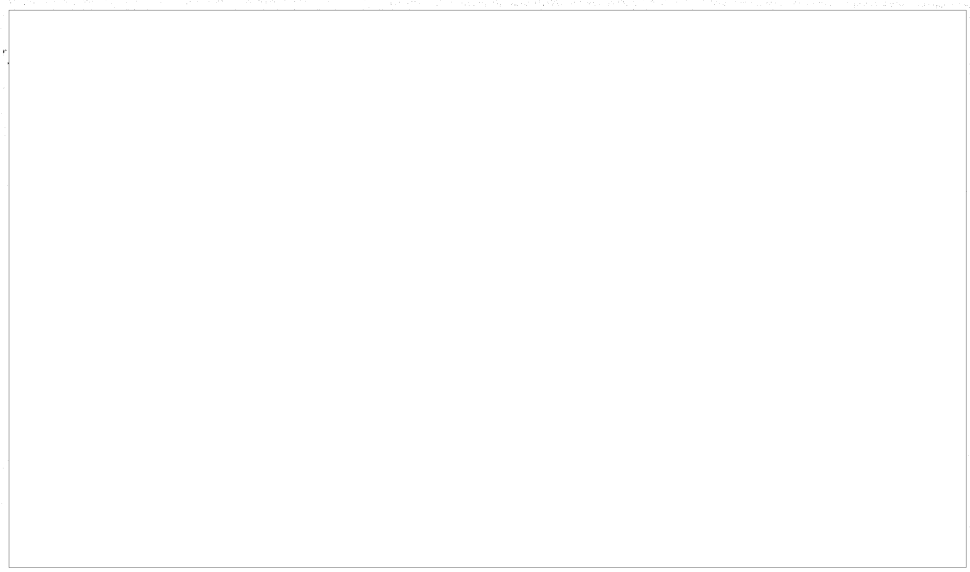

Title: SOVIET TRACK TOOLS AND MACHINERY - USSR

Source: Spravochnik Dorozhnogo Mastera i Brigadira Puti, Russian handbook for Track Foreman and Track Brigade Leaders, Chapter VIII, Moscow, Transzheldorizdat, 1950

SOVIET TRACK-Tools AND MACHINERY

For rapid and continuous checking of track over long distances rather than at specific points, track-measuring trucks and track-measuring cars are employed. On USSR railroads Dolgov track-measuring trucks and Lyashenko and Dolgov track-measuring cars are used.

The Dolgov track measuring truck [redacted] is moved along the tracks by hand, or by hitching to a hand car. When towed by a hand car the truck should not travel faster than 10 kilometers per hour.

As the truck moves along, measuring instruments automatically and continuously record by means of pencils on a moving paper tape all deviations of the track gage from normal position according to gage and level.

The track-measuring car, besides deviations of width and level, also records horizontal and vertical thrusts.

For continuous mechanical examination of rails, Soviet railroads are currently using defect detector cars, defect detector units mounted on U[A] hand cars, and SFTI-13 defect detector trucks (designed by the Siberian Physico-Technical Institute. Two-filament Model No 13).

The purpose of all types of defect detector units is:

(1) To detect rail defects (including invisible internal defects) throughout the entire length of the rail, with the exception of joints under cover plates;

(2) To record the defects detected in writing on the moving paper tape of a recording apparatus, and also to give light and sound signals.

Recently the Siberian Physico-Technical Institute designed, tested and now is producing a small quantity of defect detectors for rail joints.

Ballasting Machine (track lifter and shifter) designed by Stalin Prize Winners Barykin, Belogortsev and Aleshin

The basic purpose of this machine is the continuous lifting of track for ballasting during reconstruction, capital and medium repairs, and when laying new track. The ballasting machine can also perform moving and rough-bending of track, as well as lifting and installing small 2-S metal forms.

Recently the ballaster has been adapted for cutting fouled ballast from under ties and for performing other work.

The basic working parts of the ballaster are:

(1) Two wings which distribute the ballast onto the tracks, that is, which transfer and then level ballast previously dumped along the track;

(2) A hoisting frame with tongs which pick up the rails by the head and hold them at a height of 35 centimeters while the machine is in motion;

(3) Two ballasting frames, on the lower part of which are fastened crosspieces to level the ballast under the crossties while the track is raised;

(4) A straightening mechanism for moving the track and truing it in plane.

