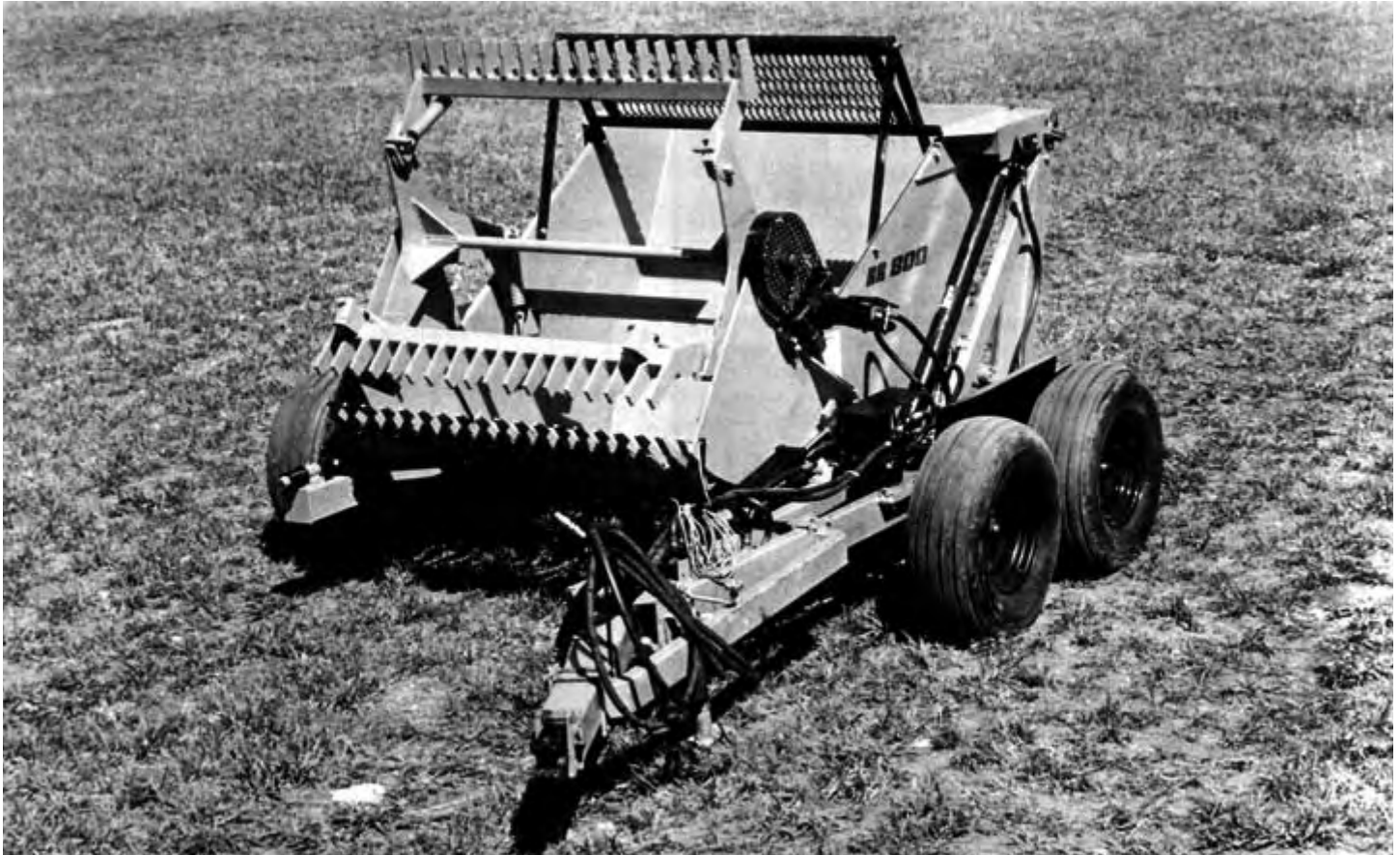


Evaluation Report

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Rite-Way RR-800H Rotary Rock Picker

A Co-operative Program Between



RITE-WAY RR-800H ROTARY ROCK PICKER

MANUFACTURER AND DISTRIBUTOR:

Rite-Way Manufacturing Co. Ltd.
Box 3344
Regina, Saskatchewan
S4P 3H1

RETAIL PRICE:

\$8,775.00 (December, 1981, f.o.b. Humboldt, complete with optional tandem wheels, hydraulic flow control valve and rock guard).



