Animal-Driven Power Gear

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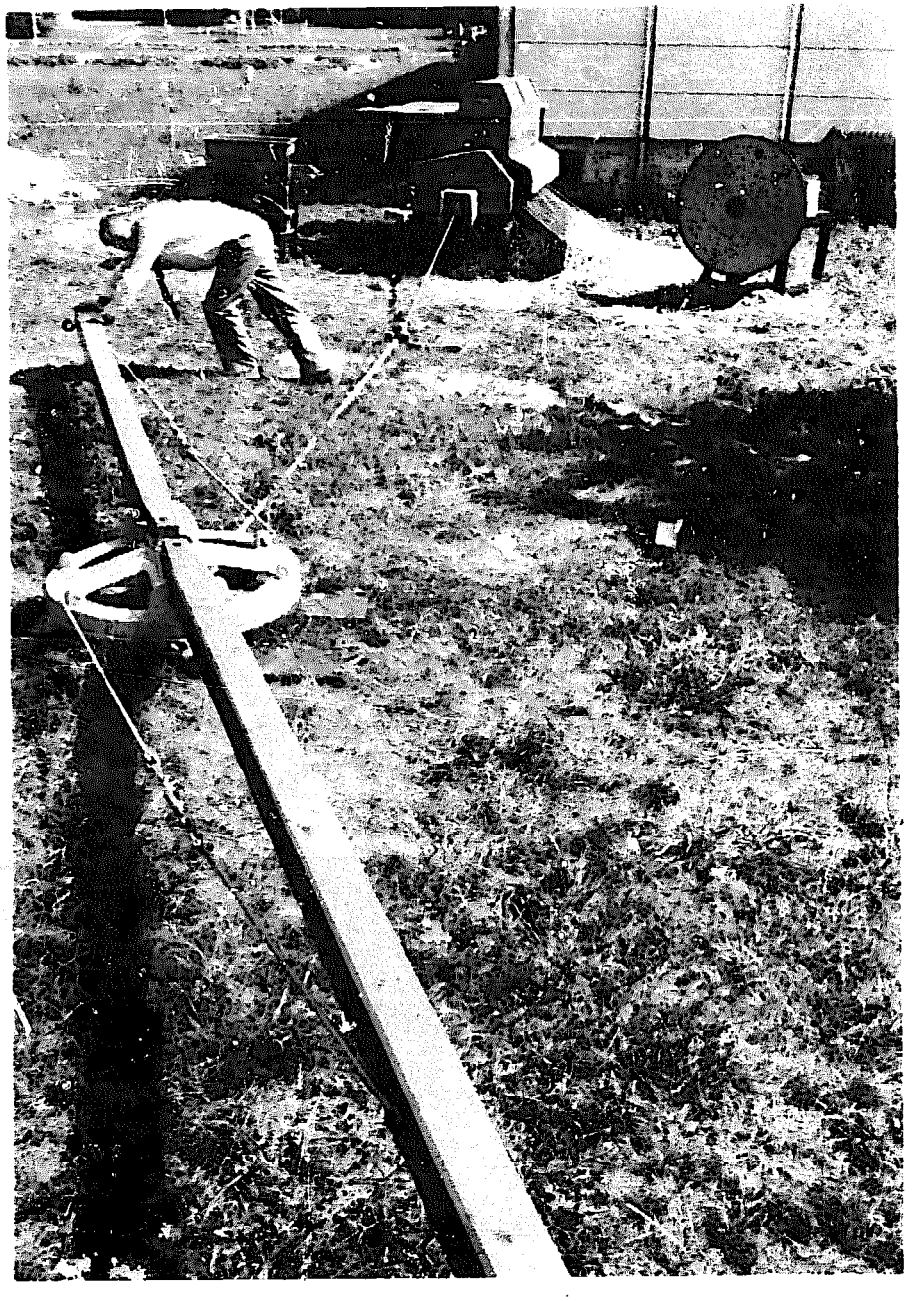
ANIMAL-DRIVEN POWER GEAR



A new source of energy for rural development in opium-growing areas.

United Nations, 1975

This pamphlet is one of a series produced in accordance with the policy of the United Nations Division of Narcotic Drugs. It provides basic information for national authorities concerned with the problem of drug control, especially in the crop substitution sector. Its purpose is to assist authorities in facilitating the introduction at the village level of animal-driven power gear for processing new crops which are intended to replace the cultivation of narcotic crops.

The pamphlet may also be of interest to the United Nations specialized agencies, particularly FAO and UNIDO, which are concerned with agricultural implements and crop substitution in remote regions of the world.

Further copies of this pamphlet may be obtained by application to the United Nations Division of Narcotic Drugs, Palais des Nations, Geneva.

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INTRODUCTION

The world-wide problem of controlling illicit drugs is being tackled in many ways through different disciplines. Law enforcement is one, but it is difficult and inhumane to act forcefully against illicit cultivation of the plants from which drugs such as opium, coca and cannabis are produced - drugs which are the source of most international illicit traffic - when farmers are heavily dependent on these crops for their cash income.

The United Nations, co-operating with Specialized Agencies and the governments concerned are, therefore, trying to introduce alternative crops and other sources of income: they are already meeting with some success in Thailand.

A major obstacle to progress, in the remote areas where most of these plants are grown, is the lack of mechanical energy to power the machinery needed for efficient processing of a greater quantity of farm produce. There is no electric power. Introduction of the internal combustion engine is almost impossible because of the heavy

capital outlay, high operating costs and maintenance difficulties.

As a result of the recent "energy crisis", new efforts have been made to generate power by using the heat of the sun, the wind or other cheap and readily available kinds of fuel. The United Nations Division of Narcotic Drugs is itself seeking an "energy breakthrough" in order to overcome the inherent difficulties of improving the use of land, water and human resources in areas which now produce illicit crops. It is believed that this breakthrough may be achieved with modern adaptations of animal-driven power gear. This has played a major part in boosting agricultural progress over wide areas of Europe. Variants have also been used in the Nile basin from time immemorial.

Machinery for more efficient small-scale crop processing, which has been developed and modernized after recent research by the Division of Narcotic Drugs with assistance from the Government of Poland, can be powered by tractors, diesel engines or electric motors. The Division, however, is concerned with the replacement of illicit crops which are grown in areas out of reach of such equipment. The aim is to find a source of power which can use local sources of energy. Animals are nearly always available which can be harnessed to generate energy for the operation of simple agricultural equipment until other sources of energy gradually become available.

TECHNICAL DESCRIPTION

Animal-driven power gear works on the same principle as a bicycle which is basically an arrangement of levers and gears that transforms slow leg-movement into the speedy rotation of a wheel. In one type (Fig. 1), there is a compact set of iron gears which need only be firmly based on a clearing of level land. Two wooden bars or levers, each about 4 metres long, are bolted to the centre of the large horizontal input gear. They extend like two spokes of a large wheel. A horse or other animal is hitched to the outer end of each bar, and it can be easily trained to walk slowly in a circle.

The gear unit can be powered by horses, cows, camels, bullocks, donkeys, etc. Walking at a comfortable pace, the animal can make three complete circles per minute, thus turning the input gear at that speed. The series of meshing gears gives a speed multiplication of say 25 or 44 times, so the output gear rotates at 75 or 135 revolutions per minute. The output is, of course, dependent on the number and the strength of the animals used, but it is usually more than sufficient for operating a variety of