SPECIFICATIONS OF THE BALLASTING MACHINE (1936 MODEL)

Width of open wings (meters)	Up to 6
Height track can be lifted for ballasting at one pass (centimeters)	5 - 28
Span of track lifted free between the wheels (meters)	26.0
Clearance of machine in travelling condition	1-V
Length of machine over buffers (meters)	47.19
Working speed of machine (km/hr)	5-15
Weight of machine (tons)	80.2

When operating the machine should be pulled by a locomotive at least as powerful as a Series E or Shch.

When depositing ballast on the tracks the machine moves with a speed of up to 15 kilometers per hour; when lifting track, 10 kilometers per hour.

The ditcher-spreader, which is widely used in the USSR, performs the following operations:

1. In summer:

   (a) Clearing and deepening ditches

(b) Cutting new culverts in cuts and flat locations

(c) Cutting shoulders in fills and cuts

(d) Grading of the ballast layer

(e) Cutting and finishing the slopes of cuts and fills

(f) Various planing jobs in construction of second tracks, shearing and leveling of earth and ballast

2. In winter:

(a) Clearing snow from station tracks

(b) Ice removal

(c) Piling snow at snow train dumping points

(d) Keeping culverts open for the accomodation of spring flood water

The working equipment of the ditcher-spreader consists of a center plow and two wings. The plow, working as either a single-track or double-track snow plow, consists of two front and two side moldboards.

The main working components of the machine are the side wings (only one wing at a time is actually working).

SPECIFICATIONS FOR DITCHER-SPREADER MANUFACTURED IN 1936

Weight (tons)	45
Length over buffers (millimeters)	18,340
Operating speed (kilometers/hour)	from 3 - 15
Maximum wing overhang from track axis (millimeters)	6,700
Maximum distance from lowest point of culvert to head of rail (millimeters)	1,300
Angle formed by wing and track axis (degrees)	45
Maximum distance between the axis of the culvert being cleared and the axis of track (millimeters)	3,650 - 4,300
Plow moldboards can be brought down [redacted] below the head of rail (millimeters)	50
Clearance in transport condition	1-V

Track-Laying Machine Designed by Stalin Prize Winner Platov

The Platov track-laying machine is designed for laying track by sections in new construction as well as in track renovation. In the latter case, it also dismantles track in sections.

It consists of a crane for the placing of track sections, and flat cars for transportation of track sections from the assembling base to the crane.

The Platov track-laying crane is a cantilever crane with a 9-meter boom. It is mounted on three gantry frames installed on a four-axle flat-car. Two hoisting tackle trolleys travel along the flanges of the lower beams of the crane boom for the purpose of lifting and lowering the track sections.

At the rear end of the crane is mounted an electric winch. The crane is equipped with two 73-hp ZIS-5 motors and an NM-40 direct-current 40-kilowatt dynamo.

The motors and the dynamo are mounted under the frame of the flatcar.

For the transportation of the assembled track sections a three-flatcar train is made up. The first flat car is self-propelled, and the other two are trailers. All flatcars are of the heavy-duty four-axle type.

The floors of all the flatcars, including the crane car, have conveyors consisting of two rows of double-flange rollers.

The self-propelled car is equipped with a 73-horsepower ZIS-5 motor.

PNEUMATIC MACHINERY FOR TRACK WORK

Equipment used to mechanize track work by pneumatic machines consists of the following basic units:

(1) Air compressor

(2) Pneumatic tools driven by compressed air

(3) Air lines consisting of flexible hose and metal gas pipes, through which the compressed air is delivered to the tools.

Compressors

In track work, mobile self-propelled compressors are used.

Each compressor consists of the following parts:

(1) The engine;

(2) The compressor proper, an air pump consisting of one or several piston air cylinders;

(3) Metal tank for the compressed air.

The basic principle of compressor operation is as follows:

The engine (usually of the internal combustion type) rotates the crankshaft of an air pump (compressor). The air pump sucks in the air through a purifying filter, compresses it, and forces it into the air receiving tank.

The most popular compressor on the railroads of the USSR is the Soviet manufactured ZIS-5 VVK-200 (or VVK-200 for short) which is mounted, with storage tank, on the chassis of a ZIS-5 truck.

The truck engine transports the unit and operates the compressor.