FIGURE 1. Rite-Way RR-800H Rotary Rock Picker.

SUMMARY AND CONCLUSIONS

Overall functional performance of the Rite-Way RR-800H rock picker was good in small rock and fair in large rocks. Ease of operation and adjustment were good.

Typical field speeds were from 2 to 8.1 km/h (1.2 to 5.0 mph) in scattered rocks and from 1.0 to 3.8 km/h (0.6 to 2.4 mph) in windrowed rocks. Ground speed was usually limited by rock build-up on the grate. The Rite-Way RR-800H could pick rocks from 50 mm to 685 mm (2 to 27 in) in size. In rocks greater than 370 mm (14.5 in) in size, the workrate was reduced by rocks frequently jamming between the reel and the grate.

The amount of soil and trash delivered to the hopper depended on operating depth, reel speed and field conditions. In most conditions, soil retention was small.

Hopper capacity was about 1814 kg (4000 lb). The hopper dumping height of 2180 mm (86 in) was adequate for piling rocks.

A tractor with 45 kW (60 hp) maximum power take-off rating had sufficient power reserve to operate the Rite-Way RR-800H in most field conditions. The Rite-Way rock picker transported well at speeds up to 40 km/h (25 mph).

The operator manual contained a parts list and a brief list of operating and servicing instructions.

The Rite-Way RR-800H was safe to operate as long as normal safety practices were observed. A serious safety hazard was encountered when removing rocks that had jammed between a reel bat and the grate. A slow moving vehicle sign was not supplied.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifications to reduce rock jamming between the reel bats and grate.
2. Supplying an optional hydraulic valve kit for tractors that cannot divide the hydraulic flow to operate the grate lift and reel at the same time.
3. Providing a more convenient grate transport lock.
4. Modifications to protect grate pivot and cylinder slider grease

- fittings from damage by flying rocks.
5. Supplying a slow moving vehicle sign.
6. Modifications to protect the hydraulic valves, hoses and fittings from rock damage.
7. Modifications to reduce the number of reel drive chain failures.
8. Modifications to reduce the number of reel spring failures.
9. Modifications to prevent rock damage to the hopper bottom and the hopper rock guard.
10. Modifications to prevent rock damage to the fenders.
11. Modifications to reduce tandem wheel pivot wear.

Senior Engineer: G.E. Frehlich

Project Technologist: D.H. Kelly

THE MANUFACTURER STATES THAT

With regard to recommendation numbers:

1. Modifications to the reel and grate have been made to reduce rock jamming.
2. An optional hydraulic valve kit for these tractors is available on 1982 models and up.
3. We recommend using the mechanical stroke adjustment on the cylinder to lock the grate in a raised position during transport.
4. Modifications to protect the grate pivot and cylinder slider grease fittings will be implemented on 1982 models and up.
5. A slow moving vehicle sign will be available as an option in 1982.
6. Protective covers for the hydraulic valves, hoses and fittings are provided for 1982 models and up.
7. This recommendation will be investigated.
8. Newly designed springs are being used on 1982 models and up.
9. The hopper bottom and rock guard have been redesigned to provide greater strength.
10. The fender supports will be strengthened on new production machines.
11. Modifications have been made to reduce tandem wheel pivot wear.

MANUFACTURER'S ADDITIONAL COMMENTS

In our opinion, the performance of the Rite-way RR-800 hydraulic high dump rock picker is better than any rotary rock picker available today. For large rocks ranging in size from 300 to 1500 pounds, it is recommended that the operator use the machine as a prong type rock picker. This is accomplished by timing the bats to allow the rock to slide onto the grate, then activating the reel to clamp the rock in position. By raising the grate to the highest position using the two hydraulic cylinders, the reel can be rotated to slide the rock into the hopper.