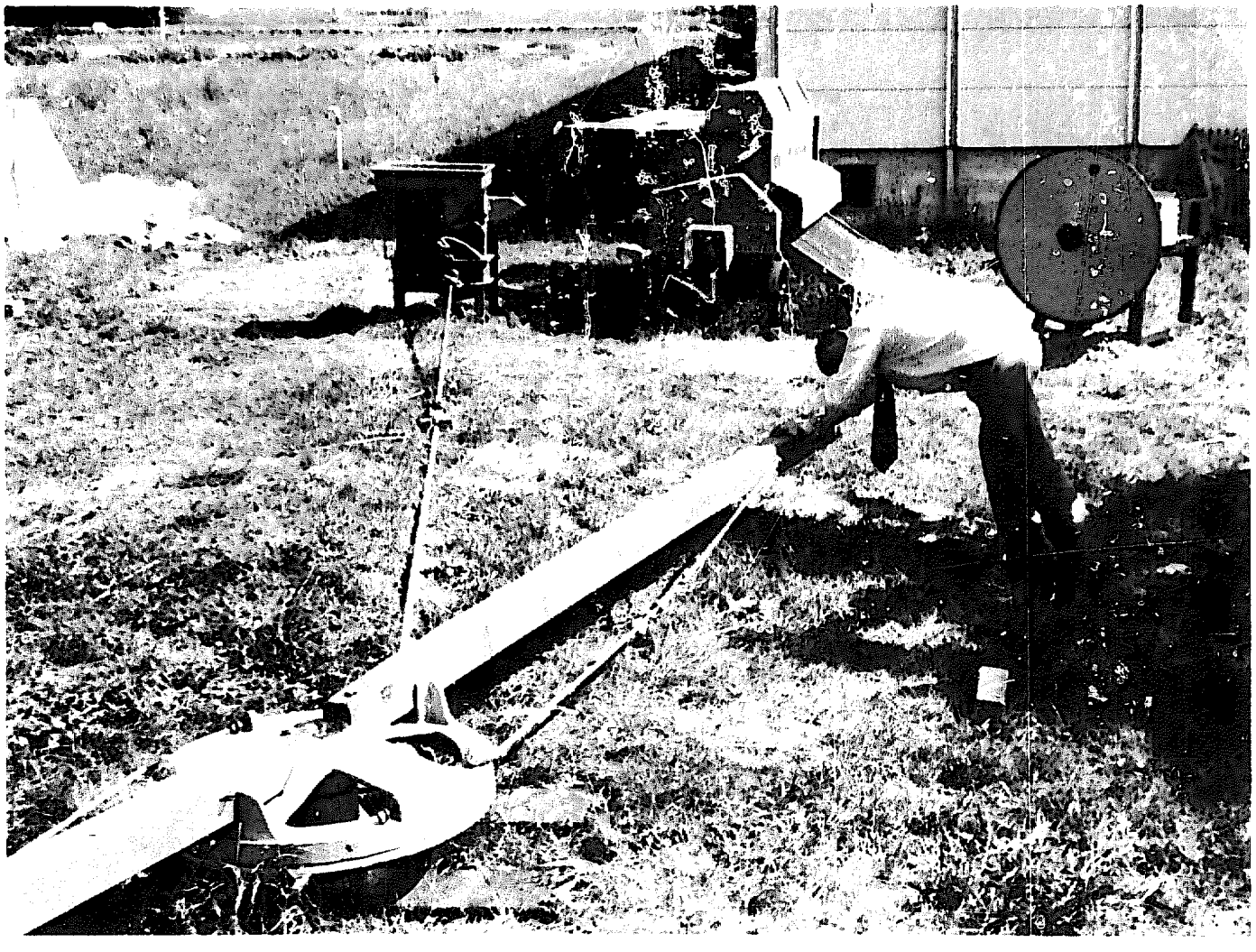

Fig. 1 — Power gear unit. Behind it a grinding mill, a thresher and a chaff-cutter can be seen.

individual processing machines, such as a thresher, a grinding mill, a chaff-cutter or a press for oil or juice extraction.

These machines are preferably placed under cover, close to the power gear unit. Each can be connected to the gear by a drive-shaft with two sections linked by universal joints. The section of the shaft nearest the gear runs flat along the ground, so that the animals can step over it easily as they circle round. The outer section can then be angled up to couple it to the processing machine.

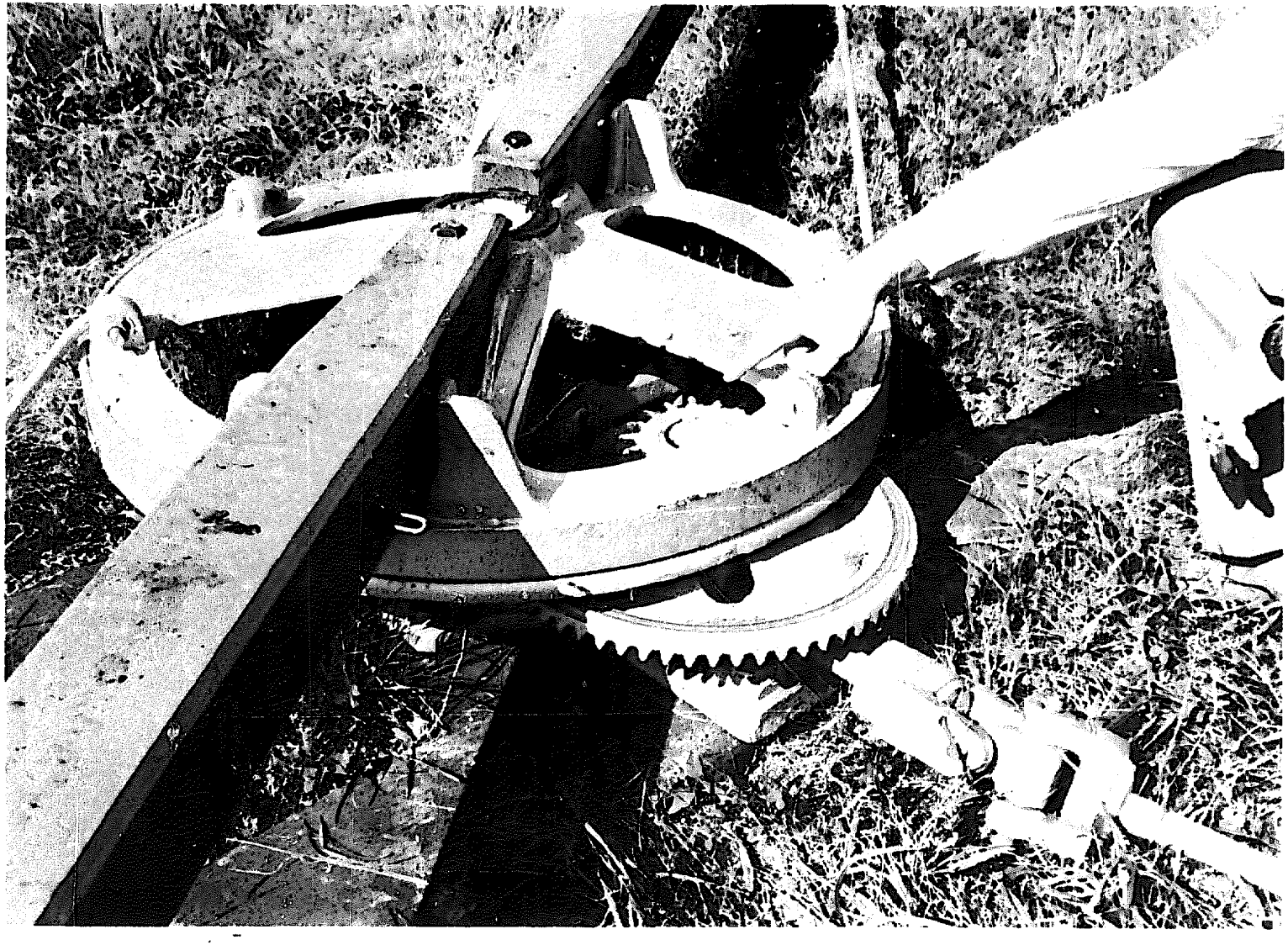

Fig. 2 Close-up view of the gearing system.

SMALL POWER UNIT

The machine (shown in Fig. 2) can be driven by two animals hitched to the outer ends of two wooden bars 4 metres long which are bolted to the large input gear. The animals walk in a circle and can complete three circuits per minute. This unit has a gear ratio of 24 : 1. The speed of the output shaft is 75 r.p.m. and this is sufficient to drive most of the processing attachments. The over-all speed multiplication is 50 times.

There are three speed multiplication stages in the power unit. The large input gear on a vertical axis meshes with a small spur gear for the first step-up in speed. This pinion is integral with a larger bevel-toothed crown gear which rotates at the same rate, but has a higher peripheral speed because of its greater diameter. The crown gear then drives a small bevel pinion for the final multiplication. The axis of this last gear is at right angles to the others, so that the output shaft can be horizontal and thus able to power the attachments, which are placed about 10 metres away.

