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SURVEY OF UNDERGROUND HYDRAULIC COAL MINING TECHNOLOGY

VOLUME III. APPENDIX B: DATA ON HYDRAULIC MINING EQUIPMENT AND COMPONENTS

TERRASPACE, INCORPORATED

PREPARED FOR
BUREAU OF MINES

15 OCTOBER 1975

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16. Abstracts

Data on equipment and components that have been used in hydraulic mining experiments, tests, and operations were collected from the literature. Also data were obtained from U.S. manufacturers and suppliers of equipment that is potentially applicable and available in the U.S. for hydraulic mining. The data have been divided into 24 main categories and have been assembled on two-page data sheets in the report.

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APPENDIX B
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United States
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APPENDIX B

DATA ON HYDRAULIC MINING EQUIPMENT AND COMPONENTS

Data on equipment and components which have been used in hydraulic mining experiments, tests, and operations were collected from the literature. Also data were obtained from U.S. manufacturers and suppliers of equipment which is potentially applicable and available in the U.S. for hydraulic mining. The data have been divided into 24 main categories (see the following page) and have been assembled on two-page data sheets which follow.

Wherever possible, drawings or photographs are included immediately after each data sheet.

The number designation of each data sheet corresponds to the number of the section in Volume 1 which discusses the relevant equipment category.

In many cases, some of the relevant design and performance data were not found in the literature. In most cases, capital and operating costs were not available. Where relevant, estimates of the 1975 cost, exclusive of the installation cost, have been included, based on data obtained in the period January to March 1975, or extrapolated from an earlier date to 1975, with escalation for inflation.

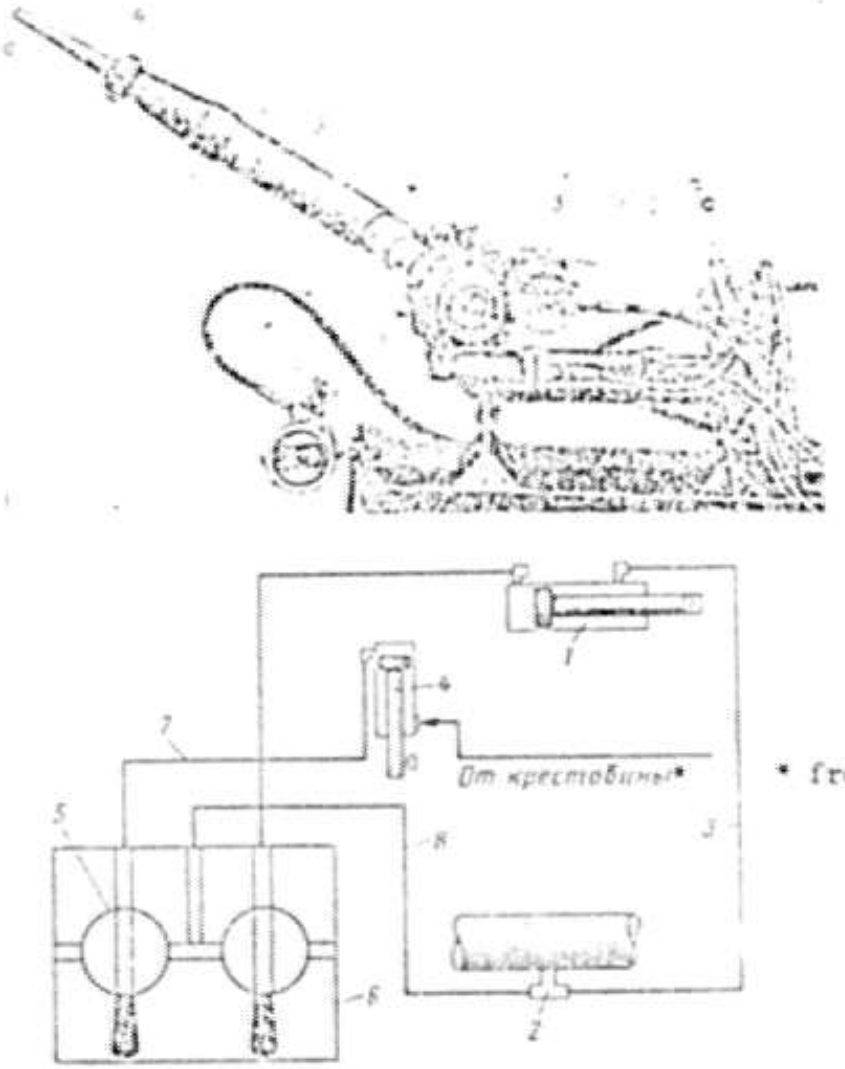
DATA SHEET 5.7.1-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor GMDTS-2
B. Country of Origin	USSR
C. Distinguishing Characteristics	Automatic swinging of shaft in horizontal plane with water hydraulic control
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Skids, supply pipe, barrel, nozzle elevation and rotation cylinders
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	For thin seams at any pitch angle
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKRNIIGidrougol Institute
11. Status of Development	Developed, but with limited use

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Donbass
16. Type of Control A. Input	Automatic swinging in horizontal plane; jacks operated by high pressure mine water
B. Comments	Remote control system not reliable so GMDTS-2m was developed
17. Reliability	
18. Safety	Not good as when water pressure is turned on, shaft usually rises upward sharply and turns to the left, possibly displacing timber and creating danger for the operator
19. Major Causes of Failure	
20. Maintenance Requirement	15 to 20 shifts in soft coal, 8 to 10 shifts in anthracite
21. Major Overhaul	Repair twice a year, overhaul once a year
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	Water operated control cylinders corroded easily; operation unsafe. Needs service twice a month.
24. Pertinent Reference Documents	238
25. Drawing(s)	p. 9, fig. 62b
26. Photograph(s)	p. 9, fig. 62a

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* from the cross brace

Fig.62. Hydromonitor GMDTS-2

a.- Installation diagram; b.- hydraulic remote control diagram

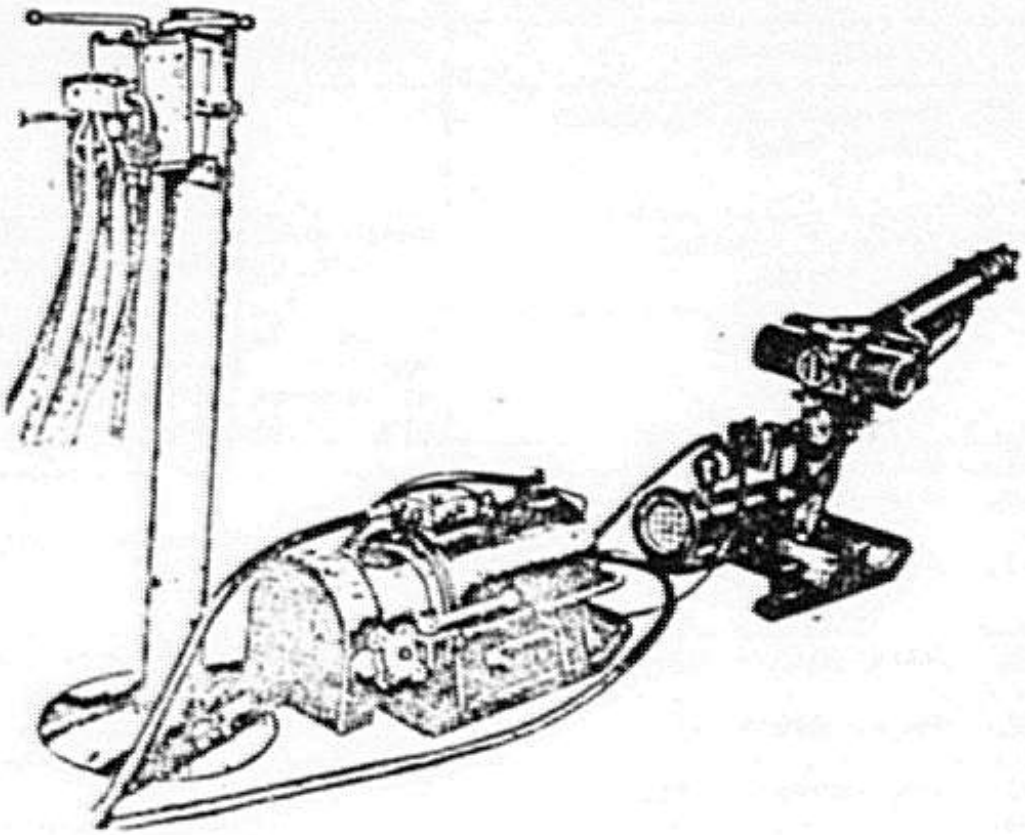
DATA SHEETS 5.7.1-2

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor GMDTS-3 with PPG-2 Adapter				
B. Country of Origin	USSR				
C. Distinguishing Characteristics	Remote controlled with program adapter PPG to provide automatic control of swing in horizontal and vertical planes				
2. Function	Break coal semi-automatically				
3. Designation of Mining Systems for which Applicable					
4. Major Components	Monitor barrel, nozzle, program adapter PPG-2, control hoses, water line, oil pump and reservoir				
5. Design Parameters					
6. Performance Parameters A. Input					
B. Output					
C. Performance Capacity					
D. Efficiency					
E. Limiting Environmental and Coal Seam Conditions	For coal seams greater than 0.8 m thick with any angle of dip				
7. Size of Equipment	Monitor	Oil Plant	Program Adapter	All Equipment With Hoses	
A. Length	1650 mm	950mm	300 mm		
B. Width	450 mm	408mm	145 mm		
C. Height	650 mm	430mm	300 mm		
8. Weight of Equipment	170 kg	90kg	26 kg	385 kg	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	-				
10. Developing Agency	Ministry of Coal Industry of USSR Technical Administration				
11. Status of Development	Produced in Novokuznetsk, 1968				

