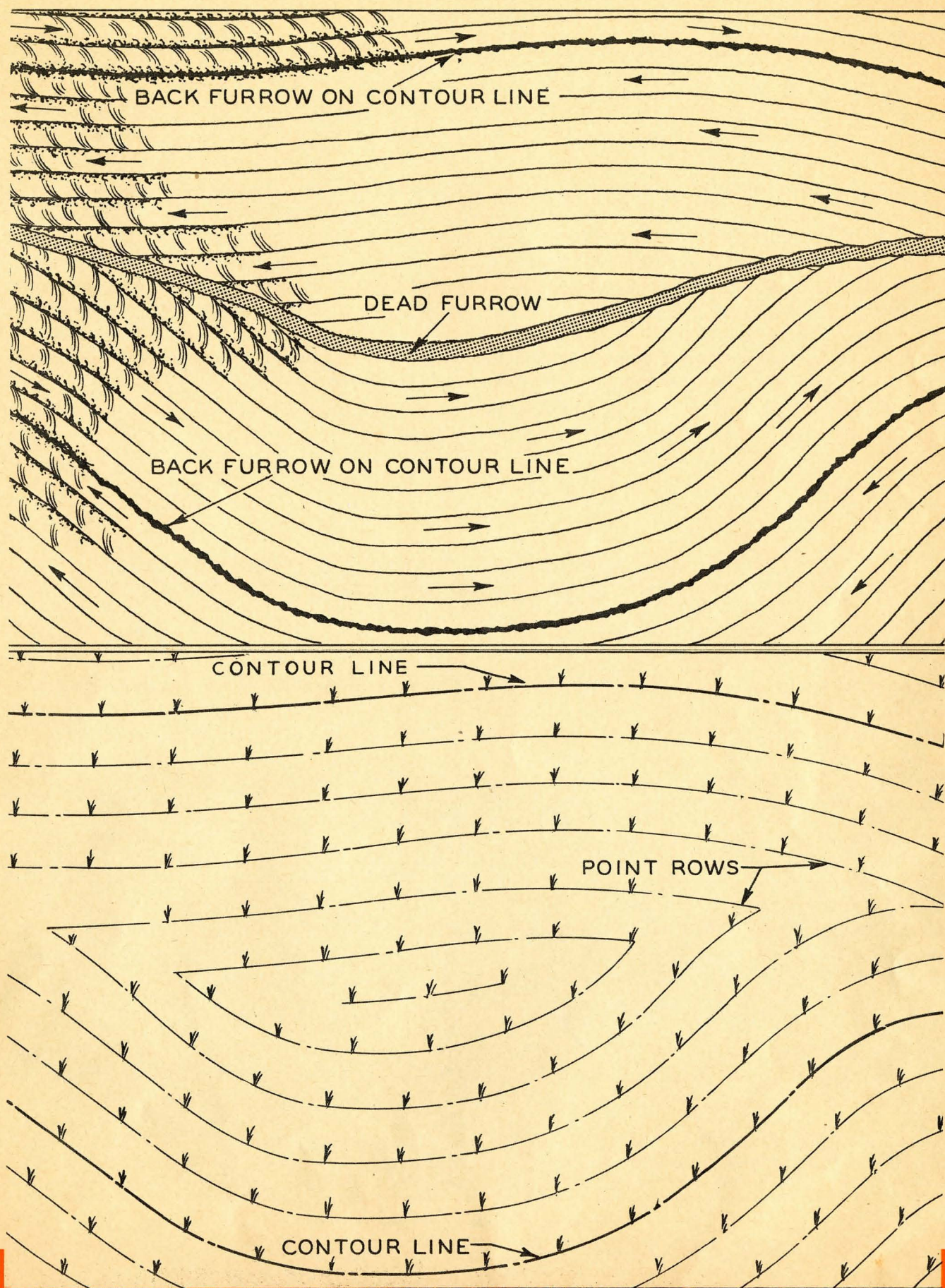
## Contour Row Crops

In planting row crops on the contour, the rows are run parallel to the first contour guide line in both directions from it—up to the top of the slope; and for one-half the distance down to the second guide line at the narrowest point between the two. Then planting is started at the second contour line and continued up toward the first and down half way to the next. This places point rows near the center of the area between the two contour lines. See Figure 6. It gives the greatest number of "through" rows and puts all of the short rows together where they can be handled without extra driving. The same system is followed for each successive contour on the slope.

If the turns around a ridge become too sharp to be handled conveniently with regular cultivating and harvesting equipment, these sharply curving rows may be eliminated by cutting across the bend with a well-rounded curve and filling in the cut-off area with point rows. Another solution is to leave a sod strip down the face of the ridge as a turnrow or headland.