The two horizontal gears turn on vertical spindles inserted in a simple metal base plate, which also supports the journals carrying the pinion on its output shaft.

As a foundation for the assembly, the base plate is bolted to two thick wooden beams. These are buried with their top surfaces just level with the ground. The plate could also be anchored in a simple concrete base.

The two wooden bars to which the animals are hitched are fastened to the large input gear by single bolts near the centre. They are held by close-fitting channels moulded into the casting, with shouldered flanges at the rim. Stays made of iron rods and tensioned by turnbuckles are connected between the outer ends of the wooden bars and attachment eyes on the gear rim behind the supporting flanges. These are placed behind the direction of movement of the bars and take the strain of the pulling animals which can be placed on either side of the bars, according to the direction of rotation. The machine can be rotated either clockwise or anti-clockwise.

To accommodate this flexibility of operation, the output drive can be taken from either side of the machine. The output shaft carrying the final bevel pinion extends along the entire base of the machine, and the drive-shaft leading to the attachments can be coupled to either end. It is, of course, important that rotation of the output shaft is in the correct direction to drive the attachment!

The drive-shaft is coupled to the output shaft by a universal joint, which enables the power to be transmitted at an angle. This joint is of normal formation consisting of a U-shaped metal piece at the end of each shaft. These two pieces are positioned at right angles to each other and are independently joined to a central cross-shaped member by swivel-pins. The iron parts of the joint are simple castings or forgings and easily produced. This double-hinged arrangement is rigid in torsion but provides angular flexibility.

The shaft is made in two sections, each about five metres long. The first runs along the ground or in a shallow covered trench, so that the circling animals can step over it easily. A universal joint then couples this inner section of the shaft to the outer one, which can be tilted up at any angle to be coupled to the required processing machine. The shaft can be moved so that a number of machines can be left in position for use at a radius of 10 metres from the power unit and spaced around it.

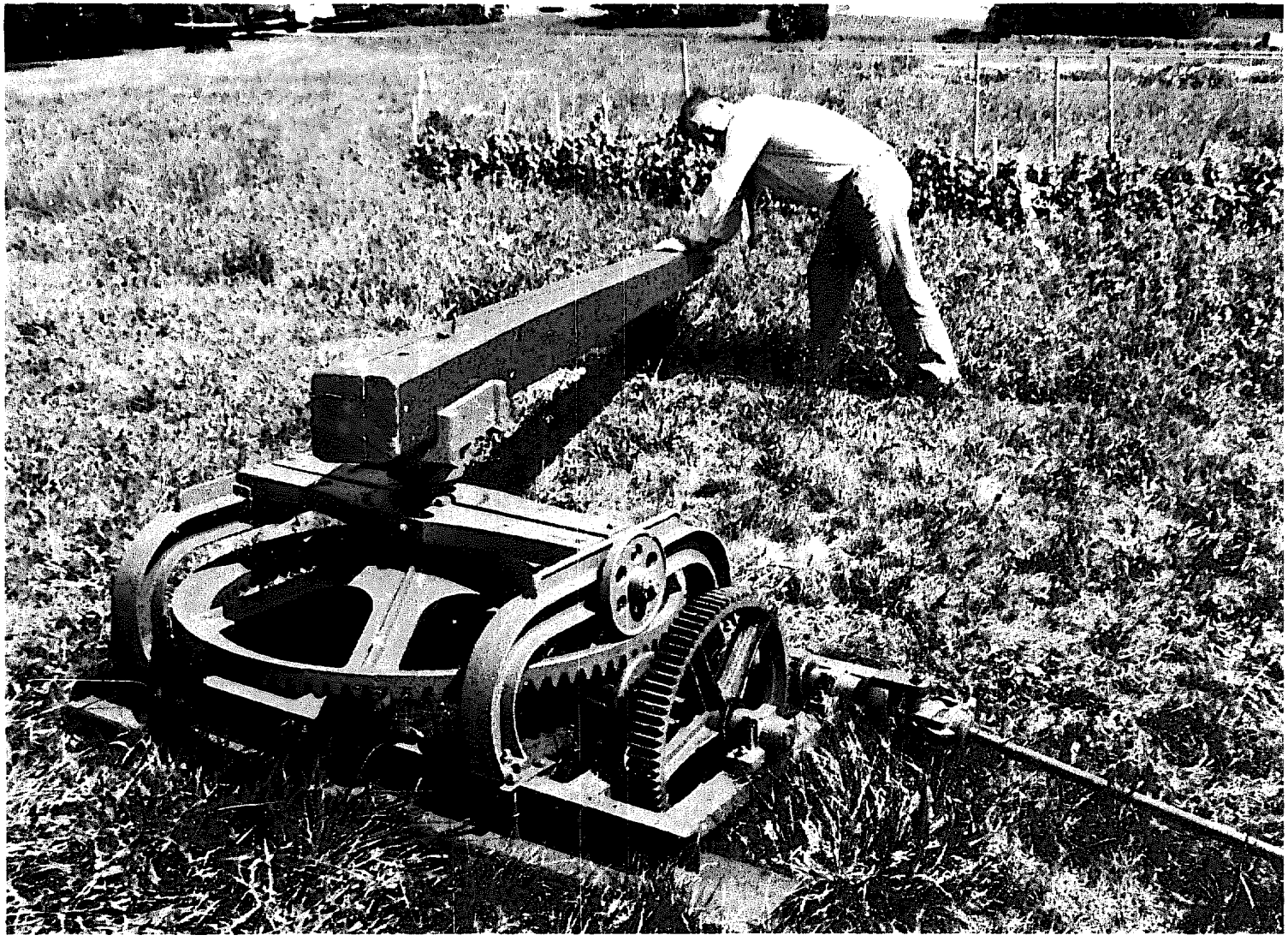

Fig. 3 Power gear intended for a team of four animals.

LARGE POWER UNIT

This unit can be adapted for use with two or four animals. The gear ratio is 1 : 44 and with three circuits per minute the output shaft turns at about 130 r.p.m. (Fig. 3). The photograph shows only one of the two wooden drawbars in place. For full normal use there should be two bars, as with the smaller unit, but with two animals hitched to each one.

The basic design of this machine is similar to the one for two animals, although the components are larger to cope with the greater power which is generated. Here again there are three speed multiplication stages.

The large crown-type input gear runs on a vertical spindle resting on a fabricated iron base. The top of the spindle is supported by a wooden cross-member, which is easy to make and which provides a desirable amount of elasticity to the equipment so that the parts move smoothly. This wooden member is bolted between two I-section iron beams that can be bent to the required U-shape in a blacksmith's forge.

The crown gear drives a small pinion which is integral with a larger spur gear on a common horizontal spindle.

This large gear then rotates the small final pinion on the output shaft, which carries the universal joint for the two-piece drive-shaft leading to the various attachments. Once again, most of the parts of this unit are fairly simple iron castings. The entire assembly is bedded in the ground, preferably in a simple concrete or wooden base.