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	VNII Gidrougol - Kuzbass
15. Designation of Mines where Used	
16. Type of Control A. Input	Semi-automatic with remote program variation. Control system pressure (40-60 kg/cm^2)
B. Comments	Maximum distance of control unit from monitor - 10 m; angle of shaft swing in horizontal 90° max. 5° min., vertical 100° max. 5° minimum
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	Parts subject to wear last 3 times as long as conventional
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Program adapter permits programming sweep pattern over face
B. Disadvantages	
24. Pertinent Reference Documents	457
25. Drawing(s)	
26. Photograph(s)	457, p. 1 (cover)



DATA SHEETS 5.7.1-3
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor PG-1u
B. Country of Origin	USSR
C. Distinguishing Characteristics	Pulsating monitor with remote control; can be used in non-pulsating mode (Developed from GMDTs-3
2. Function	Break Coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Barrel, axial airpipe, pulsator valve, high pressure water feed lines, damper, seals
5. Design Parameters	Induce pulsations in water stream by air injection
6. Performance Parameters A. Input	Water pressure to 100 kg/cm^2 150 m^3/hr water consumption
B. Output	Pulse rate to 40 per second
C. Performance Capacity	15-17 tons coal per hour (output is almost double non-pulsating jets with same press.)
D. Efficiency	Coal breaking time reduced to 25-30% less than ordinary non-pulsating monitor
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	1800 mm
B. Width	540 mm
C. Height	660 mm
8. Weight of Equipment	150 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Kuzbass Polytechnic Institute
11. Status of Development	Tested in Hydromine 300 hours - water pressure at nozzle outlet 60-85 kg/cm^2

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Krasnorgorskaya hydromine in seam IV Internal
16. Type of Control A. Input	Remote - pulsating rate can be varied from 0 to 40 pulses per second
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Can break almost twice the amount of coal as non-pulsating monitor
B. Disadvantages	
24. Pertinent Reference Documents	738
25. Drawing(s)	P. 20, fig. 65
26. Photograph(s)	

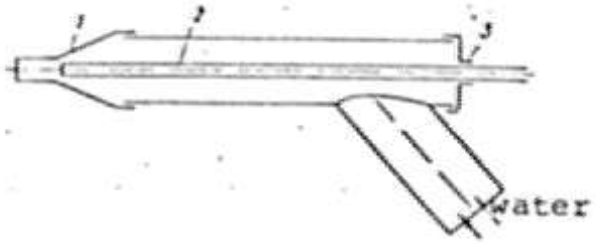


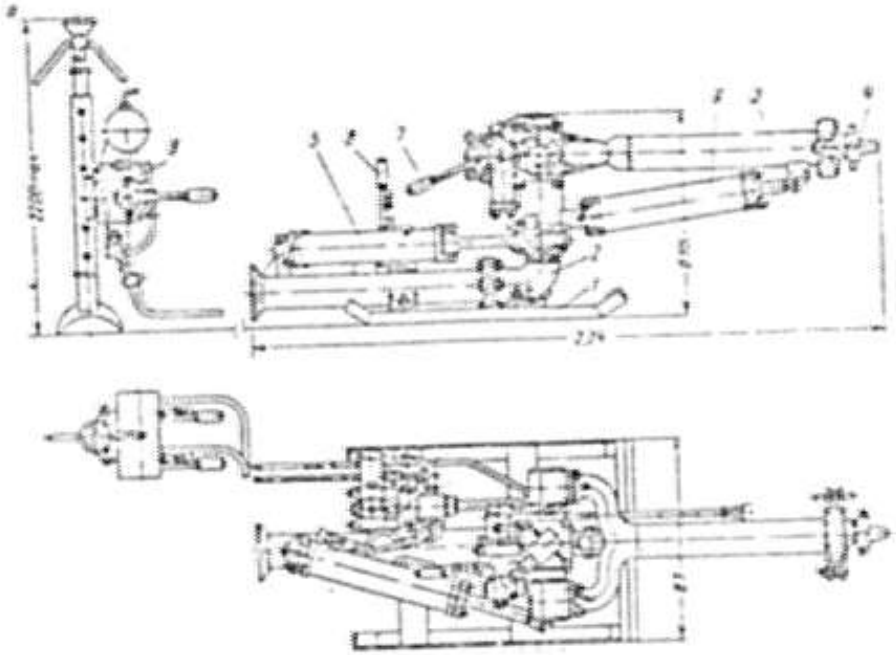
Figure 65.
DESIGN OF AIR PULSATOR

DATA SHEET 5.7.1-4
DATA ON COMPONENTS ANL SUB-SYSTEMS

1. A. Name and Model Number	Monitor GDTS-3m
B. Country of Origin	USSR
C. Distinguishing Characteristics	Remote controlled with automatic program control
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Skid base, remote transmission barrel with a control valve, revolving head with a supply pipe, barrel nozzle, hydraulic jack distributor valve, oil pump and controls
5. Design Parameters	Nozzle diameter: 15, 17, 19, 22, & 25 mm
6. Performance Parameters A. Input	Water pressure 10-100 atm water consumption to 150 m^3/hr
B. Output	
C. Performance Capacity	25 tons/hr on development with 19 mm nozzle at 100 atm with automatic program control
D. Efficiency	1.5 times improvement by program control
E. Limiting Environmental and Coal Seam Conditions	For average and thick seams
7. Size of Equipment A. Length	2110-2240 mm
B. Width	700 mm
C. Height	715-860 mm Height of controller 2200 mm maximum
8. Weight of Equipment	359.5 kg - monitor
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	VNIIGidrougol - Kuzbass
11. Status of Development	in operation

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	"Polysayevskaya Severnaya" (Zarechnaya) in Kuzbass
16. Type of Control A. Input	Remote control from distance of 10-15 m optional standby control at monitor
B. Comments	Shaft angle of rotation in horizontal plane 270°, shaft angle of rotation in vertical plane up 90°, shaft angle of rotation in vertical down 30°
17. Reliability	High
18. Safety	Excellent because of remote operation
19. Majo Causes of Failure	Worn out nozzle, barrel does not rotate, failure of remote control system
20. Maintenance Requirement	Replace and/or clean worn/dirty parts twice a month
21. Major Overhaul	Twice a year minor repairs Once a year major overhaul
22. Replacement Period	
23. Comments on Suitability A. Advantages	The feed-back coupling and the absence of a high thrust in the remote control system insure steadyness and easy controllability
B. Disadvantages	
24. Pertinent Reference Documents	238, p. 4, 14
25. Drawing(s)	p. 5, fig. 60 a & b, p. 8, table 11
26. Photograph(s)	



b) Control panel

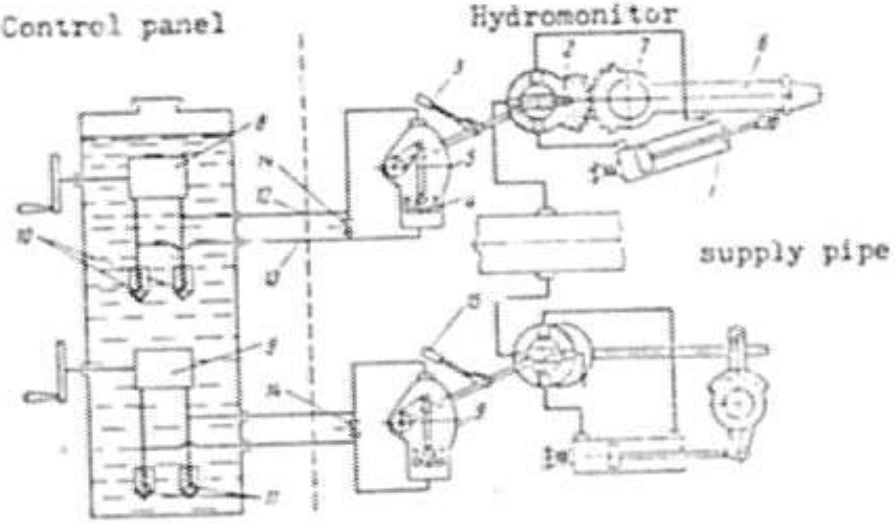


Fig.60. Hydromonitor GDTS-3m

a - Installation diagram; b) Hydraulic control diagram

TABLE 11

Disrepairs and methods of their elimination

Disrepair	Cause	Means of elimination
Deterioration of jet quality	wear and tear of nozzles	Replace nozzles. Clean up the flow damper
Mechanism of shaft rotation does not function	Obstruction of the damper. Apertures through which dirty water flows are obstructed.	Blow through hoses and the apertures in control cranes
	Barrels' control valve plugs and packing rings worn out	Replaced the worn out parts
Failure of the remote control system	Break of hoses	Replace the damaged hoses
	Insufficient level of oil in the panel	Add oil to the tank (its level must be such that the "sucking" devices of the pump be flooded)
	Pump rams jammed (usually when oil gets dirty)	Conduct the proper repairs

Annotation: The revision of any kind of hydromonitor, repairs and elimination of disrepairs may be conducted only after discontinuing water supply to them, i. e. upon closing the valve of the water supply