Fig. 4.—White guide lines follow the true contour of the field. Black lines show the modified curve followed in tillage operations.



Figs. 5 & 6.—Upper picture shows contour plowing with proper location of dead furrow. Lower picture shows location of point rows in the same field.

## ESTABLISHING GRASSED WATERWAYS

Grassed waterways offer a safe way of carrying the run-off water from contoured or terraced fields. See Figure 7. The sod in these waterways protects the soil from washing and prevents the formation of sharp gullies or ditches which are difficult to cross with farm machinery.

Tillage tools are lifted when crossing such waterways, so the grassed area will not be destroyed. The gangs of implements such as the disc harrow are either straightened so they roll free when crossing waterways, or the field is worked in sections to avoid crossing the sodded areas. The edges of each waterway strip are purposely left ragged to retard the formation of ditches where the

sod of the waterway joins the cultivated land.

Such a waterway should always be wide enough to handle the heaviest run-off. Even on short slopes the waterway should never be less than 12 feet in width since this allows the grass to be mowed and handled with regular haying equipment, keeping down the weeds and providing a crop from the land in the waterway.

A rule often applied is two feet of waterway width for every acre drained, but this varies with the locality. If the channel is too narrow, heavy rains may cause the water to overflow on the plowed land, forming a ditch on each side of the grassed channel. Ample width in grassed waterways avoids many difficulties in handling run-off.