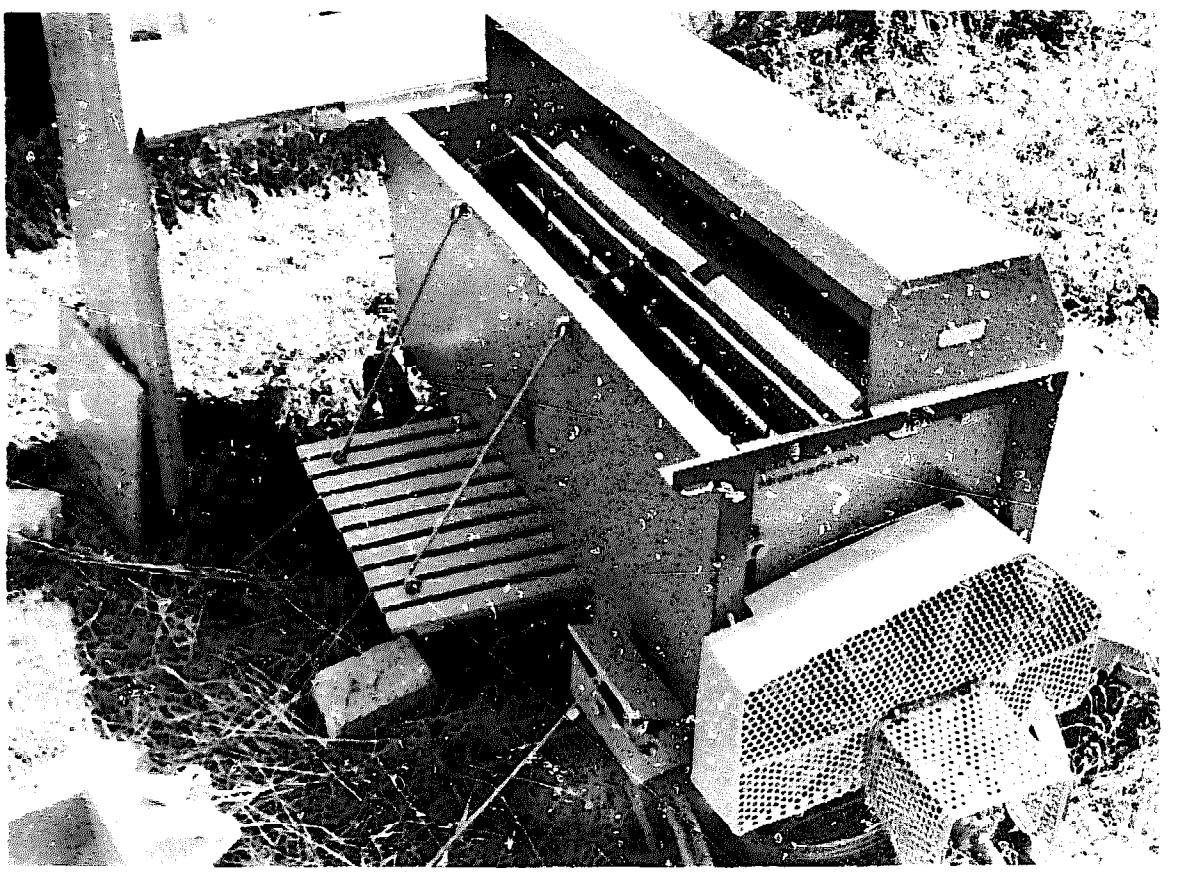

Fig. 4 – Thresher with work-table removed to reveal some of the inner mechanism.

THRESHING MACHINE

The basic threshing unit (Fig. 4) is designed to separate the ears of grain from the straw of wheat, barley and other cereal crops. There is a longitudinal drum 1800 mm long and 230 mm in diameter rotated at about 1100 to 1250 r.p.m. This has six beater bars fixed around its circumference, and is partially encircled by a concave wire grid. The gap between the grid and cylinder is adjustable, and is set so that it is wider at the upper inlet than at the lower outlet. Typical settings are 22-24 mm at the top and 4-5 mm at the bottom.

With the work-table in place (Fig. 5) the harvested crop is fed evenly by hand into the space between the grid and drum. As the drum slowly rotates the grain stalks are forced down into the narrowing gap. At the same time, the beater bars knock the grain out of the husks, and the kernels fall through the wire grid into a collecting hopper at the back. The straw then passes around the drum and drops out into a chute behind the machine.

The thresher has a maximum output of 300 kg of grain per hour. For this full capacity it requires about 2 to 3 horse power. This can be provided easily by the larger power gear unit though the smaller can also be used.

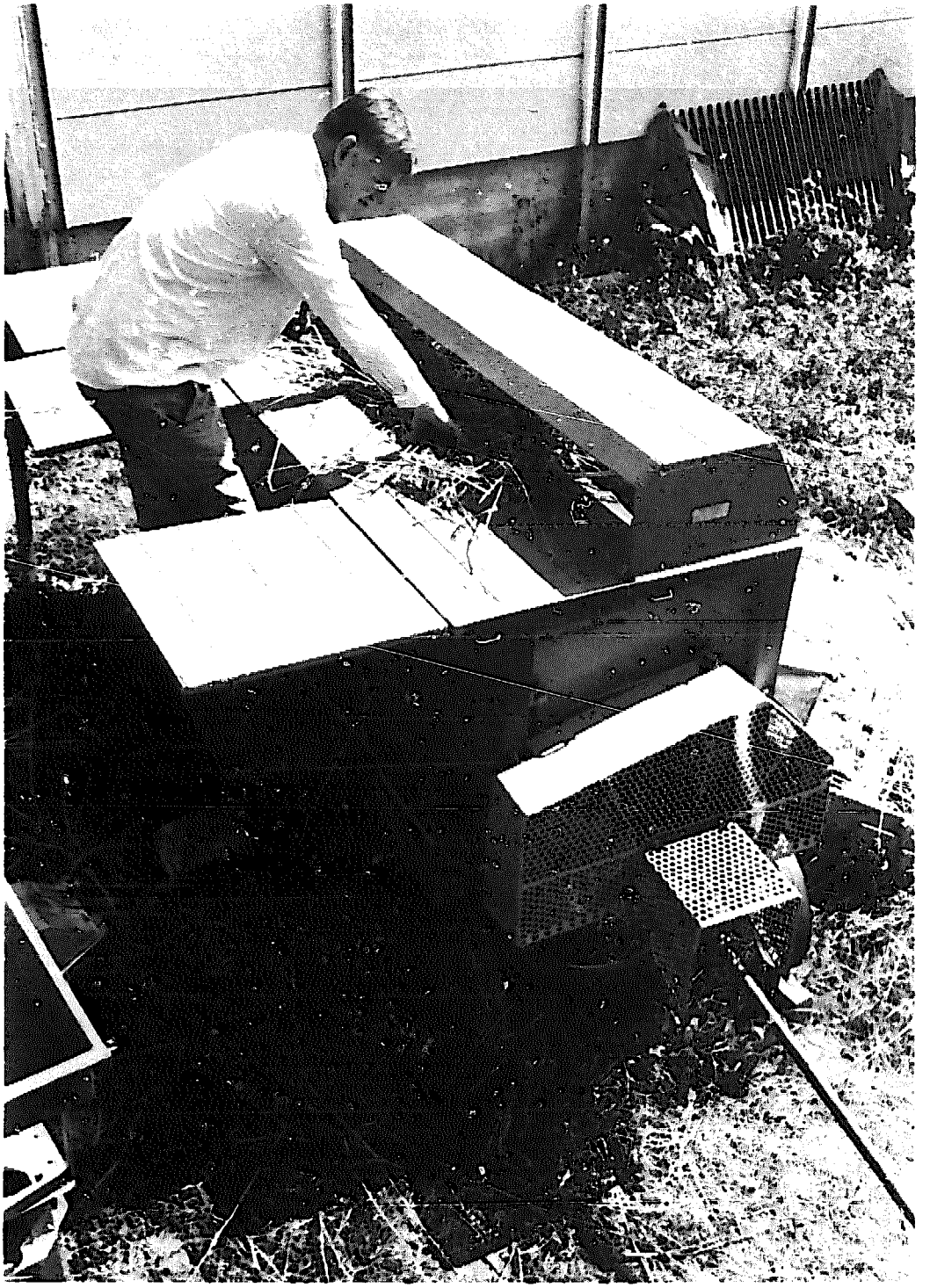

Fig. 5 – Thresher in use with work-table in position.

Simple reduction gearing on the input shaft gives the drum the correct rotational speed. A foot pedal enables the drum to be braked by the operator at any time.

The machine is made mainly of wood, sheet metal, wire rod, and iron castings. The unit constructed for use with power gear weighs 615 kg and is mounted on four wheels which enable it to be towed from place to place. The machine is also equipped with a pulley and may be powered by a tractor, or by a diesel or electric engine.