All Rite-Way rock pickers are equipped to pick rocks in this manner. This method is safe and causes very little stress to either the tractor or the rock picker.

NOTE: This report has been prepared using SI units of measurement. A conversion table is given in APPENDIX III.

GENERAL DESCRIPTION

The Rite-Way RR-800H is a pull-type rock picker with a 1.5 m (58 in) wide grate. It is supplied with a standard hydraulic reel drive, powered by the tractor hydraulic system. Optional ground driven or 540 rpm power take-off driven reels are available.

The Rite-Way RR-800H is designed for picking rocks from the soil surface. An inclined, adjustable finger grate, consisting of 19 steel bars spaced at 50 mm (2 in) operates just beneath the soil surface. Rocks are assisted onto the grate and conveyed along it, into a hopper by a circular reel. The reel has three spring loaded bats, each with 18 teeth. The hopper holds about 1814 kg (4000 lb) of rocks. Grate height and hopper dumping are hydraulically controlled.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Rite-Way RR-800H was operated in the conditions shown in TABLE 1 for 101 hours. Most of the tests were conducted in severe windrowed rock conditions. The Rite-Way RR-800H was evaluated for rate of work, quality of work, ease of operation and adjustment, power requirements, safety and suitability of the operator manual.

TABLE 1. Operating Conditions

Rock Size	Hours
Less than 200 mm (8 in)	41
200 to 300 mm (8 to 12 in)	37
Greater than 300 mm (12 in)	23
Total	101
Rock Concentration	Hours
Light	10
Medium	30
Heavy	61
Total	101

RESULTS AND DISCUSSION

RATE OF WORK

Suitable field speeds ranged from 2 to 8.1 km/h (1.2 to 5.0 mph) in scattered rocks and from 1 to 3.8 km/h (0.6 to 2.4 mph) in windrowed rocks. Maximum speed was determined by operator skill, rock size, rock concentration, and field conditions. In heavy rock concentrations, rock build-up on the grate limited ground speed to 3 km/h (2 mph). Ground speed was further reduced in rocks larger than 370 mm (14.5 in), since the reel frequently jammed.

QUALITY OF WORK

Picking Characteristics: The reel bat arms were spring loaded to allow the bats to retract up to 370 mm (14.5 in) to clear obstructions. The hydraulic reel drive was equipped with a pressure relief valve.

Reel aggressiveness was fair. If too many rocks were fed onto the grate, the reel bats retracted causing rock build-up on the grate. In heavy concentrations of small rocks (FIGURE 2), two passes were usually needed to remove most of the rocks.



A)



B)

FIGURE 2. Performance in Small Rocks: A) Before Picking, B) After Two Passes with Picker.

In large rocks (FIGURE 3), one pass was usually sufficient. Large rocks frequently jammed between fully retracted reel bats and the grate (FIGURE 4) stopping the reel. Such rocks could usually be removed by reversing the reel. Occasionally, jammed rocks had to be removed with a tractor and a chain. Modifications to reduce rock jamming are recommended.



A)



B)

FIGURE 3. Performance in Large Rocks: A) Before Picking, B) After One Pass with Picker.



FIGURE 4. Typical Rock Jam.

The 1.5 m (58 in) grate was wide enough to accept most rock windrows. In non-windrowed areas of concentrated rock, a wider grate would be desirable.

Reel Speed: Proper reel speed was necessary to fully utilize hopper capacity and to obtain maximum workrate. Rocks accumulated at the front of the hopper and reduced hopper capacity when the reel speed was too slow. If the reel speed was too fast, rocks were thrown over the back of the hopper. The optional rock guard reduced the number of rocks thrown over the hopper.

The operator manual recommends a reel speed of 25 to 45 rpm for most field conditions. A tractor capable of supplying a hydraulic flow of 54 L/m (12 gpm) was needed to run the reel at 45 rpm when using the hydraulic reel drive. This speed was adequate for most field conditions.