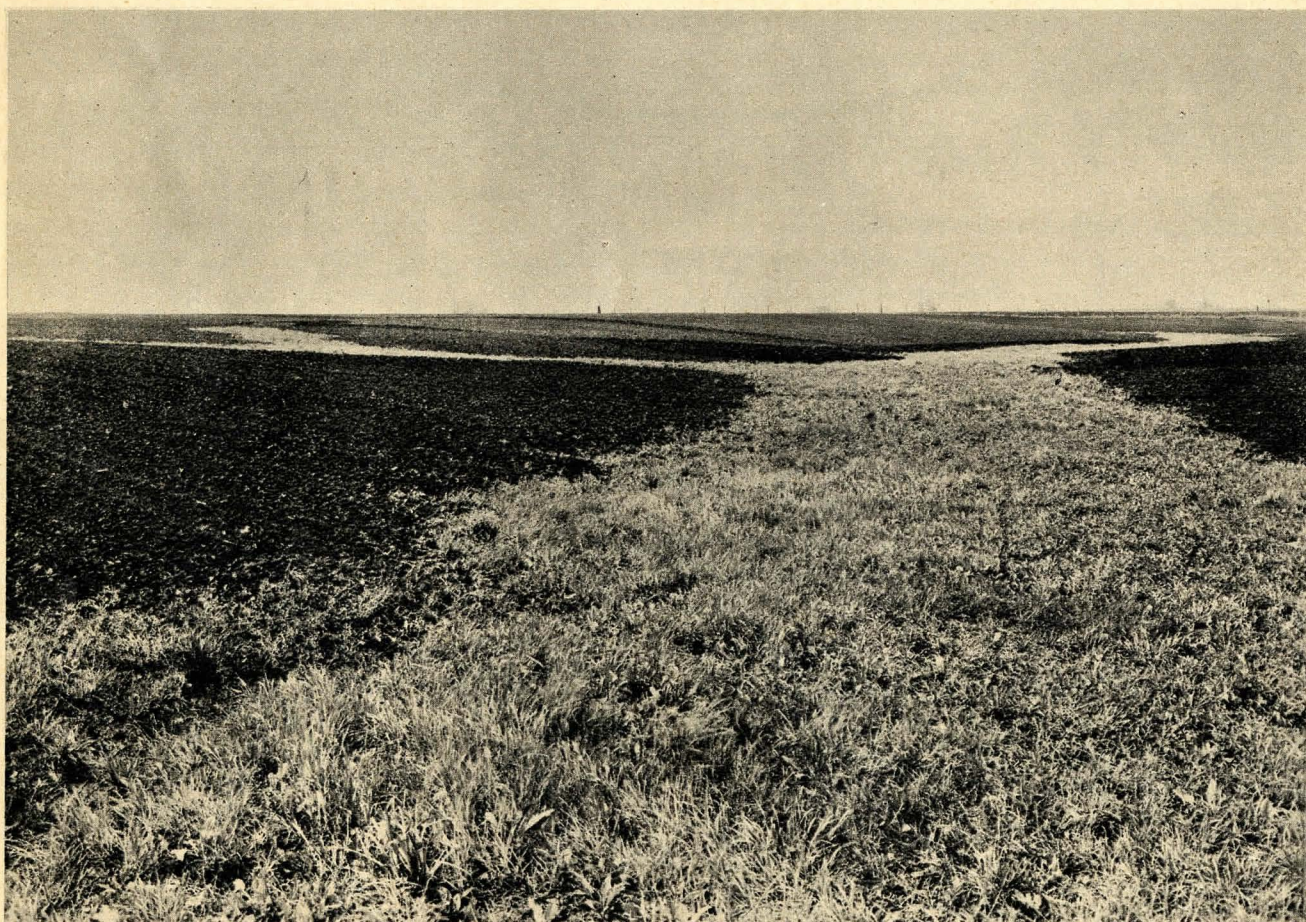


Fig. 7.—A grassed waterway leading down a hillside.

## *Construction of a Grassed Waterway*

The first step in the construction of a grassed waterway is to work down the sides of any existing sharp ditches with a disc harrow or plow. Usually the waterway follows the natural channel of the old drainage way, but this channel is reshaped so the water will be thinly spread over a wide area. See Figure 8.

When the channel has been reshaped into a very much flattened "U", the loose dirt is firmly packed by rolling it crosswise with a regular field packer or a heavily-weighted disc-harrow with the gangs set straight. Then the waterway is heavily fertilized and seeded down to a permanent grass mixture. A nurse crop such as oats or rye is used to hold the soil until the permanent sod becomes established. In drier areas, a cover crop or hay

mulch is used, instead of a nurse crop, to hold the soil until the permanent grass becomes established. The seedbed is often left rough to retard washing or blowing, but should be prepared well enough to promote a quick, uniform "catch" of grass.

Many farmers contour a field first, and establish waterways later, because contour furrows reduce the amount of run-off which must be carried in the waterway while the protective sod is being established. Where grassed waterways are used as terrace outlets, a reverse procedure must be used—the waterways being established one or two seasons before the terraces are built. This makes the waterways better able to handle the relatively heavy volume of water coming from the terrace system.

*You have what it takes*

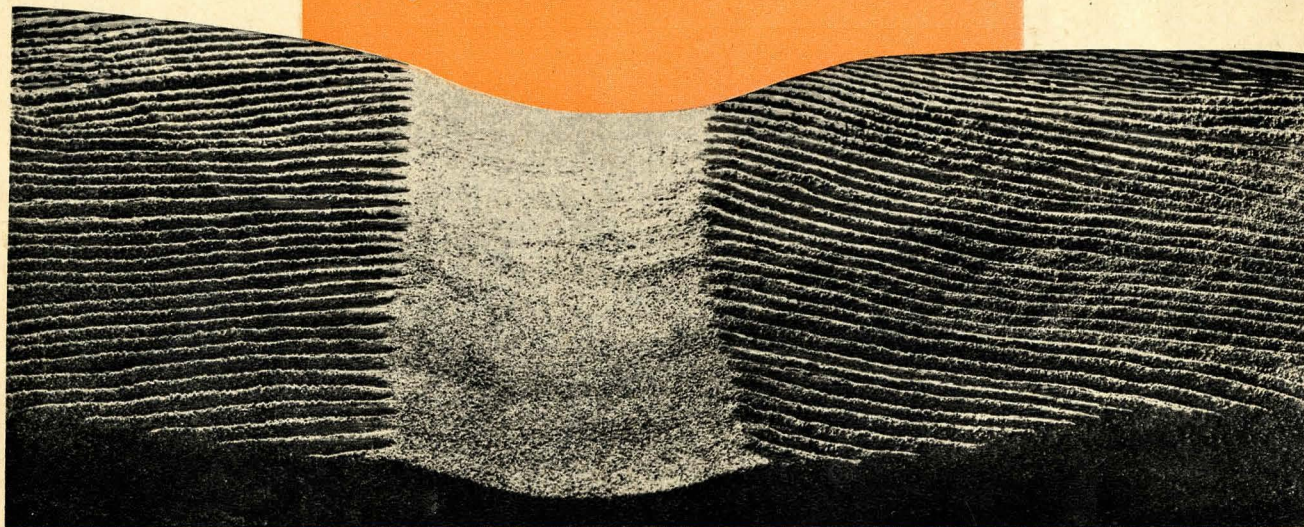


Fig. 8.—Cross-section of a typical grassed waterway.