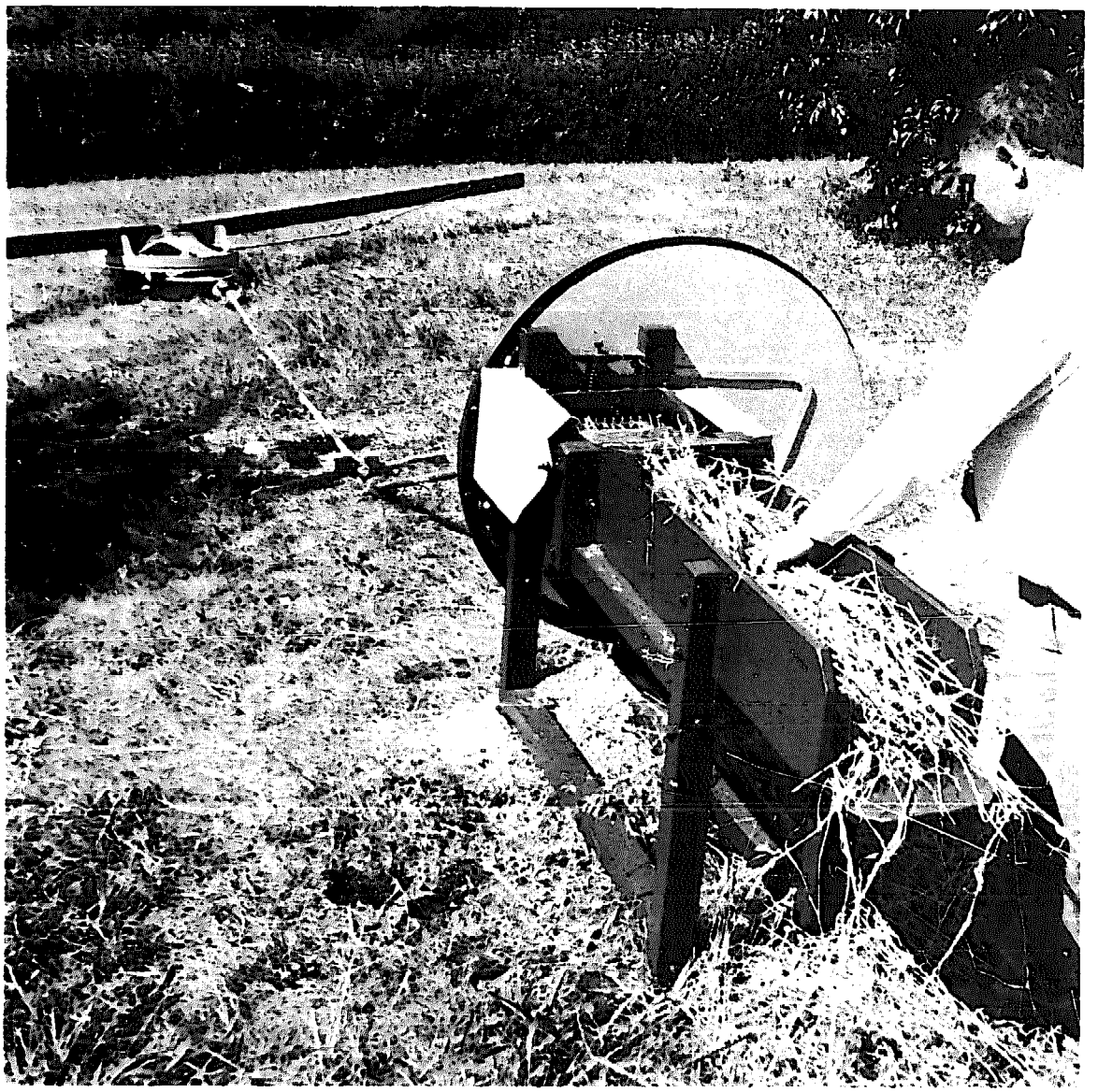

Fig. 6 Chaff-cutter connected to the power gear.

CHAFF-CUTTING OR CHOPPING MACHINE

This unit (Fig. 6) cuts straw, hay or similar fodder into short lengths for animal feed. It can be powered by the same power gear unit.

The machine has a flywheel 1 metre in diameter with two radial knives on its inner face. Armfuls of straw (possibly from the adjacent thresher) are fed directly into the hopper, and pushed by hand towards a pair of toothed rollers which slowly rotate in opposite directions. The rollers compress the straw bundle, at the same time drawing it forward towards the knives.

With each half-revolution of the flywheel one of the knives slices off the ends of the compacted straw or other fodder. The cut material falls into a container on the ground. The length of the cuttings or chaff may be either 10 or 18 mm, depending on the speed of the toothed rollers, which determines the amount of straw that is fed in before each cut. To produce improved cattle fodder, the cuttings can be mixed with silage, meal or other nutrients.

The flywheel is turned at a constant speed and drives the rollers through a simple train of cast-iron gears.

Replacing or shifting one pair of gears on the input train to the rollers allows for changing their rotational speed. Aside from the flywheel, gears and rollers, the entire machine is made of wood.

GRINDING MILL

This machine (Fig. 7) for use with the animal-driven power gear unit produces flour from grain. There are two circular grindstones of 500 mm diameter facing each other on a common horizontal axis. The first of these grindstones is stationary and has a hole in the centre. A drive-shaft passing through this hole supports the second stone, and rotates it at 600 r.p.m. by a series of step-up gears from the input at the coupling universal joint.

Grain is poured by hand into the hopper, which holds about 50 kg at a time. Through an adjustable opening in the bottom it falls down a tube which feeds it through the central hole in the stationary stone. From here the grain drops into the space between the two grindstones, where it is crushed and ground as one stone rotates against the other.

Centrifugal force pushes the ground particles outward from between the two stones, which are then contained by the box-like enclosure. At the same time, several fan blades on the rim of the rotating stone create a forced draught inside the enclosure. This circulating air, plus the centrifugal action, forces the particles out through an opening into a

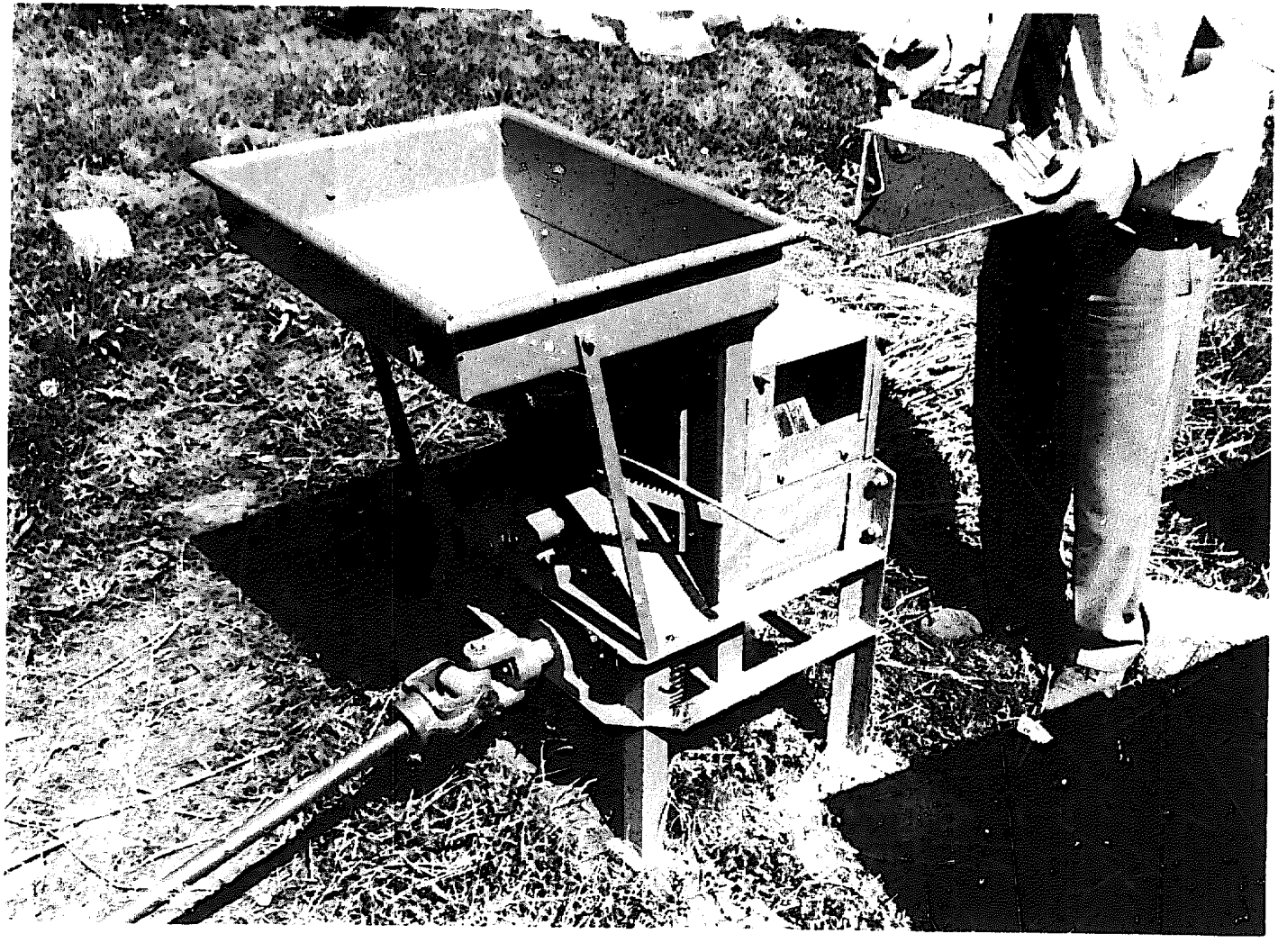

Fig. 7 Grinding mill with outlet duct removed.