To effectively remove surface rocks and to minimize soil retention in the hopper, both the reel speed and the ground speed had to be selected to suit field conditions. In scattered rocks, best

performance was achieved with a tooth index¹ of about 1.5 in fields with light rock concentrations, 4 in fields with medium rock concentrations and 6.1 in fields with heavy rock concentrations. In windrowed rocks, best performance was achieved with a tooth index of about 3.2 in fields with light rock concentrations, 6.8 in fields with medium rock concentrations and 12.2 in fields with heavy rock concentrations.

Operating at the recommended reel speed of 45 rpm corresponding ground speeds were about 8.1, 3.0 and 2 km/h (5.0, 1.8 and 1.2 mph) in scattered rocks for light, medium and heavy rock concentrations, respectively. In windrowed rocks, ground speeds were about 3.8, 1.8 and 1.0 km/h (2.4, 1.1 and 0.6 mph) for light, medium and heavy rock concentrations, respectively.

Operating Depth: It was usually best to operate with the grate just touching the soil surface. This was adequate for removing rocks lying on the surface, however, partially buried rocks were pushed back into the soil by the grate. The grate could be set below the soil surface to remove small embedded rocks if the field was not too firm. Caution was needed to prevent damage to the grate and frame when working in fields containing large embedded rocks.

Trash and Soil Retention: The amount of soil and trash placed in the hopper depended on machine operation and field preparation. The amount of soil retained was small in most field conditions. Operating with the grate set too low, the reel speed too fast or in fields containing dirt lumps or trash, increased the amount of soil and trash retained. Properly formed, clean windrows were necessary to minimize soil retention when picking fields windrowed with a rock rake.

Field Preparation: Best performance was in fields with a firm base and a minimum amount of trash or dirt lumps. It is often desirable to use a rod weeder before picking, to place rocks on the surface, and to firm the soil.

The use of a rock rake is recommended when working in fields with an abundance of rocks smaller than 300 mm (12 in). The rock rake brings most rocks to the surface and reduces picking time.

Stability: The Rite-Way RR-800H was very stable. Skewing occurred only when the grate hooked large subsurface rocks. When this occurred, the grate either jumped over the rock or the picker skewed to the left until the grate cleared the rock.

Rock Size: The Rite-Way RR-800H could effectively remove rocks ranging in size from 50 mm (2 in) to 685 mm (27 in). Rocks smaller than 50 mm (2 in) fell through the grate and remained in the field. Rocks larger than 685 mm (27 in) would not pass between the reel centre shaft and the grate.

EASE OF OPERATION AND ADJUSTMENT

Reel Drive: The test machine was equipped with the standard hydraulic reel drive, powered by the tractor remote hydraulics. Reel speed could be varied by adjusting the optional flow control valve on the rock picker. The operator manual recommended that a tractor with a hydraulic system capable of 12,410 to 15,168 kPa (1800 to 2200 psi) at 81 to 90 L/m (18 to 20 gpm) be used. The test machine was operated with a tractor capable of 15,500 kPa (2250 psi) at 68 L/m (15 gpm). This was adequate for most field conditions. The hydraulic pressure relief valve effectively prevented damage to the reel and grate during the test.

On some tractors, the grate lift response was very slow when the reel was operating, even though the tractor hydraulic flow was sufficient to operate the reel and grate lift at the same time. Although the tractor flow was adequate it could not be properly divided between the two functions. It is recommended that the manufacturer supply an optional valve kit to allow the rock picker to be used on these tractors.

Bat force was adjusted by changing the tension of the reel springs. Clearance between the bat teeth and the grate was not adjustable.

The reel could be easily reversed from the tractor to clear rock blockages or build-up on the grate.