*to contour and terrace*

## Maintaining Waterways

Maintaining grassed waterways is largely a matter of continued care and common sense. In addition to lifting tillage implements, care should be taken never to plow parallel to a waterway or to use it as a field road, since furrows or wheel tracks leading down the slope readily become ditches. If it is necessary to have a road running up a slope, a raised and sodded roadbed is suggested, with the edge sloped so the run-off drains into adjacent contoured furrows, or into a grassed waterway which

parallels the road and extends the length of the slope.

Breaks in the grassed surface of a waterway can be repaired by sodding the damaged area. This is especially advisable if the waterway is a terrace outlet, or carries a considerable volume of water for some other reason. In addition, the stand of grass should be protected by regular mowing, fertilizing when needed, and the prompt removal of debris and silt which might smother the grass which it covers.

## BUILDING TERRACES WITH A PLOW



Fig. 9.—A broad-based terrace in a wheat field.

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The widely-accepted broad base terrace can be effectively built with an ordinary farm tractor and plow, either moldboard or disc. Tests have shown that terracing with this regular farm equipment generally requires a smaller cash outlay than when larger commercial machinery is employed to do the work.

A typical broad base terrace has a shallow water channel 16 to 20 feet wide and 15 inches deep, with an equally wide, gently rounded terrace ridge on the lower side. See Figure 9. When made with a plow, this terrace is usually of the island type, with a foundation of solid, unplowed soil underneath the terrace ridge.

## Soil Conditions

If terraces are to be successfully built with a moldboard plow, the soil must be in a condition to plow readily. On most soils this means just dry enough to work, but in some sticky soils, the job is done best in the late summer or early fall, when the ground is fairly dry, yet not too hard to penetrate. A fast plowing speed will move the dirt further with each round.

In addition, the area to be plowed in constructing the terrace must be nearly free of vegetation, since any debris will make the loose soil difficult to handle. If a disc plow is used, more trash can be handled than with a moldboard plow, but an excess of weeds, grass, or stalks must be avoided because it will weaken the terrace ridge and may cause it to fail.

## Running Terrace Lines

In building terraces with a plow, as when using other types of equipment, the first step is to have the lines, marking the location of each terrace, carefully laid out to give the right amount of continuous fall in the terrace channel, or, in drier areas, to give a level channel designed to hold all of the rainfall on the slope. Either need calls for careful surveying, and the homemade leveling equipment previously described is not accurate enough for this work. In addition, most farmers have found it profitable

to have their terracing plans checked by a soil conservation technician or other experienced person to determine the best layout for that particular slope, length of field and type of soil. Usually, the local county agent can give assistance along this line.

After the field has been staked out, with each line of stakes showing the center of each *terrace waterway*, the field is ready for terracing with any ordinary plow—moldboard or disc—pull-type, or tractor-mounted.