metal duct which supports a sack in which the flour can be collected.

The fineness of the flour can be varied by an adjustment nut at the end of the drive-shaft supporting the rotating grindstone which alters the spacing between it and the stationary stone.

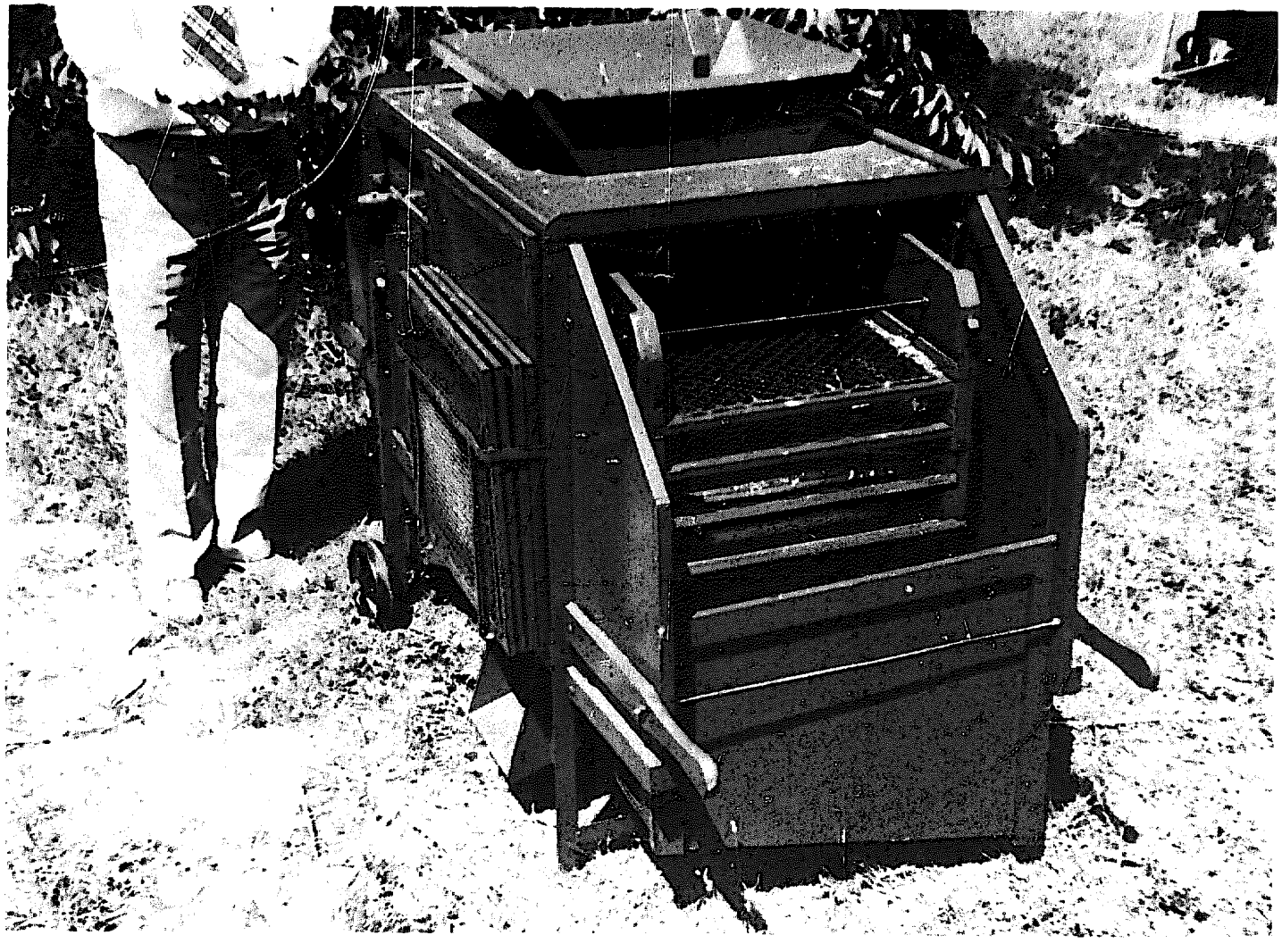

Fig. 8 - Winnower, showing the input hopper and the series of mesh screens.

WINNOWER

Before the threshed grain is ground it should first be cleaned. This could be done with a hand-driven winnower (Fig. 8) which separates the grain kernels from the chaff, husks, sand and dirt. The material is shaken through a series of wire screens while creating a forced draught to blow away the light-weight waste. The action requires little power and the machine is easily operated by hand. It could however be adapted for use with the animal-driven power gear.

Grain from the thresher is poured into the hopper and drops into the topmost of a stack of four horizontal wire screens spaced about 80 mm apart. This array of screens is shaken or vibrated sideways as the operating crank is turned at about 45 to 60 r.p.m. The ingredients then either fall through or are retained by the different screens.

The mesh of the screens varies from top to bottom, with the coarsest at the top. This one holds the chaff. Everything else falls onto the second screen which is of less coarse mesh. This retains the husks, but allows the grain to pass through to the third screen. At the same time, the hand-crank turns a large fan at the back of the machine, which blows the light chaff and husks off the two

top (and forward tilted) screens and out through a broad opening at the front of the machine.

The two lower screens are tilted slightly to the rear, so that the heavier grain collected on the finer third one is not affected by the blast of air.

Continuous vibration causes the grain to flow back down the inclined screen to a collecting container. The output is about 600 kg per hour. At the same time, any sand or dirt which is mixed with the grain sifts through the third screen and drops on to the bottom one, which has the finest mesh of all.

All the wooden-framed screens have the same dimensions, and each winnower is supplied with a set of eight. All have different meshes to permit use with various types of grain. The four screens selected for any particular grain are slotted into the vibrating carrier in the correct order. Spare screens are slotted into a rack on the side of the machine.

The winnower is made almost entirely of wood and metal sheets, with the exception of the crank-shaft and a pair of gears that turn the fan. In addition, there is a simple arrangement of rods and rocking levers that give the screens their vibrating motion. The machine weighing around 130 kilogrammes is mounted on two wheels and can be moved around with a pair of barrow-like handles.

ROOT CUTTER

This machine (Fig. 9) slices potatoes, turnips, sugar beet and other root crops into small pieces suitable for animal feed. It is hand-operated and has an output of 500 kg per hour. At the base of the hopper are a pair of conical discs facing each other, each with 26 short curved blades projecting from the surface. The crank is on a flywheel which helps rotate the cones at a steady slow speed.

The hopper can hold 22 kg of harvested roots, and guide plates ensure that they are pressed by their own weight against the moving blades. As the discs are rotated, the blades gouge out short chips which then drop through the opening below the discs.