Hopper Dumping: The hopper held about 1815 kg (4000 lb) of large or small rocks when completely filled (FIGURE 5). One pair of tractor remote hydraulic outlets and a selector valve on the rock picker raised the hopper for dumping and controlled the grate height. To dump the hopper, the tractor hydraulic lever was activated

after the selector valve was set to the hopper control position by pulling a rope running to the tractor. The hopper emptied completely and could pile the rocks 2180 mm (86 in) high.



A)



B)

FIGURE 5. Typical Hopper Loads in A) Small Rocks, B) Large Rocks.

Maneuverability: The Rite-Way RR-800H was quite maneuverable. Its turning radius was short enough for easy operation, however, normal care had to be taken to prevent interference between the tractor tire and the picker frame when making right turns.

Since it is desirable to feed rocks into the rock picker without driving over them, the distance between the hitch and the outside of the right tractor tire should not exceed 795 mm (31 in).

Transporting: The Rite-Way RR-800H was easily transported. It towed well at speeds up to 40 km/h (25 mph). The 207 mm (8 in) transport clearance was adequate. The transport locks were difficult to install and a storage location was not provided when they were not in use. To lock the grate for transporting, a metal spacer had to be attached to the fully extended cylinder rod with a hose clamp (FIGURE 6). Modifications to provide a more convenient transport lock are recommended.



FIGURE 6. Transport Lock.

¹The tooth index is the ratio of the tangential tooth tip speed to the forward speed. A high tooth index gives aggressive picking action.

Hitching: The Rite-Way RR-800H was easily hitched to a tractor. A hitch jack was provided and the hitch clevis was fixed allowing one-man hook-up. The hitch clevis was adjustable vertically to permit frame levelling.

Ease of Servicing: Servicing was easy. All grease fittings and chains required lubrication twice daily and were accessible. Greasing fittings on the grate pivot and grate cylinder sliding mechanism were easily damaged by rocks. Modifications to protect these fittings from rock damage are recommended.

POWER REQUIREMENTS

A tractor with 45 kW (60 hp) maximum power take-off rating had sufficient power reserve to operate the Rite-Way RR-800H in most conditions. Average power requirements varied widely, depending on field conditions. High draft forces occurred when the grate hooked partially buried rocks.

OPERATOR MANUAL

The operator manual contained a parts list and a brief list of operating and servicing instructions. It is recommended that the operator manual be expanded to include detailed information on operation, adjustment and servicing.

OPERATOR SAFETY

The Rite-Way RR-800H was safe to operate and service as long as common sense was used in following good safety procedures.

A serious safety hazard was encountered when rocks jammed between the reel bat and the grate, fully retracting the reel bat under spring pressure. Serious bodily harm could result if the bat suddenly released when the operator was removing the rock. Modifications to reduce the frequency of rock jams have been recommended.

The maximum load on each of the four 11L x 15, 6-ply tires was 1047 kg (2310 lbs) with a full hopper. This was below the maximum load of 1120 kg (2470 lbs) recommended by the Tire and Rim Association.

No slow moving vehicle sign was supplied. It is recommended that a slow moving vehicle sign be supplied as standard equipment.

DURABILITY RESULTS

TABLE 2 outlines the mechanical history of the Rite-Way RR-800H during 101 hours of field operation. The intent of the test was functional evaluation. The following mechanical problems are those, which occurred during the functional testing. An extended durability test was not conducted.

TABLE 2. Mechanical History

Item	Hours
Hydraulics:	
-The knob on the reel flow control valve was broken by a rock and repaired at	4, 31
-The hopper or grate cylinder hydraulic hoses were broken by rocks and replaced at	9, 29, 44, 97
-The steel hydraulic lines to the right hopper or grate cylinders were broken by rocks and replaced at	31, 32, 44, 76
-A grate cylinder hydraulic fitting was broken by a rock and replaced at	24, 58
-A hopper cylinder hydraulic fitting was broken by a rock and replaced at	9, 23, 31, 68
-A hydraulic fitting on the reel flow control valve was broken by a rock and repaired at	36, 41, 44, 49
Reel:	
-A reel bearing flange was broken by a rock and replaced at	80
-The reel drive sprocket failed and was replaced at	62
-The reel drive chain failed and was repaired at	16, 23, 24, 49, 54, 58
-A reel spring failed and was replaced at	23, 27, 29, 36, 49, 54, 101
-The reel drive chain guard failed and was repaired at	36, 41
-A reel bat failed and was repaired at	49, 95, 97
-The reel shaft failed and was replaced at	54
Hopper:	
-The hopper bottom grate was broken by rocks and was repaired at	62, 71, 81
-The hopper rock guard was broken by rocks and was repaired at	54
Fenders:	
-The wheel fenders were bent by rocks and were straightened at	24, 31, 54, 62
Wheels:	
-The tandem wheel pivots wore excessively	during the tests