DATA SHEET 5.7.1-5
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor - GMDTS-3MA
B. Country of Origin	USSR
C. Distinguishing Characteristics	Remote controlled hydromonitor with oil hydraulic system for control of elevation and azimuth
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Supply pipe, vertical pipe and crosshead, barrel, hoses to controller, controller, oi pump and reservoir
5. Design Parameters	
6. Performance Parameters A. Input	Operating pressure up to 120 kg/cm^2
B. Output	Water flow rate to 180 m^3/hour Nozzle diameter 15-25 (35) mm
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	For gently pitching, pitching, and steep seams over 0.5 meters thick
7. Size of Equipment A. Length	1526 mm monitor unit only
B. Width	540 mm monitor unit only
C. Height	660 mm monitor unit only
8. Weight of Equipment	367 kg with control panel and oil pump
9. Cost (and Year of Cost Evaluation and Basis for Costs)	Monitor cost ≅ $2000 in 1971 (Ref. 785) Automatic Control Unit cost ≅ $500 in 1971 (Ref. 785)
10. Developing Agency	VNIIGidrougol' Institute - Kuzbass
11. Status of Development	Production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Kuzmashzavod (Kuzmach Plant) (Kutnetsk Machine Works)
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	Remote control with hydraulic jacks for elevation and azimuth. Automatic shaft swinging by a given angle in horizontal plane
B. Comments	Remote control unit can be located from 10-15 m from monitor. Angle of shaft rotation in horizontal - 210°, in vertical up - 80° to 15° down
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Control with oil hydraulic system more reliable than with water hydraulic system
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 10; 874; 277, p. 8; 1074, p.7
25. Drawing(s)	738, p. 10, fig. 60; 1074, p.7, fig. 3;
26. Photograph(s)	874

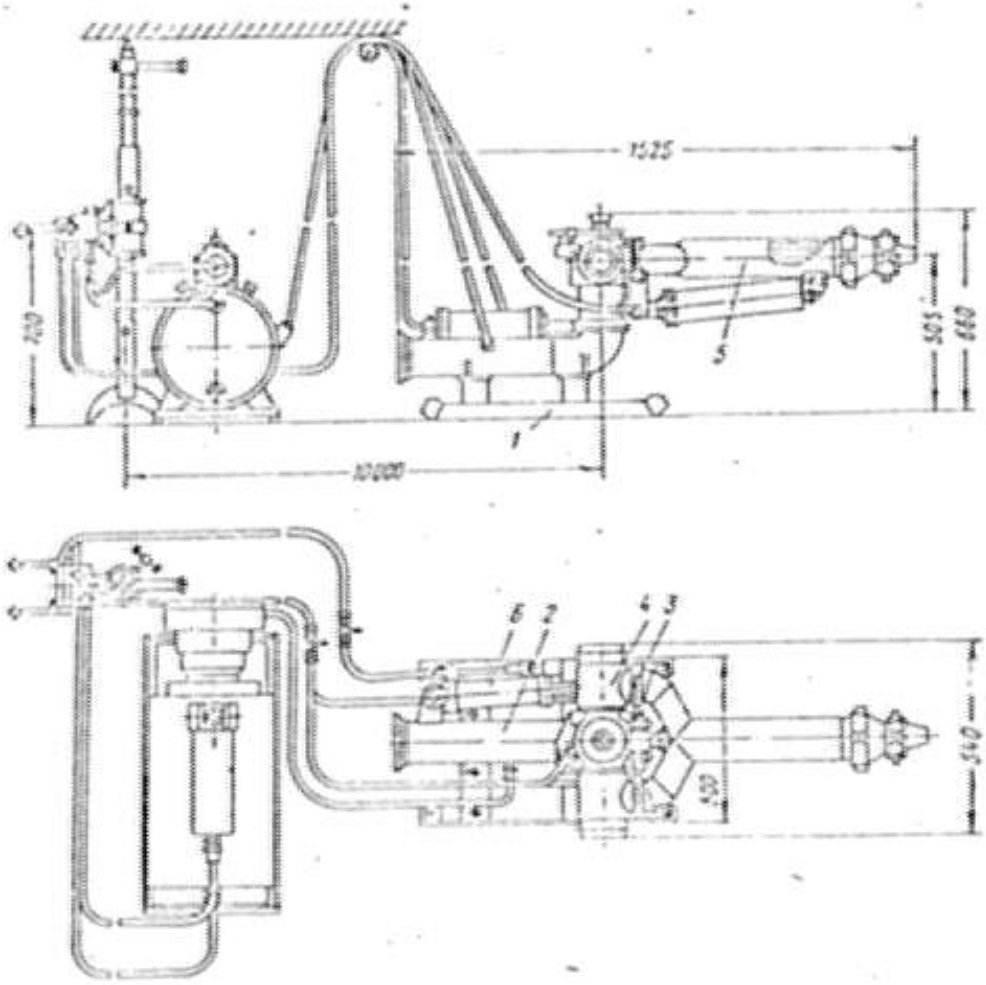
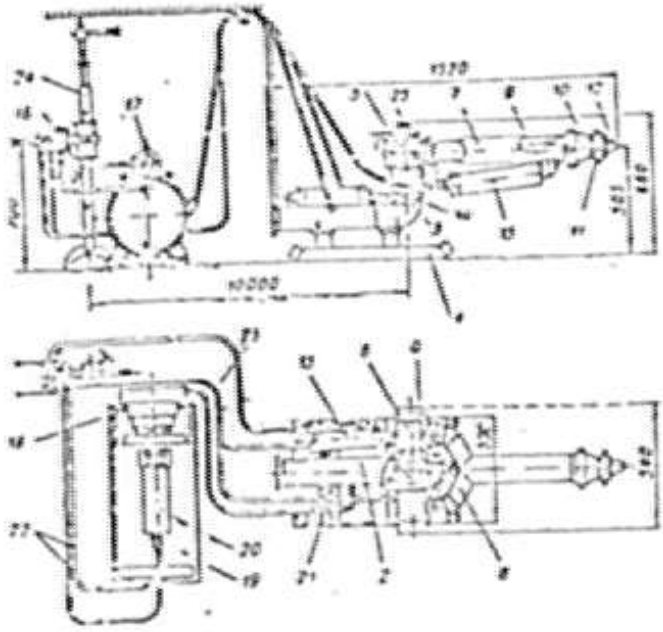


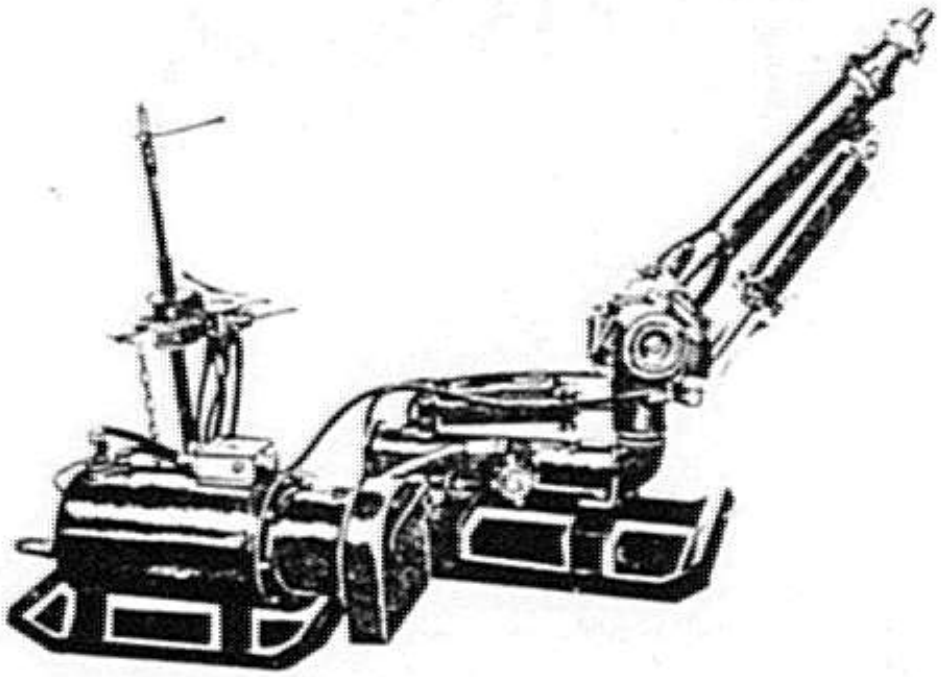
Figure 60.
THE GMDTs-3MA HYDROMONITOR



1) slide rails (carriage); 2) feed pipe; 3) axis; 4)cross brace; 5) wrist; 6) rotating head; 7) shaft; 8)bridge piece; 9) damper; 10) cone; 11) applied nu 12) nozzle; , 1), 15) hydraulic jacks; 14) notched sector; 16) control panel; 17) oil station; 18) servo; 10) oil tank; 20) filter; 21) pressure water hose; 22) oil hose; 23)remote control hoses; 24) spacer

Pig. 3. Hydromonitor GMDTS-3M**)

Reference 874



DATA SHEET 5.7.1-6
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor GMDTS-2m
B. Country of Origin	USSR
C. Distinguishing Characteristics	Remote control, modern version of GMDTS-2 monitor
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Skid, barrel, elbows, horizontal & vertical control jacks, hydraulic control panel, pump and reservoir, nozzle
5. Design Parameters	
6. Performance Parameters A. Input	Water pressure 15-100 atm Water consumption to 150 m^3/hr
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	Nozzle diameter 15, 17, 19, 22, & 25 mm 1480 mm
B. Width	640 mm
C. Height	380 mm
8. Weight of Equipment	Monitor 189.4 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKRNIIGidrougol - Donbass
11. Status of Development	Production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Irminsk factory for hydraulic equipment
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Extensively used in hydromines of the Donbass
16. Type of Control A. Input	Remote control from distance of 10-15 m Optional standby control at monitor
B. Comments	Shaft angle of rotation in horizontal plane 300°, in vertical plane up 90° to down 15°; hydraulic oil used for control system, pump driven by hydraulic drill SGR-4m at 20-40 atm
17. Reliability	
18. Safety	Excellent because of remote operation
19. Major Causes of Failure	Wear out of nozzle, shaft does not rotate, failure of remote control system
20. Maintenance Requirement	Replace and/or clean worn/dirty parts
21. Major Overhaul	Twice a year minor repairs Once a year major overhaul
22. Replacement Period	
23. Comments on Suitability A. Advantages	The feedback coupling and the absence of a high thrust in the remote control system insure steadyness and easy controllability
B. Disadvantages	
24. Pertinent Reference Documents	238, p. 4; 785, p. 5
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.7.1-7