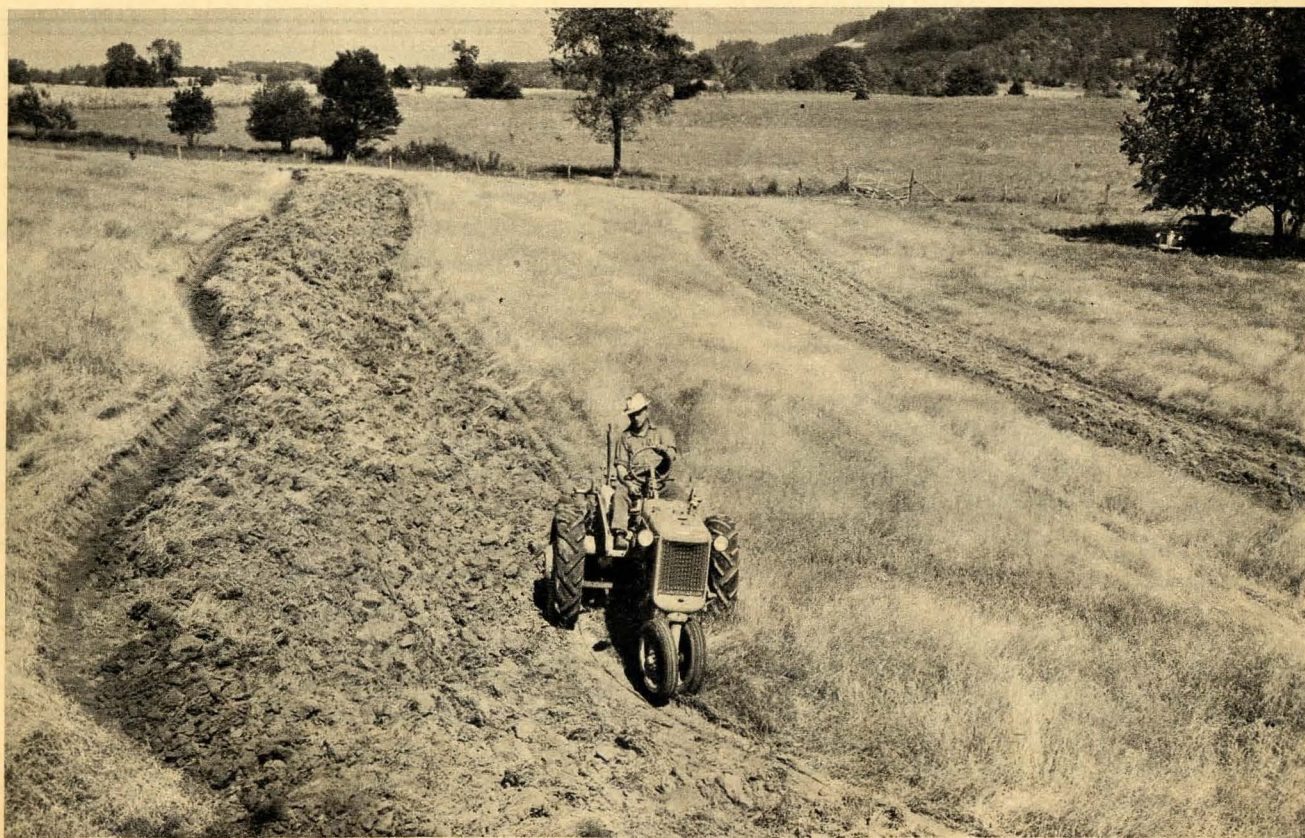


Fig. 10.—Terracing a southern hillside with a disc plow.

## Construction of a Terrace

The first furrow is turned downhill, with the plow running just above the line of stakes. When this first trip across the field is completed, the stakes are moved straight down the slope, one at a time, for a uniform distance of 8 to 12 feet, depending on the width of terrace ridge desired. This restaking is done by means of a length of light chain or rope, since it is important to keep the width uniform. See Figures 11 and 12.

On the return trip across the field, the plow is run just below the new line of stakes, throwing the dirt uphill and forming an "island" of uniform width between the two sets of furrows. The tractor should be carefully driven to keep these furrows parallel.

If the terrace is being built with a conventional pull-type 2-bottom 14-inch plow, two more rounds are plowed around the "island". See Figure 11, top picture. If other types of plows are being used, the work is continued until a similar strip of land (seven feet wide) has been plowed on each side of the "island". On the first rounds, the plow is run at a uniform depth of about four inches, but on the last round, the plow is adjusted so the last furrow on the upper side of the "island" will be very shallow. This eliminates a sudden step-off from the unplowed land above. On the return half of this round, on the lower side of the "island", the plow is again operated at the full depth of four inches.

At the start of the following round (round 4 if a two-bottom 14-inch plow is being used) the operator begins to move the plowed dirt on the upper side of the "island" further toward the center to form the terrace ridge. This is done by starting again at the inside edge of the seven-foot "wave" of plowed dirt and replowing this same ground, running the plow so that on the first round the dirt is moved 8 to 12 inches nearer to the center of the "island". See Figure 11, second picture. The plow is run deep enough so that a thin slice of the firm earth underneath is turned with the loose dirt to make the plow scour.

While the seven-foot "wave" is being replowed on the upper side of the "island", (rounds 4, 5 and 6 if a two-bottom plow is used) the plowed land on the lower side is widened out to 14 feet. On the last trip along the lower edge of this side, the plow is adjusted so the final furrow is very shallow. This is especially important, here, to eliminate a ditch below the terrace ridge.

On the next round (number 7 if a two-bottom plow is used) the operator again starts to replow the upper