SPECIFICATIONS OF THE ZIS-5 VVK-200 AIR COMPRESSOR

Engine	ZIS-5
Engine power (horsepower)	72
Air Compressor	VVK-200
Air delivered per minute (volume figured in non-compressed state) (cubic meters)	4.5
Compressed air working pressure (atmospheres)	6
Fuel and lubricant used per 8-hour work day:	
(a) Gasoline (kilograms)	80
(b) Lubricating oil (kilograms)	4
(c) Compressor oil (kilograms)	1
(d) Lubricating grease (kilograms)	0.5

The VVK-200 compressor can service simultaneously one of the following group of operating tools:

(a) 8 crosstie tampers

(b) 4 rail drills

(c) 4 nut-tightening wrenches [nut setters]

(d) 4 spike pullers

(e) 4 spike driving hammers

(f) 8 riveting hammers

The VVK-200 compressor can ~~make its approach to the job~~ get to the working area either by highway or by rail.

Its maximum highway speed is 40 kilometers per hour; maximum rail speed is 80 kilometers when traveling on flanged wheels.

Air from the VVK-200 compressor is fed to the tools through flexible rubber hose.

If local conditions prevent the compressor from approaching close to the tracks, a rubber hose 40-50 meters long is fed from it. At the end of the hose is an air distributing bank, to which are connected individual 18-meter-long hoses, leading to individual tools at work.

When the compressor is stationed close to the track, the hoses for individual tools are connected directly to the compressor outlets.

Pneumatic Crosstie Tampers

To mechanize the operation of tamping the crosstie bottoms into the ballast, pneumatic and electric tampers are used.

Their specifications are given in Table 72:

SPECIFICATIONS OF PNEUMATIC CROSSTIE TAMPERS

Model	Weight in Kilograms	Actual air consumed (cubic meters per minute)	Blows per minute	tamping face area (millimeters)
ZK, Plant imeni L.M. Kaganovich	19.0	0.50	1,400	75 x 16

Model	Weight in Kilograms	Actual air consumed (cubic meters per minute)	Blows per minute	Tamping force area (millimeters)
ShA-19, "Pnevmatika" Plant	18.6	0.50	1,800	70 x 17
PD-4, "Pnevmatika" Plant	28.9	0.8-0.95	1,200	80 x 40

Note: Model PD-4 is obsolete; manufacture of it has been discontinued.

Pneumatic Spike-Driver

Rather similar in principle and construction to the pneumatic tamper. The main difference is the shape of the handles and the striking face, in which there is a socket that fits the spike head.

This pneumatic spike driver delivers 1,500 blows per minute, and is capable of driving from 8 to 12 spikes a minute. It is operated by one man.

Pneumatic Drills

These tools are used in track work for drilling holes in crossties and logs, and also in rails.

The working principle of the drill is as follows. An air motor is located in the tool housing. Compressed air fed from the compressor enters consecutively into the air cylinders of the motor and actuates their pistons, thereby rotating a crankshaft, which in turn, through a system of gears, rotates a spindle into which is inserted a drilling bit.

When necessary to drill holes in rails the pneumatic drill can easily be fitted to any type rail with the help of a special frame equipped with clamps that fit over the rail head. The forward feed of the bit is effected by pressing a lever regulating a rack and pinion gear.

The pneumatic drill is operated by one man.

It takes 30-40 seconds to drill a 30-millimeter hole.

A pneumatic drill for the drilling of holes in crossties and logs for spikes and bolts is operated by one man. It takes 6-7 seconds to drill a hole.

Pneumatic Nut Runner

Similar in its operation to the pneumatic drill above.

This pneumatic wrench can be used for any nut. By setting the sleeve to loosening or tightening position on the wrench handle, right or left travel will be imparted to the wrench.

The "Pneumatika" Plant makes the Model GK pneumatic nut runner, which weighs 18.2 kilograms and consumes 1.2 cubic meters of air per minute. It is operated by two men. It will tighten 60 six-bolt joints in one hour.

ELECTRIC MACHINERY FOR TRACK WORK

The electrical equipment utilized in the mechanization of track work, like the pneumatic equipment used, is composed of three basic parts:

(1) The electric power installation, which generates the electric power;

(2) The electrically-operated tools;

(3) Insulated cables for feeding the electric current from the power installation to the working tools.

The mobile motor-generator made at the Kaluga Plant is mounted on the chassis of a ZIS-5 truck.

It is adapted for either highway or rail travel by equipping it with either pneumatic rubber tires or truck tires with steel flanges.

The self-propelled motor generator is designated to feed electric current to portable electric tools such as wood and metal drills, rail-cutting saws, crosstie tampers, nut runners, etc.; it also can be used for lighting purposes at night.