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor GMRTS-2A
B. Country of Origin	USSR
C. Distinguishing Characteristics	Compact monitor with manual control instead of water hydraulic control as in GMDTS-2
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	Thin seams in Donbass
4. Major Components	Sliding carriage, water supply pipe, cross-head, by-pass elbow, barrel, screw jack to lock monitor against roof and floor of seam, and aiming control rod
5. Design Parameters	Nozzle diameter: 15-25 mm
6. Performance Parameters A. Input	0.045 to 0.06 m^3/sec flow rate at 60 kg/cm^2 operating pressure
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	135 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Thin seams in Donbass
16. Type of Control A. Input	Manual shaft rotation 360° in horizontal; 90° up, 45° down in vertical plane
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 9
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.7.1-8
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor GMDC-2 (GDC-3)
B. Country of Origin	USSR
C. Distinguishing Characteristics	Hydraulically operated with remote control
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	Working pressure 15 to 100 atm (10-100 for GDC-3) Water consumption to 150 m^3/hr
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	Diameter of Nozzle: 15, 17, 19, 22, or 25 mm
B. Width	Water feed pipe diameter 100 mm
C. Height	
8. Weight of Equipment	135 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Kuzbass
16. Type of Control A. Input	Hydraulically operated with remote control station 10-15 m from monitor
B. Comments	Angle of swing of monitor in horizontal 300°, vertical up 90°, down 15° (30° down for GDC-3)
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	658
25. Drawing(s)	p. 812, Table 4
26. Photograph(s)	

TABLE 4

Specifications of hydro-monitors

	Type of hydro-monitors		
	RGM-1	GMDC-2	GDC-3
Diameter of feeding water pipe, *mm*	100	100	100
Working pressure, *atm*	30-60	15-100	10-100
Water consumption, m^3/*hour*	120	up to 150	up to 150
Diameter of nozzles, *mm*	15,17,19 22,25	15,17,19 22,25	15,17,19 22,25
Angle of swing of hydro-monitor shaft in horizontal plane,	360°	300°	240°
in vertical plane			
(a) upward	90°	90°	90°
(b) downward	45°	15°	30°
Weight, *kg*	250-260	135	320

DATA SHEET 5.7.1-9
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor G-1
B. Country of Origin	USSR
C. Distinguishing Characteristics	Remote water or oil control at distance of up to 50 m
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	Barrel I.D. = 85 mm
6. Performance Parameters A. Input	Operating pressure 20-100 atm
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Breaking of coal in thin seams or steep or gently pitching seams of thickness over 0.6 m
7. Size of Equipment A. Length	1,400 mm
B. Width	600 mm
C. Height	440 mm
8. Weight of Equipment	75 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Mass produced

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Donbass
16. Type of Control A. Input	Diameter of control jacks 60 mm
B. Comments	Angle of rotation of shaft in horizontal 180°, vertical up 60° to down 7°
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	1074, p. 5
25. Drawing(s)	1074, p. 6, fig. 2
26. Photograph(s)	

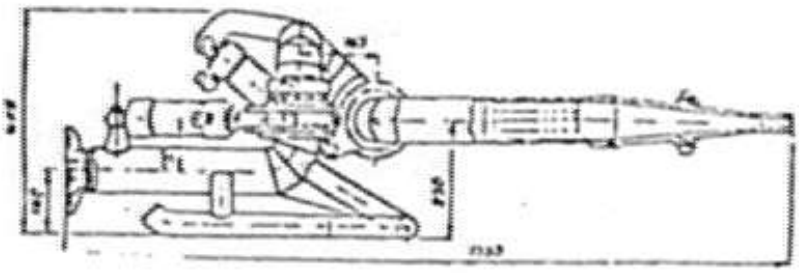


Fig.2. Hydromonitor G-1

DATA SHEET 5.7.1-10
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	"Irminets GI-1"
B. Country of Origin	USSR
C. Distinguishing Characteristics	Remote control with asymmetric bridge and integrally mounted oil pump
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	Operating pressure to 120 atm Water consumption to 150 m^3/hr
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Hydraulic breaking of coal in winning, cutting, and development faces in seams 0.5 m and thicker
7. Size of Equipment A. Length	1,680 mm
B. Width	450 mm
C. Height	430 mm
8. Weight of Equipment	108 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Mass produced

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Irminsk Hydraulic Equipment Factory
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Donbass
16. Type of Control A. Input	
B. Comments	Angle of rotation of shaft in horizontal 180°, vertical up 60° to down 7°
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	1074, p. 6
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.7.1-11
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor Gn-1
B. Country of Origin	USSR
C. Distinguishing Characteristics	Manually operated
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	Nozzle diameters 0.76 and 1.08 inches
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Designed for use in steeply pitching seams
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Kuznetsk Coal Institute (KusNIUI)
11. Status of Development	Used in 1952 in Tyrgan mine

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Tyrgan mine (Kuzbass)
16. Type of Control A. Input	Rotates 360° around horizontal axis and 140° around vertical axis
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	549, p. 11
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.7.1-12
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor G-1R
B. Country of Origin	USSR
C. Distinguishing Characteristics	Manual control monitor similar to GMDTS-3A
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	Hydraulic
4. Major Components	Nozzle, swivel joints, mounting skid, feed pipes
5. Design Parameters	
6. Performance Parameters A. Input	Operating water pressure to 100 atm; water consumption to 200 m^3/hr, pipe I.D. 100 mm
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	For hydraulic breaking of coal in development and cutting faces in thin seams over 0.5 m
7. Size of Equipment A. Length	1,400 mm
B. Width	500 mm
C. Height	390 mm
8. Weight of Equipment	65 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Mass Produced

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Donbass
16. Type of Control A. Input	Manual
B. Comments	Rotation of barrel in horizontal 180°, vertical up 60° to down 7°
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	1074 p. 5
25. Drawing(s)	1074 p. 5, fig. 1
26. Photograph(s)	

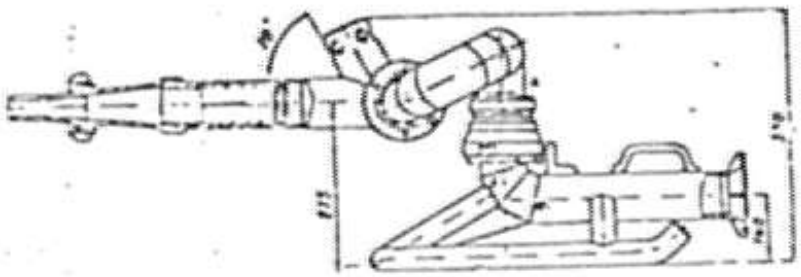


Fig.1. Hydromonitor G-1R

DATA SHEET 5.7.1-13
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor RGM-1m and RGM-1
B. Country of Origin	USSR
C. Distinguishing Characteristics	Manually operated
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Skid, water pipe, quick release device, steering wheel, handle for fixing barrel of monitor, barrel, nozzle, worm gear box, cross brace, elbows, bushings and packings
5. Design Parameters	Nozzle diameters 0.76 and 1.08 inches
6. Performance Parameters A. Input	Working pressure 30-60 atm Water consumption to 120 m^3/hr
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Seams more than 0.9 m thick at any angle (RGM-1 for gently pitching seams)
7. Size of Equipment A. Length	Diameter nozzle: 15, 17, 19, or 25 mm
B. Width	Water feed pipe diameter 100 mm
C. Height	
8. Weight of Equipment	255 kg with short barrel 262 kg with long barrel
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	RGM-1 developed by Kuznetsk Coal Institute (KuzNIUI)
11. Status of Development	Used in 1952 in Tyrgan mine

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Tyrgan Mine (Kuzbass)
16. Type of Control A. Input	Manually aimed
B. Comments	Angle of swing in horizontal plane 360°, vertical plane 90° up to 45° down
17. Reliability	
18. Safety	Not good as water and coal particles are reflected toward the operator
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	Labor consuming due to manual control
24. Pertinent Reference Documents	658; 238, chapter IV; 549, p. 11
25. Drawing(s)	658, p. 810, fig. 32, p. 812, table 4; 238, p. 2, fig. 59
26. Photograph(s)	

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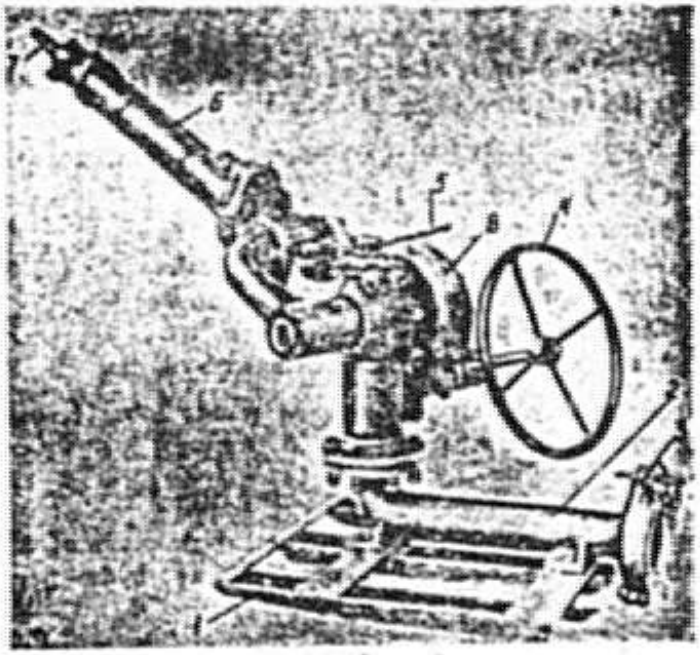


Fig. 32. Hydro-monitor RGM-1m

1—Skid. 2—Water pipe. 3—Quick release device. 4—Steering wheel. 5—Handle for fixing shaft of hydro-monitor. 6—Shaft of hydro-monitor. 7—Nozzle. 8—Worm gear box.