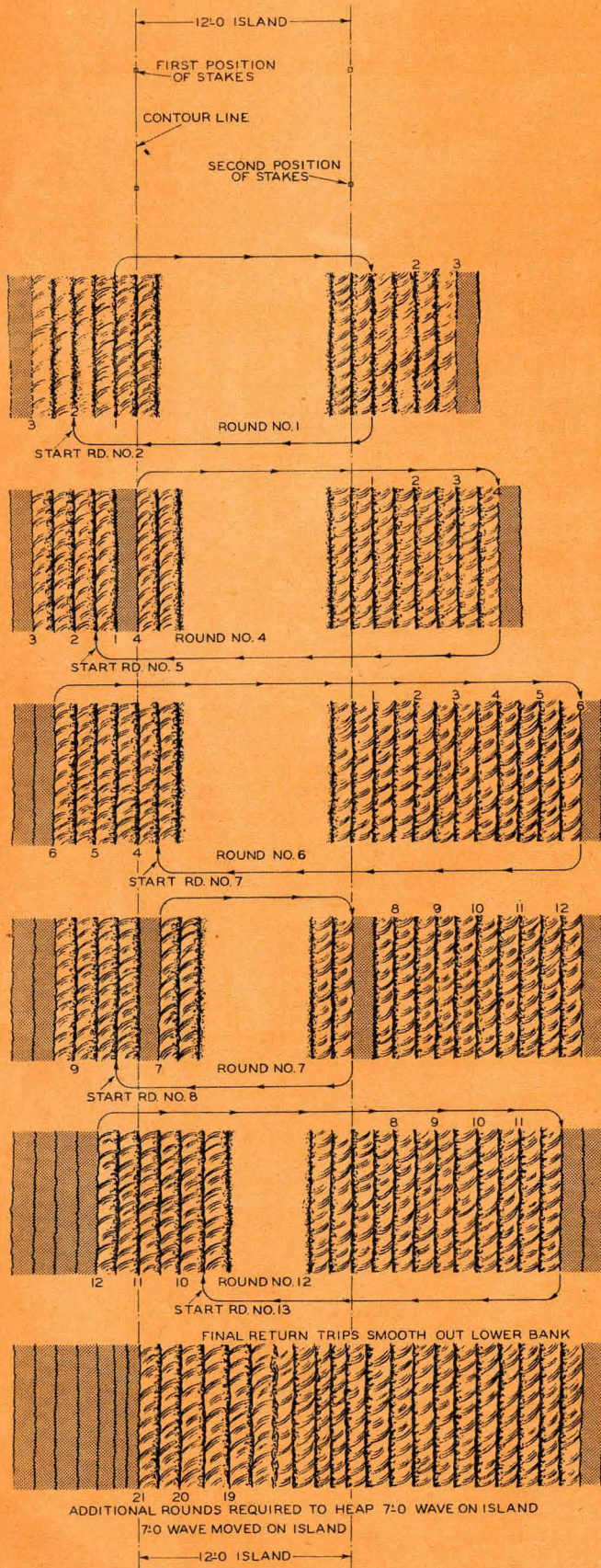


Fig. 11.—Terrace construction, overhead view.

"wave" of soil and at the same time he begins to replot the 14-foot lower "wave", running the plow so the dirt is moved a few inches nearer the center of the "island" See Figure 11, third and fourth pictures. No attempt is made to move the lower "wave" any great distance uphill. It is simply reploted to heap the dirt higher along the edge of the "island".

Plowing is continued until the plowed earth from upper and lower sides meet to form a rounded terrace ridge. See Figures 12 and 13. By this time the water channel will also have the desired dimensions, since the open furrow above the terrace ridge has been widened each time the upper "wave" of dirt has been reploted.

If a nine-foot "island" was left in the beginning, about 27 rounds will be required to complete the terrace with

a two-bottom 14-inch plow.

By this time, the upper, 7-foot "wave" of soil will have been reploted eight times (after the initial plowing); and the lower, 14-foot "wave" reploted three times (after the initial plowing). Three return trips across the field are left as extras to be used in smoothing up the lower side of the ridge and in filling any ditch left at the lower edge where the terrace joins the unplowed land.

If the soil becomes too loose to be moved again before the terrace is completed, it may be packed with a heavily-weighted disc-harrow with the gangs set straight, or with a field packer. Another remedy used where the soil is often very dry, is to partially build the terraces and then wait for a light rain to pack the soil so plowing may be continued without difficulty.