SPECIFICATIONS

Electric Generator

Model SG-501/1-6

Capacity (kilowatts)	23
Current characteristics	Alternating, 3-phase
Voltage	220/380
Number of cycles	50
RPM	1,000

Motor

Model	ZIS-5 four-cycle
Maximum power developed (horsepower)	73
Maximum RPM	2,400
Working RPM	1,500
Fuel	Gasoline
Total weight of installation (kilograms)	5,300
Maximum speed of travel (kilometers per hour)	30

The ZhES 2.0-kilovolt-ampere motor generator ([redacted]) is at the present time the main power-generating unit used in running track maintenance.

The set is mounted on a welded tubular frame. It is carried from place to place by four men.

SPECIFICATIONS

Generator

Generator capacity	2 kilovolt-amperes (1.6 kw)
Voltage	230/133
Current (Amps)	5/8.5
Model	SGD-2A
RPM	3,000

Motor

Model	L-3/2
Power	3 hp
RPM	2,200

Fuel	2nd grade gasoline
Total weight of ZhES-2 (Kg)	200
Operating Personnel	One operator

The ZhES-4.5 motor generator put out by the Tambov Plant weighs 400 kilograms, and for this reason is almost unusuable as a portable unit for current track maintenance work. In view of this drawback, the Design Bureau of the TsUMZ has developed a 4.5 kilovolt-ampere motor-generator set mounted on a two-axle car.

SPECIFICATIONS OF THE ZhES-4.5

Generator	
Capacity (kilovolt-amperes)	4.5
Voltage	133/230
Current characteristics	Alternating, 3-phase
Model	SSG-4.5
RPM	1,500
Motor	
Model	L-6.2
Rated horsepower	6
RPM	2,200
Fuel	2nd-grade gasoline
Total weight of unit (KG)	400
Operating personnel	One operator

For feeding electric current from the ZhES-2 and ZhES-4.5 motor generators to electric track tools (tampers, rail saws and rail-drilling machines, grinders, etc.) in track maintenance work, a cable network is necessary.

The cable system consists of hose cable and connecting fixtures: switchboxes, distribution boxes, and junction boxes with either fork or socket connections.

The gages of cable ordinarily used for electric tool operations are as

follows: Main line, 3 x 10 + 1 x 6; distribution cables, 3 x 10 + 1 x 6; underwater cables, 3 x 2.5 + 1 x 1.5.

Four-strand KRPT cable should be used for track work; when necessary, a ShRPS cable can be substituted.

Electric Tampers

The main type of electric tamper used by the Soviet Union is the vibration-type tamper.

The vibration tamper made by the Zaporozh'ye Plant consists of a cylindrical body to one end of which is fastened a tamping blade in the shape of a curved spade; on the other end is a frame with handles. Inside the cylindrical body there is fastened to a shaft a small 0.5-horsepower electric motor. Also fastened to the shaft is a unilateral eccentric vibrator weight. Receiving current from the mobile motor generator, the small electric motor turns the shaft with the vibrator at a rate of 3,000 revolutions per minute, thus setting up the vibration.

The electric tamper built by the Zaporozh'ye Plant weighs 32.5 kilograms and strands one meter high.

For ballast, the working edge of the tamping blade is 87 x 20 millimeters; for sand, 237 x 20 millimeters.

To operate the electric tamper, the workers stand in pairs, as when operating the pneumatic tamper.

At present the Model EShP-1 electric vibration tamper is used for packing ballast under ties in running track maintenance. This tamper is more effective than the impact-type tamper. The tamper is fed from a mobile ZhES-2 or ZhES-4.5 motor generator. The EShP-1 electric tamper is built by the "Revolyutsionnyy trud" Plant of the Ministry of Transportation.

This tamper weighs 32 kilograms, is 1,130 millimeters long, 220 millimeters wide, 547 millimeters high, and has handles 590 millimeters long.

Electric Tie Boring Machine

The Soviet Type ESD-26 electric boring machine is mounted on a special mount so that pressure on the top of the machine lowers the drill. The depth of drilling is set beforehand by adjusting retainers.

In drilling shallow holes, the drill can be used without the mount by holding the drilling attachment by hand.

At present the TsNII tie boring machine is being used to mechanize the drilling of holes in crossties for spikes and wood screws.