TABLE 4

Specifications of hydro-monitors

	Type of hydro-monitors		
	RGM-1	GMDC-2	GDC-3
Diameter of feeding water pipe, *mm*	100	100	100
Working pressure, *atm*	30-60	15-100	10-100
Water consumption, *m³/hour*	120	up to 150	up to 150
Diameter of nozzles, *mm*	15,17,19 22,25	15,17,19 22,25	15,17,19 22,25
Angle of swing of hydro-monitor shaft in horizontal plane,	360°	300°	240°
in vertical plane			
(a) upward	90°	90°	90°
(b) downward	45°	15°	30°
Weight, *kg*	250-260	135	320

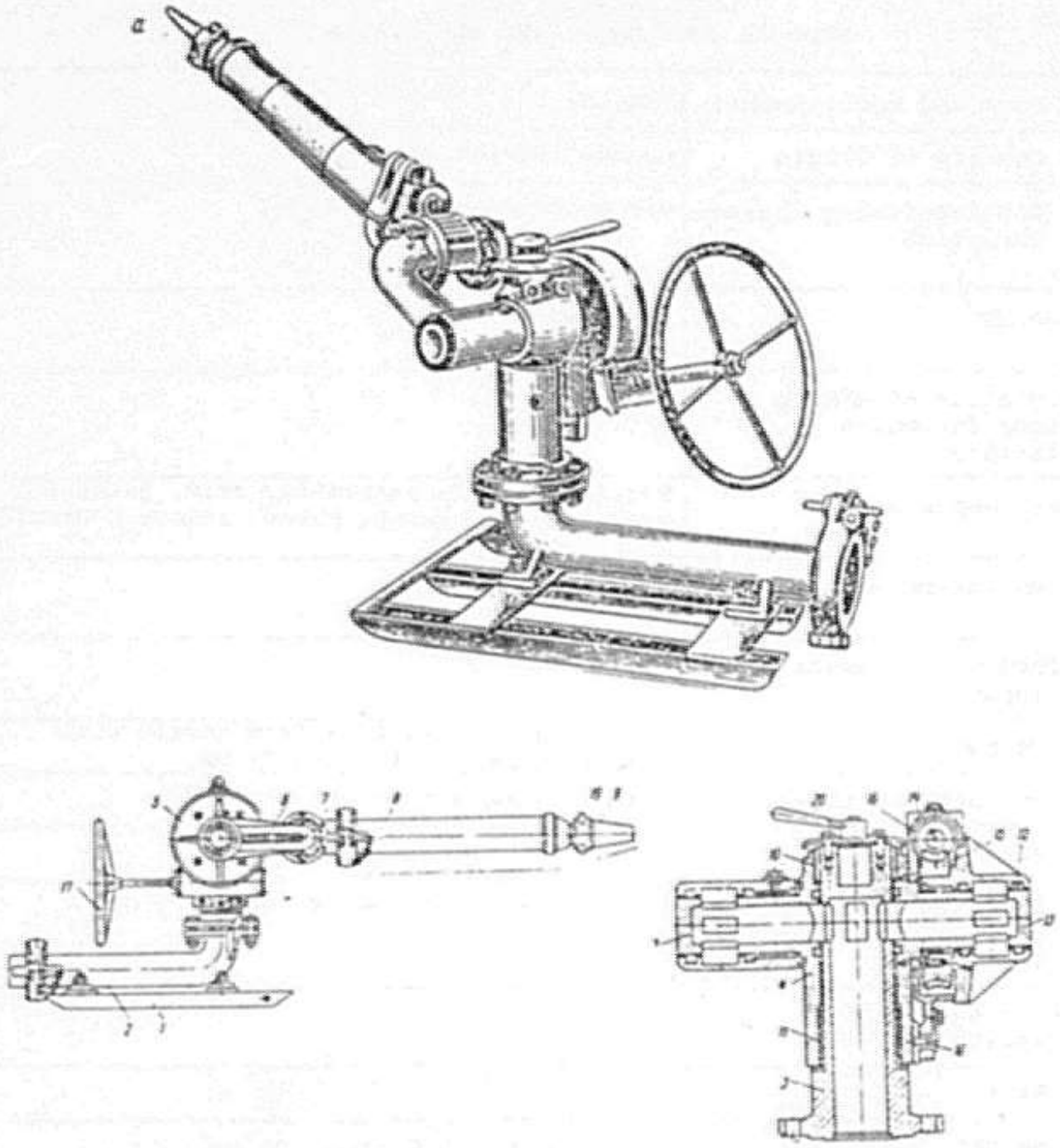


Fig.59. General view of the RGM-1F hydromonitor (a) and sketch showing its structure (b)

DATA SHEET 5.7.1-14
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor I - 270 kg
B. Country of Origin	German Federal Republic
C. Distinguishing Characteristics	Has hardened steel nozzle
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Nozzle, barrel, turntable, skid, jacks for elevation and swing, hoses, remote controller
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	Can break coal to 25 m from nozzle with nozzle diameter of 22 to 27 mm
C. Performance Capacity	8 to 10 tons output per manshift
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Coking coal in pitching seams
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	270 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Steinkohlenbergbauverein, Essen
11. Status of Development	Built 1962

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Maschinenfabrik Hemscheidt
13. Number of Units Manufactured (and Time Period)	One
14. Using Agency	
15. Designation of Mines where Used	Ruhr District (Ruhrkohl AG) Carl Funke, Gneisenau Mines
16. Type of Control A. Input	Remote
B. Comments	A geophone was developed to orient the jet stream in coal or rock because of variable noises
17. Reliability	Dust free, telephone communication from operator to high pressure pump station
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	1. Less susceptible to breakdown or changes in geological conditions. 2. No heavy machines in seam. 3. Dust free. 4. All hydraulic breaking and transport
B. Disadvantages	Too heavy; takes up to 5 hours to move to next working area
24. Pertinent Reference Documents	387
25. Drawing(s)	387, qraphs p. J2-24, 25,
26. Photograph(s)	387, p. J2-23, fig. 1