DISCUSSION OF MECHANICAL PROBLEMS

Hydraulics: The adjustment knob and hydraulic fittings on the flow control valve, and the hydraulic hoses, steel lines and fittings on the grate and hopper cylinders were broken by rocks falling from the hopper. It is recommended that the manufacturer consider

modifications to protect the hydraulic valve, lines and fittings from rock damage.

Reel: The reel drive chain failed several times when rocks jammed between the reel and the grate. Modifications to reduce the number of drive chain failures is recommended.

The reel springs permanently deformed or failed when the bats retracted fully. Modifications to reduce reel spring failures are recommended.

Three reel bats and one reel shaft broke from extended operation in severe windrowed rock conditions. Reel bat and shaft failures may not occur in less severe rock conditions.

Hopper: The wire mesh rock guard and hopper bottom were broken by rocks. Modifications to prevent damage to the hopper bottom and hopper rock guard are recommended.

Fenders: The fenders began to rub on the tires after being bent by rocks falling from the hopper. Modifications to prevent rock damage to the fenders are recommended.

Wheels: The tandem wheel pivots wore excessively during the tests. Modifications to reduce tandem wheel pivot wear are recommended.

**APPENDIX I
SPECIFICATIONS**

MAKE: Rite-Way Rock Picker
MODEL: RR-800H
SERIAL NUMBER: 174.004

WEIGHT: (hopper empty)
 -- left wheel 890 kg
 -- right wheel 930 kg
 -- hitch 265 kg
 TOTAL 2085 kg

TIRES: 4, 11L x 15, 6-ply

OVERALL DIMENSIONS:
 -- width 2680 mm
 -- height 1920 mm
 -- length 4450 mm
 -- ground clearance 207 mm

GRATE:
 -- width 1520 mm
 -- number of grate bars 19
 -- space between grate bars 50 mm
 -- length of grate bars 735 mm
 -- grate angle while operating 55 degrees

REEL:
 -- diameter 1440 mm
 -- number of bat arms 3
 -- number of teeth per bat 18
 -- spacing between teeth 65 mm
 -- tooth length 127 mm
 -- reel speed 0-52 rpm at 68 L/m

HOPPER:
 -- hopper dumping height 2180 mm
 -- hopper capacity 1814 kg

HYDRAULIC MOTOR: 1, Char-Lynn No. 104 1028 005

NUMBER OF HYDRAULIC CYLINDERS: 4

NUMBER OF CHAIN DRIVES: 1

NUMBER OF LUBRICATION POINTS: 8

OPTIONAL EQUIPMENT:
 -- ground driven or 540 PTO driven reels
 -- hydraulic flow control valve
 -- rock guard
 -- tandem wheels

**APPENDIX II
MACHINE RATINGS**

The following rating scale is used in Machinery Institute Evaluation Reports:

a) excellent	d) fair
b) very good	e) poor
c) good	f) unsatisfactory

**APPENDIX III
CONVERSION TABLE**

1 hectare (ha)	= 2.5 acres (ac)
1 kilometer/hour (km/h)	= 0.6 miles/hour (mph)
1 metre (m)	= 3.3 feet (ft)
1 millimeter (mm)	= 0.04 inches (in)
1 kilowatt (kW)	= 1.3 horsepower (hp)
1 kilogram (kg)	= 2.2 pounds mass (lb)



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