This machine is mounted on a welded frame. For drilling holes in ties under a given type of rail, the frame is equipped with appropriate guides. The machine can drill holes for R43, R38, III-a and IV-a rails, for which purpose the machine is equipped with interchangeable guides fastened by bolts to the frame of the machine. The machine is operated by two men.

For the power source, the ZhES-2, the ZhES-4.5 or other mobile generators can be used.

The productivity of the machine when drilling six holes per tie is 60-80 ties per hour. The machine weighs 27.5 kilograms, is 2,007 millimeters long, 150-215 millimeters wide, and 440-515 millimeters high.

Electric Rail Boring Machine

At present, a boring machine made by the "Revolyutsionnyy trud Plant" is widely used for drilling holes in rails. The machine consists of a bed, an electric drill and a clamp. One worker operates the machine. Time required for drilling a hole is 2-3 minutes. The productivity of the machine on an 8-hour shift is 150-200 holes, depending on the type of rail. The machine weighs 35 kilograms; maximum drill diameter is 30 millimeters.

In track maintenance a good deal of time is spent cutting off rail ends. For this work, portable rail saws are used. These machines are powered by electric motors working off mobile motor generators or internal combustion engines.

A rail saw of modern design and light weight is being manufactured by the Tambov "Revolyutsionnyy trud" Plant.

Rail ends can be cut with this machine either with the rail installed in the track or when the rail has been removed.

The machine weighs 115 kilograms; the average operating speed of the saw is 40.3 meters per minute. The average time for cutting one R43 rail with the crankshaft turning clockwise is 13.4 minutes; turning counter-clockwise, 10.53 minutes. Hence it is recommended that cutting be done with the shaft turning counter-clockwise.

The machine is operated by one man and carried by two.

For mechanizing the running and loosening of screws when changing rails or ties, and the running and loosening of track-bolt nuts when changing rails and lubricating bolts, a screw-and-nut wrench, powered by an electric motor, is used. The electric screw-and-nut wrench needs a 2.0 kilovolt-ampere power plant for its source of power. Two men are required to operate the machine, one of whom must run the motor generator. The productivity of the electric wrench in running or unscrewing may be roughly considered as follows: screws, 100 per hour; track-bolt nuts, 60-80 per hour. The wrench weighs 85 kilograms.

An electric chain saw is used to make anticreeper cross braces. Operation of the saw requires two workers. One cut requires 30 seconds. The saw weighs 35 kilograms, is 1,200 millimeters long, 290 millimeters wide and 400 millimeters high. The speed of cutting is 6.7 meters per second. The width of the saw cut is 9 millimeters.

MACHINES WORKING OFF INTERNAL COMBUSTION ENGINES

Mechanical Screw Jack

The mechanical screw jack built by the Kaluga Plant is used for lifting track.

This jack has the following specifications:

Motor	L-12 (gasoline)
Lifting capacity of jack (tons	12
Maximum height of lift (centimeters)	60
Total weight (tons)	1.0

The jack consists of a 2-axle car on which is mounted a gasoline motor and two lifting screws seated underneath the frame in transverse sockets. To the frame of the car there are fastened two pairs of clamps which hold the rails by the head at two points on each side.

Motorized Rail Saw

The Zaporozh'ye Plant makes a motorized rail saw powered by a gasoline engine.

On the frame, which is mounted on wheels, is placed a gasoline motor. Through a transmission the motor drives a disk to which is fastened a connecting rod which connects with a saw frame. A clamp serves to fasten the machine to the rails.

The rail saw has the following specifications:

Motor	KIM (gasoline)
Power of motor (horsepower)	4.5
RPM	2,500-3,000
Number of double strokes of the saw per minute	50-60
Number of sawings per hour	About 6
Fuel consumption (grams/horsepower-hour)	550
Weight of machine (kilograms)	161

In place of the internal combustion engine an electric motor may also be used on the same mounting, thus making it an electric rail saw.

Rail Grinding Machine with Rail-Drilling Attachment

The rail-grinding machine built by the Zaporozh'ye Plant consists of an L/Z-2 three-horsepower gasoline motor mounted on a mobile cart and a flexible transmission shaft leading to an emery wheel.

The machine is used for grinding built-up rails and frogs, and also for grinding the cut-off ends of rails being welded.

Maximum fuel consumption (gasoline) is 400 grams per hour.

Besides the emery wheel, a special rail-drilling attachment can be connected to the machine, making it a rail-drilling machine.

END