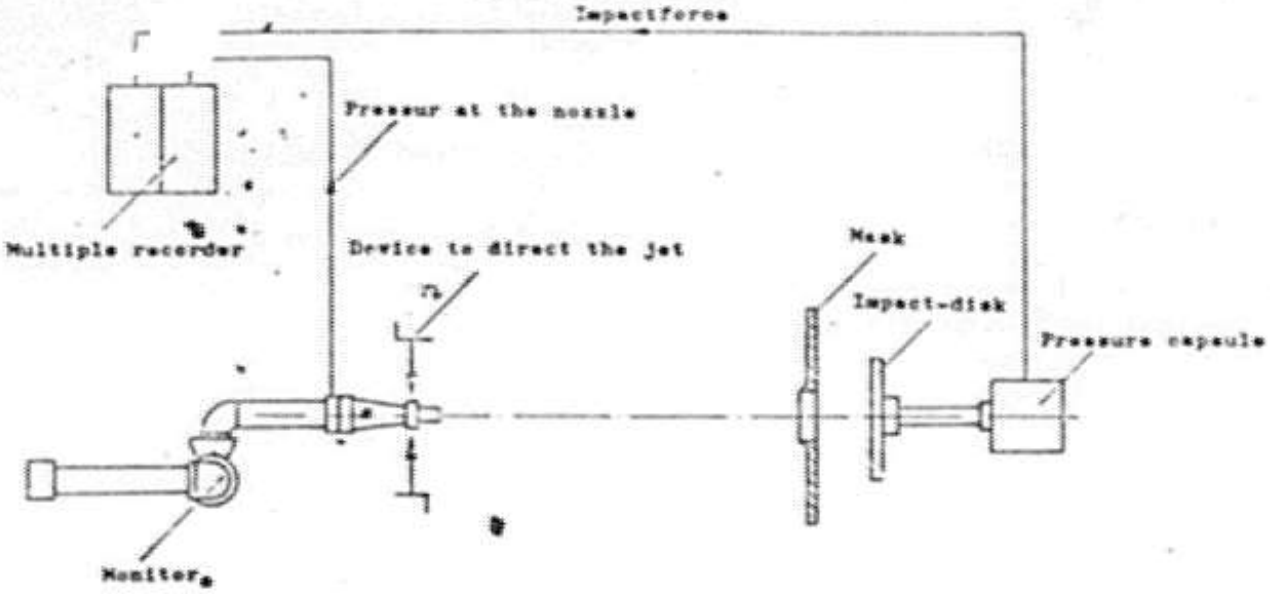


Fig. 4 Scheme of measuring device

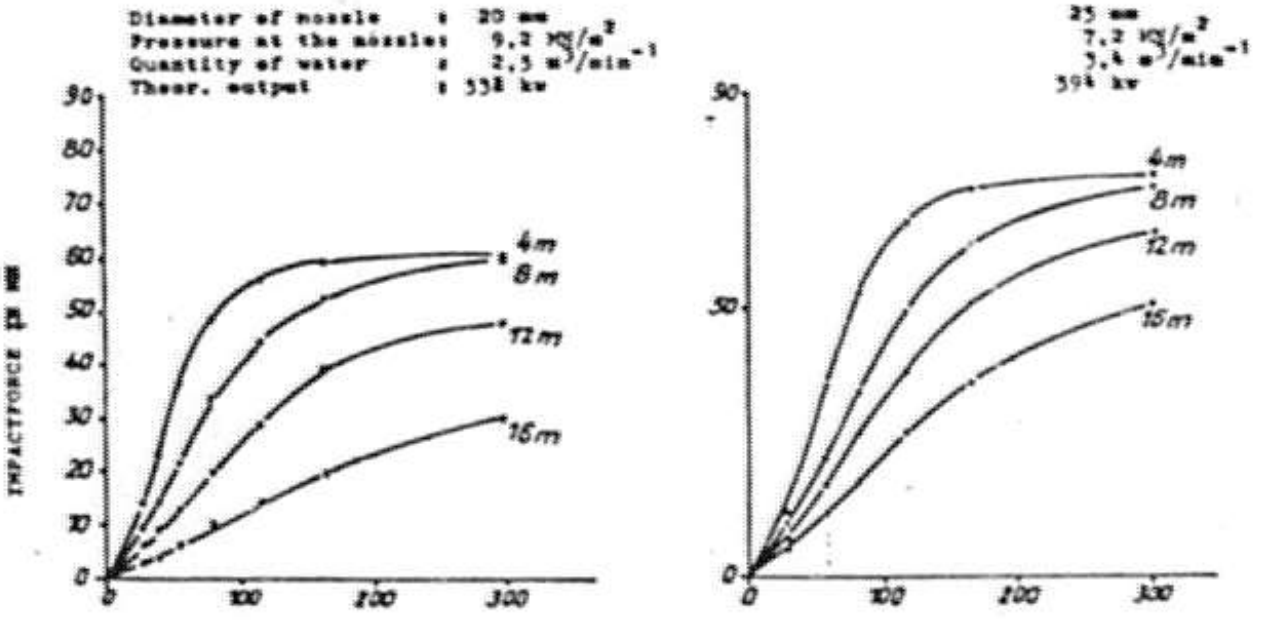


Fig. 5 Impact force over jet diameter

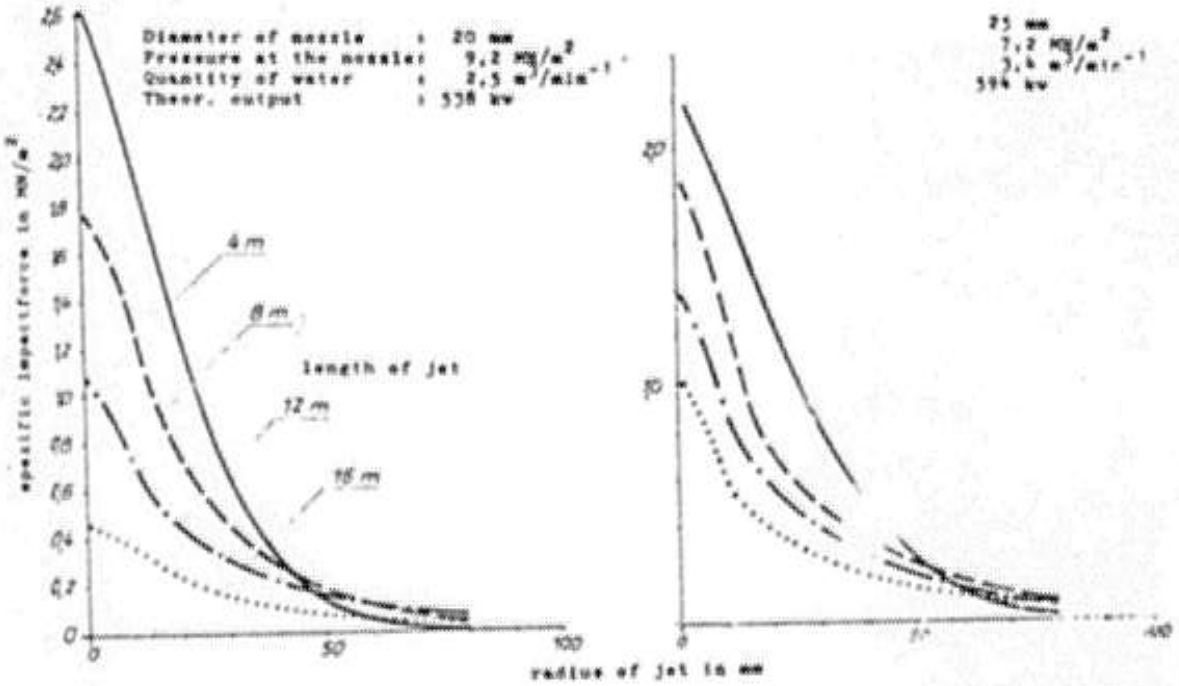


Fig. 6 Spec. impact force over jet diameter

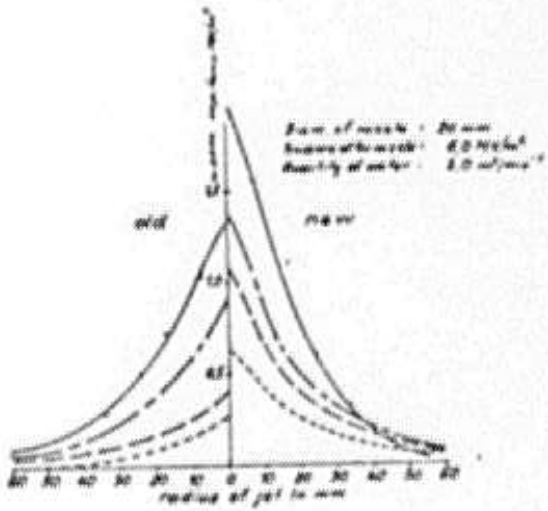


Fig. 7 Influence of nozzle quality

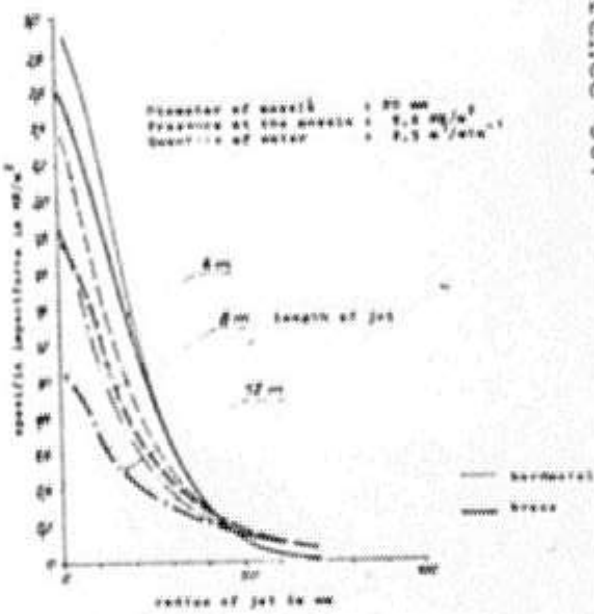


Fig. 8 Influence of nozzle quality

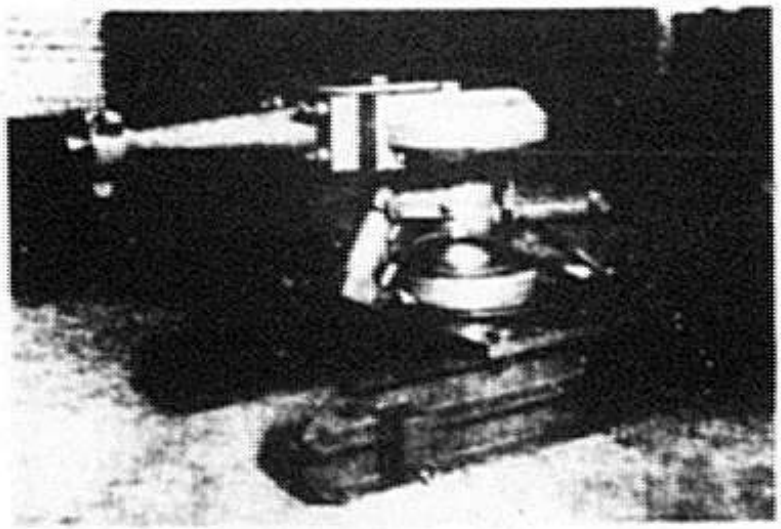


Fig. 1 First German
Monitor (270 kg)

DATA SHEET 5.7.1-15

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor II - 180 kg
B. Country of Origin	German Federal Republic
C. Distinguishing Characteristics	Hardened Steel Nozzles
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Nozzle, barrel, swiveling elbows, elevation and swinging jacks, skid, high pressure hoses, remote controller
5. Design Parameters	Can break coal to 25 m from nozzle with nozzle diameter of 22 to 27 mm
6. Performance Parameters A. Input	
B. Output	Can break coal to 25 m from nozzle with nozzle diameter of 22 to 27 mm
C. Performance Capacity	8 to 10 tons output per manshift
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Coking coal in pitching seams
7. Size of Equipment A. Length	Nozzle diameter from 17 to 27 mm
B. Width	
C. Height	
8. Weight of Equipment	180 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Steinkohlenbergbauverein, Essen
11. Status of Development	Built 1963