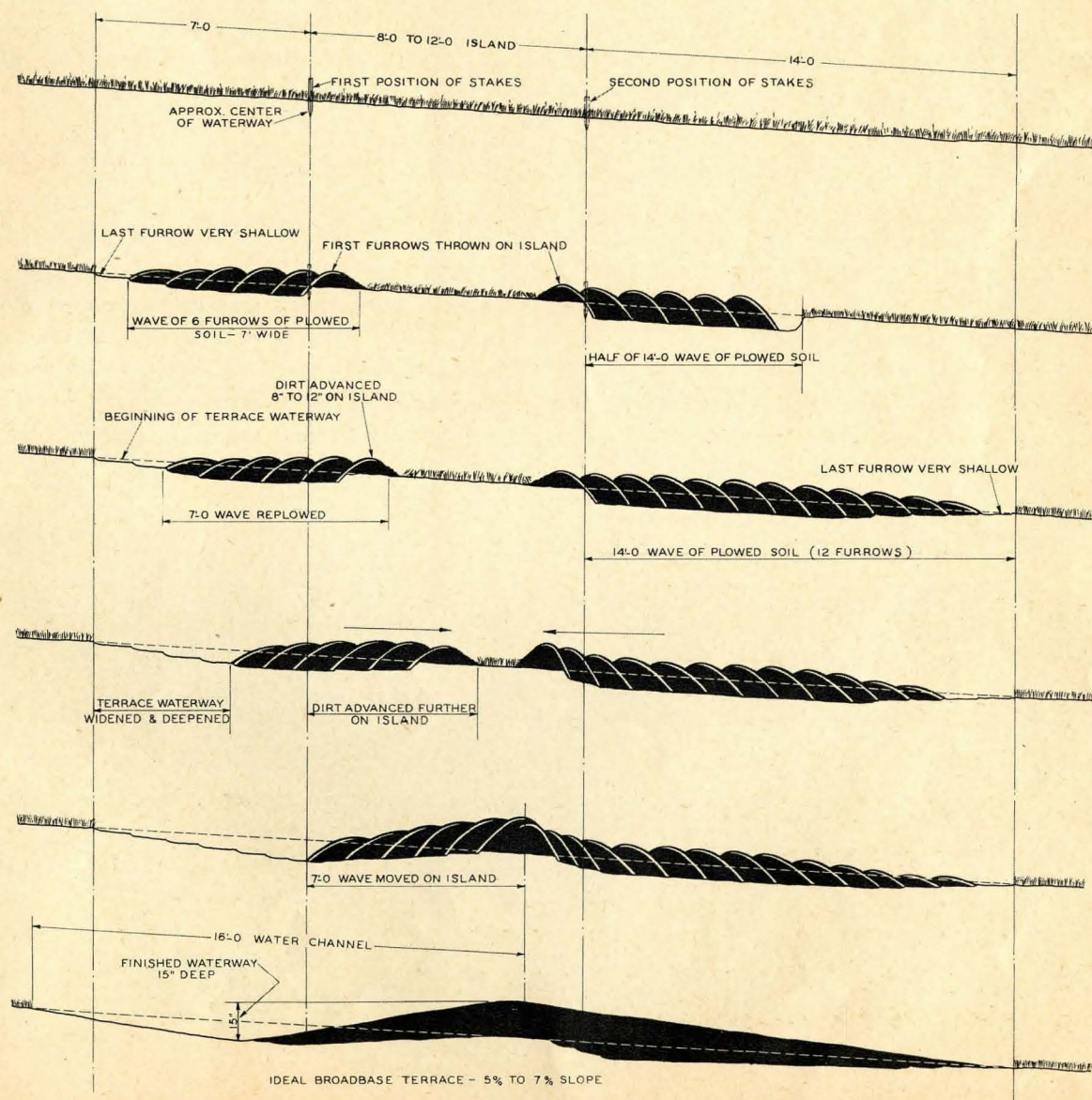


Fig. 12.—Terrace construction, end view.

## Seeding and Maintaining

As soon as the terraces in a field are finished, the field is ready for cropping. Terrace ridges are used as contour guide lines, with all planting and tillage operations carried on parallel to the terraces. Terrace waterways should be heavily fertilized to make up for the top soil removed in building the terrace.

If carefully laid out and built, broad base terraces may be permanently maintained by using care in locating back and dead-furrows whenever the field is plowed. As often as necessary, back-furrows are located on the top of the terrace ridge, and dead-furrows are left in the center of the water channel.

## On Steep Hillside

When building terraces on slopes of six percent or more, all of the dirt may be moved down from the upper side. When this is done, the return trips can be utilized to plow part of the land between the terrace being built and the next one below it, if the land is to be plowed before the next crop.

Another alternative is to use a two-way plow so that all furrows may be turned in the same direction, regardless of which way the tractor is moving. A two-way plow

also makes it possible to turn all of the furrows uphill in ordinary tillage work. This tends to counteract the downward movement of the soil by erosion and also lays heavy sod so that rainfall naturally runs down under the furrow slices, rather than tending to run off as if the furrows were shingles on a roof. Another advantage of turning furrows uphill on a steep slope is that it allows the upper wheels of the tractor to run in the furrow, giving easier steering and greater safety.

## STRIP CROPPING AND SOIL MANAGEMENT

Used alone, contour farming and terracing may not provide complete control of erosion. To be most effective, they should be used in connection with strip cropping—which breaks long hillsides into alternate strips of row crops, grain, and meadow land; and good soil management—which keeps much of the soil protected with close-growing crops, and maintains a high level of fertility. Keeping the soil rich in humus increases its moisture-holding capacity, making it possible to keep

much more of the rainfall in the soil where it is needed.