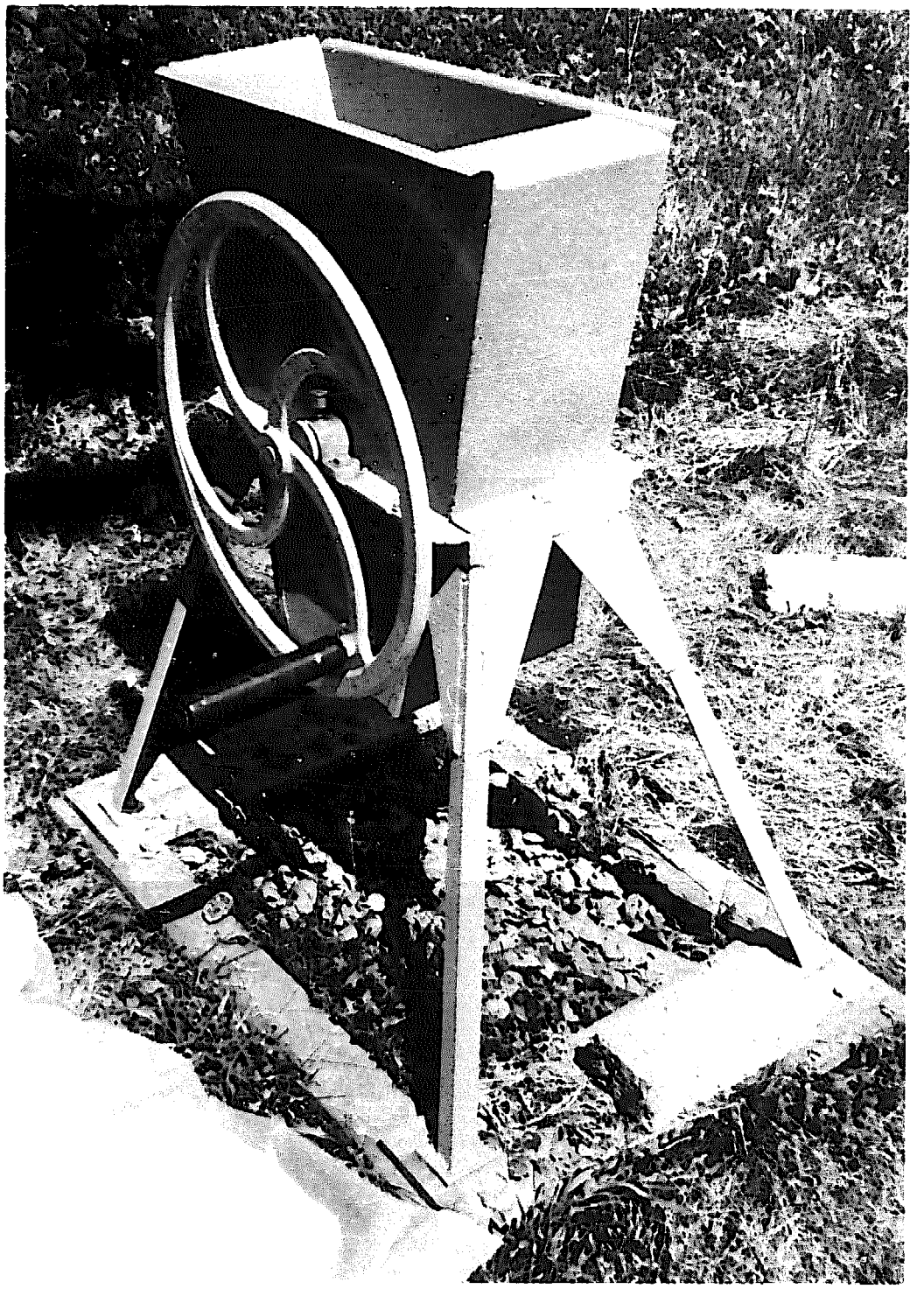

Fig. 9 – Root cutter, for making animal feed.

CONCLUSION

The construction of the basic power gear unit is simple. There are no complex or precision parts, and production of the components in developing countries should not present serious problems.

All the gears are rough iron castings, which could generally be produced from scrap metal in existing foundries. Only melting and pouring facilities would be needed and suitable sand moulds should present no difficulty. They need no milling, grinding or other finishing operations and are used just as they come from the mould. Other metal parts like universal joints could be forged by a reasonably skilled blacksmith.

The machine runs at relatively slow speeds and the parts are lightly stressed so that close tolerances are unnecessary. In general, the only machining requirements would be a drill to cut the holes for bolts used to join the various components. The entire assembly is easily dismantled into its component parts to simplify transport from one location to another.

Wood is used for the base and some structural parts of the assembly. Timber is normally available, is easy to shape, and gives some desirable elasticity to the equipment.

In the case of heavier gear units a simple wood or concrete base would be required.

Maintenance is simple. The plain bearing supporting the large input gear requires only occasional lubrication; animal fat can be used for this if commercial grease is not available. For the other gears there are oil holes or drip-feed arrangements.

The gear teeth themselves should not be lubricated, because this would only attract dirt and cause abrasive wear.

* * *

The power gear and the various processing machines described in this booklet were made in Poland. The Polish Government generously provided and transported samples of the equipment to Geneva as a gift to the United Nations. These are set up for demonstration in the grounds of the Laboratoire de Techniques Agricoles et Horticoles de Châtelaine, near the United Nations Office in Geneva.

By special arrangement with the Polish Government, there are no licensing requirements for local manufacture of the power gear. This also applies to the processing machines, which could likewise be manufactured in most developing countries.

The processing machines, which are considered very useful by farmers because they are reliable in any

circumstances, can be attached to the power unit as well as to other driving engines. Variants of these machines already exist, for example, those for pressing seed for oil or sugar cane for juice. Others, like those used for rice husking, are well known in most Asian countries, and could easily be adapted for use with animal-driven power gear units.

Manual methods in the processing of grain, oil seed and other crops in developing countries are normally very labour-intensive and slow. The animal-driven power gear, by freeing human labour resources, could contribute directly to increasing crop production. This in turn would increase the farmers' incomes, a matter of major concern to the Division of Narcotic Drugs in its activities to counter the illicit production of narcotic crops. These same power gear units could also be adapted for generating electricity in villages and for powering small cottage industries.

The major advantage of this equipment is that it can be produced at a relatively low cost, and can then be sold at prices which are compatible with farmers' low incomes. The additional cost of operation and maintenance is minimal where farm animals are already available. The equipment is simple and the principles on which it operates are already known in many countries.

The release of women from their traditional basic and burdensome role in agricultural work, which can be achieved with this equipment, is potentially of great importance to the welfare of rural populations. With animals and machines taking over from human muscle, cottage industries would have an opportunity to grow and flourish. Women could then use their natural skills and aesthetic talents in the making of traditional woven fabrics, carpets, jewellery or leather articles the sale of which would benefit the entire community. There is also an increasing demand for such handicrafts throughout the world.

In the communities with which the Division of Narcotic Drugs is concerned, effective use of animal power is an important step towards these goals. This in turn could lead to the acquisition of the capital necessary to buy and operate diesel engines, generating equipment, electric motors or tractors. These sources of power become a real possibility with a change in the pattern of the national economy and agriculture bringing increased prosperity in developing countries.

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AGRICULTURAL MACHINERY FOR USE WITH ANIMAL-DRIVEN POWER GEAR

INSTRUCTIONS FOR USE[1/]

1. WHEAT GRINDING MILLS - Type No. SD.1A (A123)

The SD.1A grinding mill is designed for grinding or milling rye, barley, oats or the seeds of leguminous plants. After adjustment of the grindstones, it can be used for milling wheat, it yields a coarse flour.

Technical specifications

1.	Hopper capacity	about 50 kg
2.	Drive	by a team of horses
3.	Weight	about 210 kg
4.	Height	119 cm
5.	Width	100 cm
6.	Length	115 cm
7.	Grindstone rotation speed	600 rpm maximum
8.	Grindstone diameter	500 mm

Operation

Two grindstones, one fixed and one movable, positioned vertically, form a working unit.

The fineness of the flour depends on the interval between the grindstones, which is set by means of an adjusting screw.

The power to drive the moving grindstone is supplied by a team of horses and transmitted through toothed wheels.

Grain is placed in the hopper above the mill; when the catch is released, the grain falls into a spiral tube.

The grain slips down the spiral between the grindstones. The flour is thrown out from the grindstones by centrifugal force and is then collected by scrapers at the outlet, to which a sack is attached.