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Oilwell Engineering
13. Number of Units Manufactured (and Time Period)	One
14. Using Agency	
15. Designation of Mines where Used	Ruhr District (Ruhrkole AG) Carl Funke, Gneisenau Mines
16. Type of Control A. Input	Remote
B. Comments	A geophone was developed to orient the jet stream in coal or rock by varying noises
17. Reliability	
18. Safety	Dust free, telephone communication from operator to high pressure pump station
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	1. Less susceptible to break down or changes in geological conditions. 2. No heavy machines in seam. 3. Dust free
B. Disadvantages	Too heavy
24. Pertinent Reference Documents	387
25. Drawing(s)	
26. Photograph(s)	387, p. J2-23, fig. 2

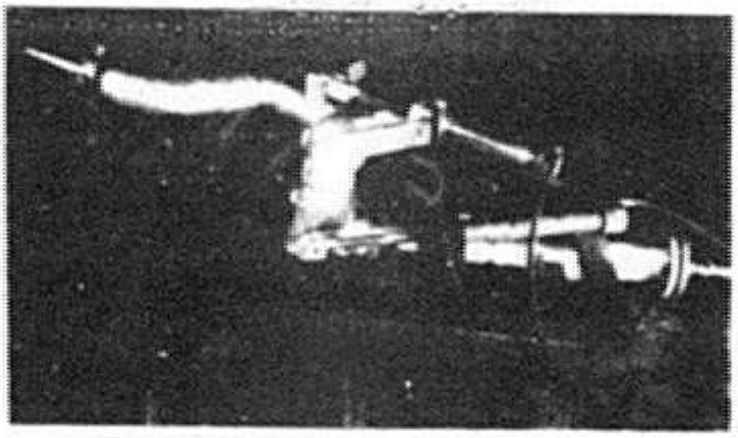


Fig. 2 Second Monitor (180 kg)

DATA SHEET 5.7.1-16

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor III - 85 kg
B. Country of Origin	German Federal Republic
C. Distinguishing Characteristics	Constructed of light weight metal Hardened steel nozzles
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Nozzle, barrel, swiveling elbows, elevation and swinging jacks, feet, high pressure hoses, remote controller
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	Can break coal to 25 m from nozzle with nozzle diameters of 22 to 27 mm
C. Performance Capacity	8 to 10 tons output per manshift (overall)
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Coking coal in pitching seams
7. Size of Equipment A. Length	Nozzle diameters from 17 to 27 mm
B. Width	45 cm (maneuverable in very thin seams)
C. Height	
8. Weight of Equipment	85 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Steinkohlenbergbauverein, Essen
11. Status of Development	Built 1963, large scale underground tests in 1971 using 4 to 5 high pressure pumps and 15 to 25 monitors

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Bergbau-Forschung GmbH
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Ruhr District (Ruhrkole AG) Carl Funke and Gneisenau Mines
16. Type of Control A. Input	Remote
B. Comments	A geophone was developed to orient the jet stream in coal or rock by varying noises
17. Reliability	
18. Safety	Dust free. Telephone communication from operator to high pressure pump station
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	1. Less susceptible to breakdown or changes in geological conditions. 2. No heavy machines in seam. 3. Dust free.4. Light wt.
B. Disadvantages	Complete mine must be designed for hydraulic system
24. Pertinent Reference Documents	387
25. Drawing(s)	387 graphs p. J2-24, 25
26. Photograph(s)	387, p. J2-23, fig. 3

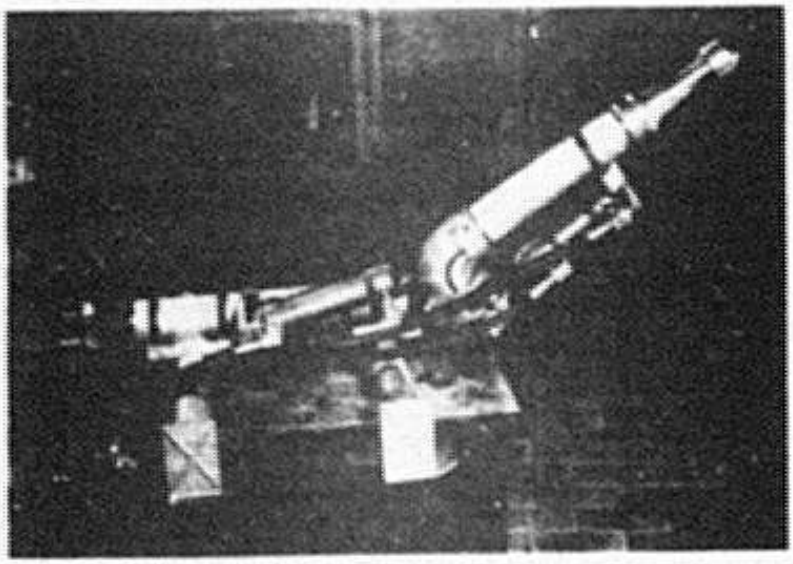


Fig. 3 Monitor from light metal (85 kg)

DATA SHEET 5.7.1-17
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor - Trelewis Mine Tests
B. Country of Origin	United Kingdom
C. Distinguishing Characteristics	Monitor mounted on special flume end which receives broken coal and water for transport away from face
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Barrel, nozzle, special flume end, splash screens, hydraulic props, swivel connections, hand winch, monitor control sled, tail pipe support, monitor isolating sled, shaft elevate and swing cylinders, honeycomb damper in monitor barrel
5. Design Parameters	
6. Performance Parameters A. Input	To monitor 450 gpm at 1200 psi
B. Output	Nozzle diameter .772-.914 inch, pressure range 600-1200 psi with flow of 450 gpm
C. Performance Capacity	46 tons/shift in heading drivage, 123 tons/shift in pillar extraction
D. Efficiency	See 542, p. 12, fig. 6
E. Limiting Environmental and Coal Seam Conditions	Minimum gradient = 1 in 15 for fluming. Practical range limit = 16 ft. Maximum range = 30 ft
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	Capital cost £66,933 total system installed
10. Developing Agency	National Coal Board
11. Status of Development	Tested June 1959 to September 1960

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	National Coal Board Central Engineering Establishment
13. Number of Units Manufactured (and Time Period)	1958-1960
14. Using Agency	
15. Designation of Mines where Used	Trelewis Drift Mine, in No. 4 area South Western Division (South Wales)
16. Type of Control A. Input	Remote Control
B. Comments	System changed to use pressurized oil for control
17. Reliability	
18. Safety	Telephone communications; shut off valves at monitor; no dust; monitor must be securely held between roof & floor; screen required to prevent fly-back; high pressure shut off at monitor
19. Major Causes of Failure	Dirty water from high pressure line caused clogging
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	Nozzles - 6 months
23. Comments on Suitability A. Advantages	
B. Disadvantages	Excess and/or contaminated water would be more efficient if total hydraulic mine was used, i.e. slurry line to surface
24. Pertinent Reference Documents	542; 169
25. Drawing(s)	542, fig. 3; 169, fig. 4
26. Photograph(s)	169, fig. 1