Information on more profitable systems of soil management is available from many sources including your local county agent or soil conservation district agent, farm papers, the Soil Conservation Service, and the U. S. Department of Agriculture.

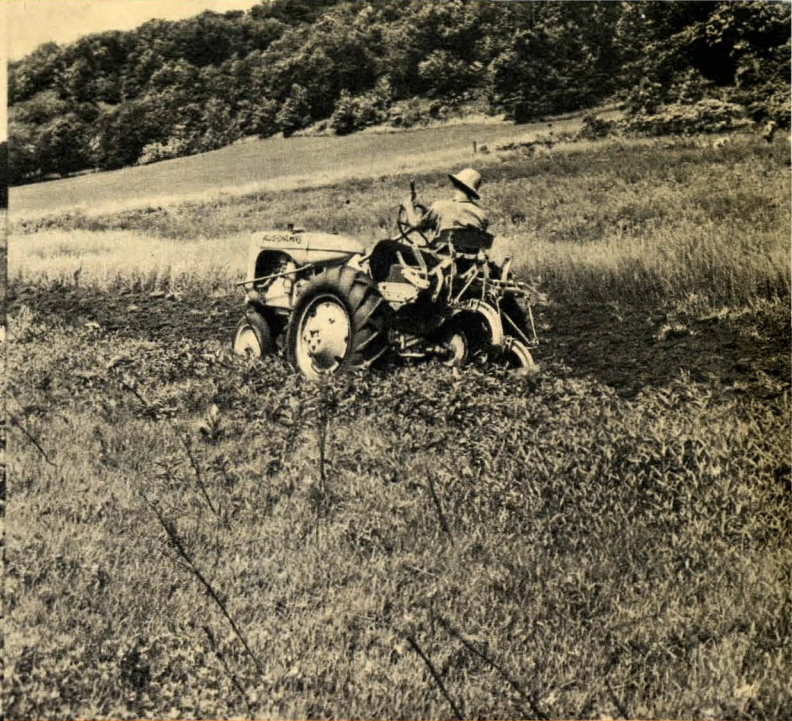
Today, modern methods and power equipment hold the key to better farming. Take care of your land and it will take care of you!



Fig. 13.—Cross-section of a typical broad-base terrace.



**Fig. 14.—Building a terrace with a direct-attached disc plow. Notice how far the dirt is being thrown.**



**Fig. 15.—Two-way plows are ideally adapted for strip-cropping, since all of the furrows can be turned uphill.**

**Fig. 16.—Broad-base terraces do not interfere with power harvesting operations when modern family-sized equipment is used.**



**Fig. 17.—These point rows show how little ground is wasted between contour lines, even when two-row machinery is used.**



Soil Conservation Photo

*You have what it takes to contour and terrace*

## **RULES FOR SAFE TRACTOR OPERATION**

- 1** Be sure the gear shift is in neutral before cranking the engine.
- 2** Always engage the clutch gently, especially when going up a hill or pulling out of a ditch.
- 3** When driving on highways, or to and from fields, be sure that both wheels are braked simultaneously when making an emergency stop.
- 4** Always ride on seat or stand on platform of tractor. Never ride on drawbar of tractor or drawn implement.
- 5** When tractor is hitched to a stump or heavy load, always hitch to drawbar and never take up the slack of chain with a jerk.
- 6** Be extra careful when working on hillsides. Watch out for holes or ditches into which a wheel may drop and cause tractor to overturn.
- 7** Always keep tractor in gear when going down steep hills or grades.
- 8** Always drive tractor at speeds slow enough to insure safety, especially over rough ground or near ditches.
- 9** Reduce speed before making a turn or applying brakes. The hazard of overturning the tractor increases four times when speed is doubled.
- 10** Always stop power take-off before dismounting from tractor.
- 11** Never dismount from tractor when it is in motion. Wait until it stops.
- 12** Never permit persons other than the driver to ride on tractor when it is in operation.
- 13** Never stand between tractor and drawn implement when hitching. Use an iron hook to handle drawbar.
- 14** Do not put on or remove belt from belt pulley while the pulley is in motion.
- 15** Should motor overheat, be careful when refilling radiator.
- 16** Never refuel tractor while motor is running or extremely hot.
- 17** When tractor is attached to a power implement be sure that all power line shielding is in place.

**Remember a CAREFUL OPERATOR always is the BEST INSURANCE against an accident.**

# **ALLIS-CHALMERS**

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