1/ These instructions have been translated from Polish and are a summary of manuals giving a detailed description of the machines. Models of the machinery have been supplied by the Government of Poland as a contribution in kind to the United Nations Fund for Drug Abuse Control, Geneva.

Preparation and use

The mill must be anchored to the ground. Before starting up, a manual check should be made to ensure that the grindstones are not too close together. The mill must not be set in motion with the driven grindstone flush against the other.

When the mill is in operation, care must be taken to ensure that the grain hopper is not empty and that the hopper outlet is unlatched.

If the hopper is allowed to empty completely or the sack becomes over-full, the mill may break down.

The mill is not equipped with any device for cleaning the grain before grinding. All hard objects, such as fragments of metal, must be removed to avoid damage to the grindstones.

The driven grindstone rotates clockwise, as shown by the red arrow painted on the mill.

The driving team must move anti-clockwise.

Care and maintenance

When the mill is in operation, it must be lubricated every few hours. Lubrication points are marked in red. The grooves in the grindstones should be checked from time to time. If the grindstones are not in a satisfactory condition they should be removed and recut.

The mill should not be left for too long in a very damp place, or the grindstones may deteriorate and break-up in use.

2. WINNOWER - Type No. WRL-05 (M-305(1))

This Winnower is used to winnow grain coming from a threshing machine which is not equipped with a cleaning device. The winnower is operated by two persons.

Technical specifications

Output	600 kg/h
Length	2,150 mm
Width	1,210 mm
Height	1,320 mm
Weight	about 130 kg
Number of upper sieves	7
Size of upper sieves	500 x 550
Number of lower sieves	2 + 1
Size of lower sieves	586 x 700

The principal components of the winnower:

1. Frame. 2. Input hopper. 3. Set of upper sieves. 4. Set of lower sieves. 5. Vertical shaker. 6. Horizontal shaker. 7. Movable waste chute. 8. Rotor. 9. Damper. 10. Shaker-ejector.

The working parts of the winnower:

5. Vertical shaker. 6. Horizontal shaker. 8. Rotor. 10. Shaker-ejector. 11. Toothed wheel. 12. Crank.

Operation

The grain is poured into the hopper, from which it passes through an adjustable slit on to the shaker, which spreads it evenly over the top sieve.

The draught from the rotor (fan) blows off dust and chaff.

After this first cleaning, the grain passes through the top sieve to the second sieve, which has a very much finer mesh. The waste separated by the second sieve is carried away by the chute.

The grain then passes to the third sieve of the winnower, which slopes forward. This sieve has an even finer mesh, through which sand and other wastes pass.

The grain, by now almost completely clean, slides from the third sieve into the bottom sieve. Here it is divided into two grades: siftings, which pass through the mesh and fall on to the ground below the winnower, and pure grain, which slides forwards down the sieve and is collected by the operator.

Use

The winnower must be anchored to the ground. It should not be on a slope but should be set level, so that the grain will fall easily on to the sieves. The machine will not work properly in a high wind. If it is in the open air it should face into the wind. The sieves used for cleaning and grading the grain are in the following mesh sizes (in mm):

Upper sieves: 20 x 20, 10 x 10, 8 x 8, 7.1 x 7.1, 6.3 x 6.3, 5 x 5, 2 x 2.
Grading sieves: 3.2 x 3.2, 2.5 x 2.5, 1.8 x 1.8.

In selecting sieves, the data below should be taken as a guide.

Sieves	Mesh size			
	wheat	rye	barley	oats
Upper sieves				
Top	20 x 20	20 x 20	20 x 20	20 x 20
2nd from the top	6.3 x 6.3	5 x 5	7.1 x 7.1	7.1 x 7.1
3rd from the top	2 x 2	2 x 2	2 x 2	2 x 2
Bottom sieves	2.5 x 2.5	2.5 x 2.5 or 1.8 x 1.8	2.5 x 2.5	2.5 x 2.5

The mesh sizes given in this table are intended only for guidance. Sieves should be selected according to the size and degree of impurity of the grain.

The draught is regulated by adjusting the opening from the fan.

If there are siftings or ears of wheat in the duct, it should be raised; if, on the other hand, there is chaff in the duct, it should be lowered.

The tilt of the upper sieves can also be adjusted to assist the smooth flow of the grain to the lower sieves.

The crank should be turned evenly at a speed of 45-60 rpm.

The winnower should be lubricated according to the frequency of its use. Vegetable oil should not be used, and no grease should be applied to toothed wheels.

The two wheels are used when the machine has to be moved a short distance. The WRL-05 winnower is not designed for towing behind a tractor or other vehicle.

3. ROOT CUTTER - Typy No. H-107/1

The root cutter is used for cutting up beets, potatoes, turnips and other vegetables.

Technical specifications

Diameter of cutting plate	450 mm
Number of blades	56
Hopper capacity	about 22 kg
Output	about 500 kg/h
Length	990 mm
Width	800 mm
Height	1,150 mm

Use

The root cutter should be anchored to the ground by four nuts as shown temporarily by means of a rod.

Vegetables placed in the hopper fall under their own weight between the plates, which are fitted with blades. The vegetables are cut by cranking the handle to rotate the conical plates. The small pieces fall on to the lower walls of the root cutter and then slide into the receptacle positioned below the machine.

Care and maintenance

If the machine is lubricated regularly, the plates will be easier to turn. The bearings of the root cutter are fitted with capped grease-nipples. After filling with grease, the cap of the grease-nipple should be screwed down on the body until no more grease is visible on the outside of the bearing.

The blades should be checked from time to time to ensure that they are not loose. If there is any play, a hand anvil should be placed under the head of the rivet and the rivet hammered from the other side.

The root cutter should be thoroughly cleaned after use; if it is not to be used again in the near future, the conical plates and blades should be coated with grease. The free grease should be cleaned off before the machine is brought back into use.

4. THRESHING MACHINE - Type No. MO118/0

The MO118/0 threshing machine is designed for threshing wheat; it leaves the straw fairly straight.

Technical specifications

Length of drum	1,800 mm
Diameter of drum	330 mm
Number of beaters	6
Width of beaters	35 mm
Basket	simple
Drive	by a team of 3-4 horses or by a 3-4 hp motor
Number of operators	5 to 7
Output	300 kg grain per hour
Length	1,930 mm
Width	1,020 mm
Height	1,500 mm
Weight	about 620 kg

Design

The frame of the threshing machine is made of angle and sheet iron. On the upper bars, front and rear, there are two seatings, holding two ball-bearings on which a shaft rotates with the drum. The three right beaters and the three left beaters are fixed to the drum. A part of the drum is encircled by a basket which consists of two curved pieces and one rib, joined by nine bars (beaters).

The 96 rods which pass through the bars form the grate of the basket, which is mounted on adjustable bearings. The basket can be moved towards or away from the beaters of the drum by means of a lever and the adjusting screws on the bearings, so as to reduce or increase the gap into which the sheaves are fed and in which threshing takes place.

The drum can be halted by means of a foot-brake.

The thresher is mounted on four wheels and can be towed from place to place.

The thresher frame carries a hopper, from which the wheat is fed into the machine, and a work table.

The straw is ejected behind the machine.

Use

The wheat for threshing should be spread on the table and fed evenly into the gap between the drum and the basket. The basket should be adjusted so that the inlet gap is about 22-24 mm wide and the outlet gap 4-5 mm wide. If the grain is damaged, the width of the gap should be increased.

After each adjustment, the machine should be checked to ensure that the beaters are not rubbing against the bars of the basket.

If the thresher rotates too rapidly, the grain will be damaged; if it turns too slowly, the threshing will not be satisfactory. If the threshing machine is driven by a team of horses, the horses must make 2 to 2.5 circuits per minute in order to rotate the drum at 42 rpm.

The thresher should be properly immobilized by chocking the wheels. All moving parts should be well lubricated before use.

The threshing machine should be run empty for about ten minutes and watched carefully to ensure that the bearings are not heating up and the drum is not making any unusual noise.

NOTE: This translation into English is distributed by the United Nations Division of Narcotic Drugs, Palais des Nations, Geneva, Switzerland, to which any enquiries should be addressed.