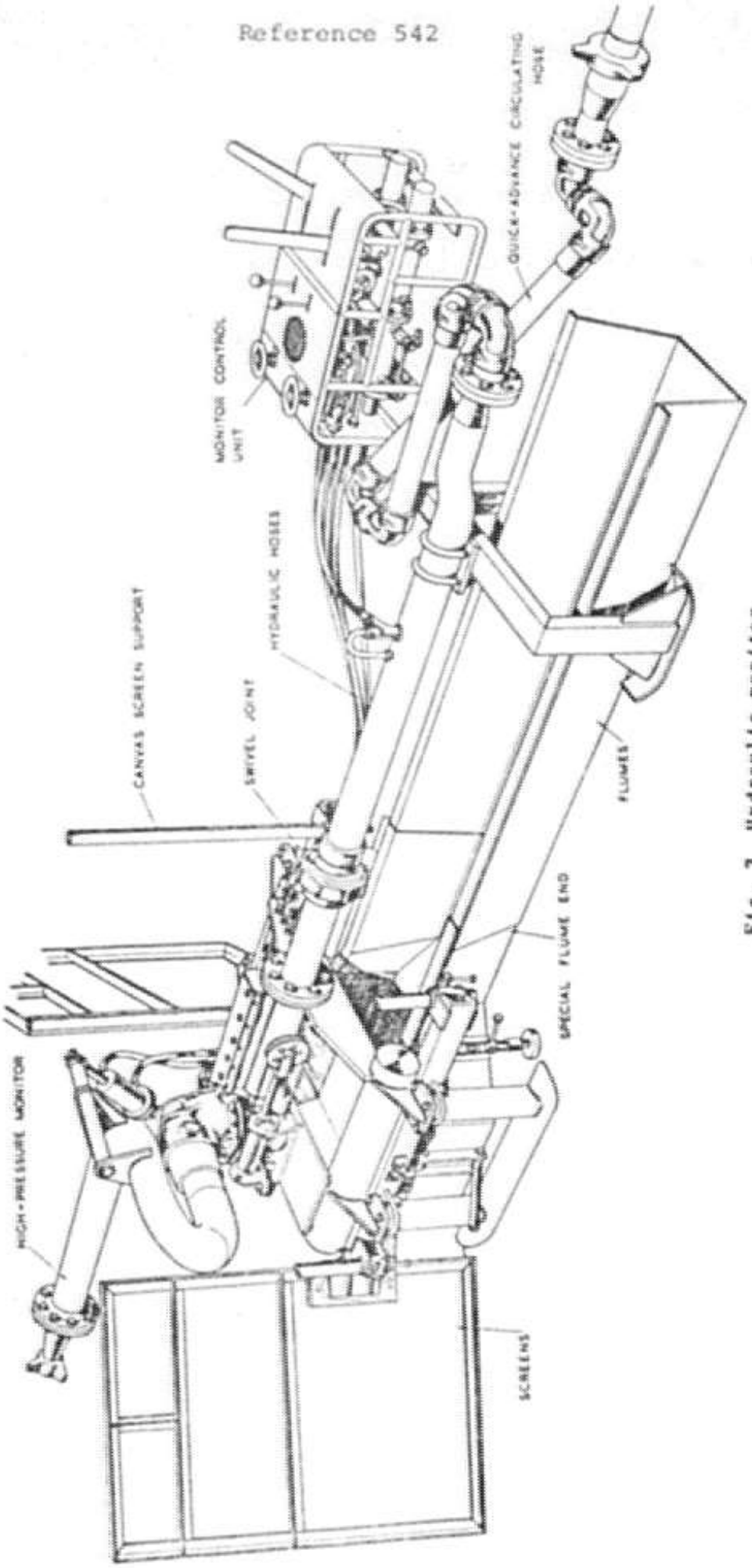


Fig. 3 Hydraulic monitor

DATA SHEET 5.7.1-18

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor (Japanese)
B. Country of Origin	Japan
C. Distinguishing Characteristics	At the control panel, an aperture of 100 mm dia. can be used to shut off 90-95% of the water flow, with final cut off by closing clinker valve
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	Jet pressure at nozzle outlet = 110-120 kg/cm^2
C. Performance Capacity	Can break coal at 10 m from monitor
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	750 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Japanese
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	Remote control without feedback
B. Comments	Working fluid of remote control system is high pressure water
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	Too heavy
24. Pertinent Reference Documents	738, p. 16, para. 3
25. Drawing(s)	
26. Photograph(s)	

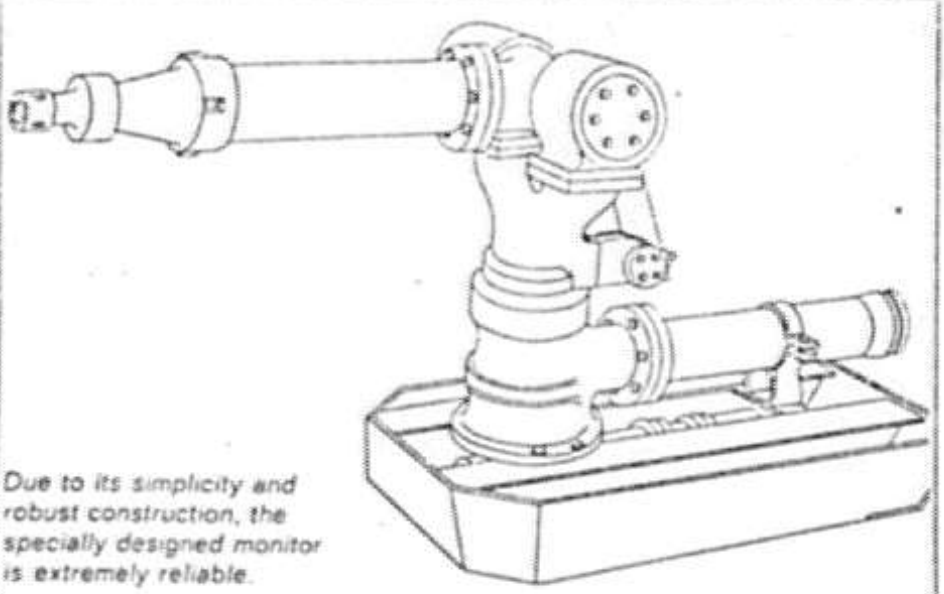
DATA SHEET 5.7.1-19

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor - NIKKI Co (For Kaiser Resources)
B. Country of Origin	Japan
C. Distinguishing Characteristics	Oil hydraulic remote control, skid mounted
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Barrel, nozzle, base, hydraulic jacks, swivel tee
5. Design Parameters	Nozzle diameter = 18 to 28 mm
6. Performance Parameters A. Input	Upto 1500 gpm @ up to 2200 psi (2500 HP) Pressure at monitor 1500 to 1800 psi
B. Output	
C. Performance Capacity	Cuts friable coal at range up to 60 ft
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Used in thick pitching seams, preferably greater than 18 ft thickness at more than 7° pitch
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

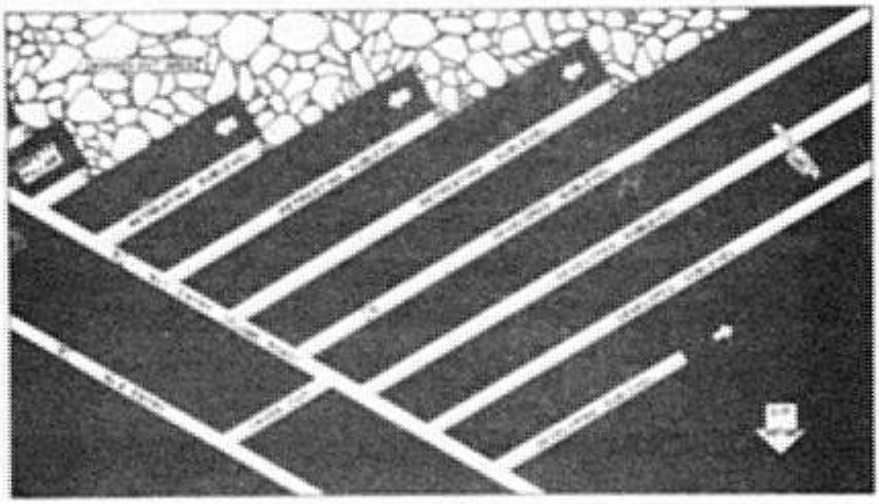
12. Manufacturer	NIKKI Co., Japan (Producer of fire-fighting equipment in Japan)
13. Number of Units Manufactured (and Time Period)	1974
14. Using Agency	Kaiser Resources, Ltd.
15. Designation of Mines where Used	Kaiser Hydraulic Mine No. 1, Sparwood, British Columbia, Canada
16. Type of Control A. Input	Hydraulic
B. Comments	Monitor can be rotated 180° in horizontal plane and 90° in vertical plane
17. Reliability	
18. Safety	Monitor remote controlled from minimum of 35 ft to maximum of 100 ft from monitor
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Exceptionally safe
B. Disadvantages	Selective mining of coal is difficult. Coal contains high amount of moisture. even after dewatering
24. Pertinent Reference Documents	834; 1100
25. Drawing(s)	834, p. 95, 96
26. Photograph(s)	



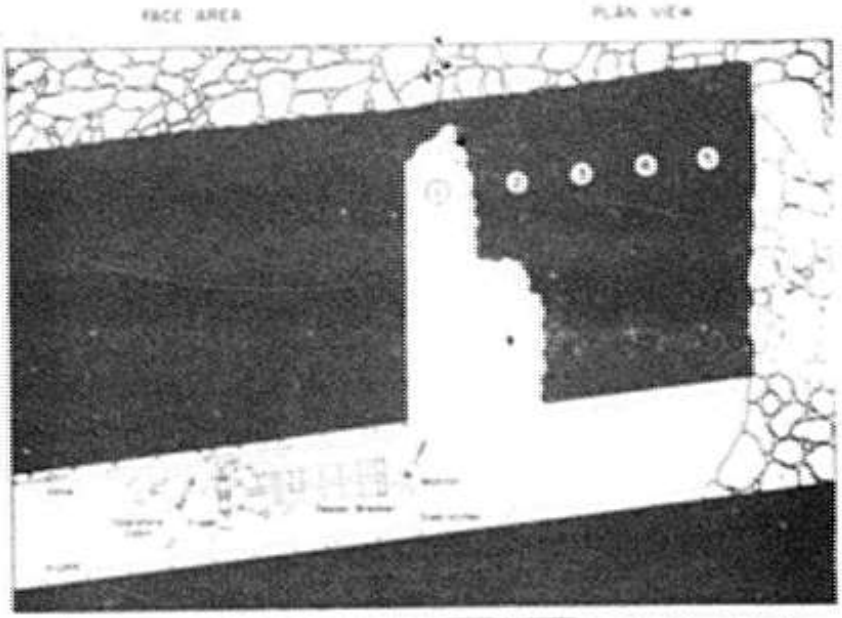
Due to its simplicity and robust construction, the specially designed monitor is extremely reliable.

Reference 1100

HYDRAULIC MINE PANEL PLAN



HYDRAULIC MINE





HYDRAULIC MINE

DATA SHEET 5.7.1-20

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor GIG-5
B. Country of Origin	Poland
C. Distinguishing Characteristics	Manual control
2. Function	
3. Designation of Mining Systems for which Applicable	
4. Major Components	Skid, nozzle, rotating joints, wheel for direction control, nozzle barrel
5. Design Parameters	
6. Performance Parameters A. Input	240 m^3/hr @ pressure of 64 atm
B. Output	
C. Performance Capacity	
D. Efficiency	Effective range: 5-7 m; effective range: less than 4.5 m @ 50 to 60 atm
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Central Mining Institute of Katovitze
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	534, p. 2
25. Drawing(s)	
26. Photograph(s)	534, fig. 394

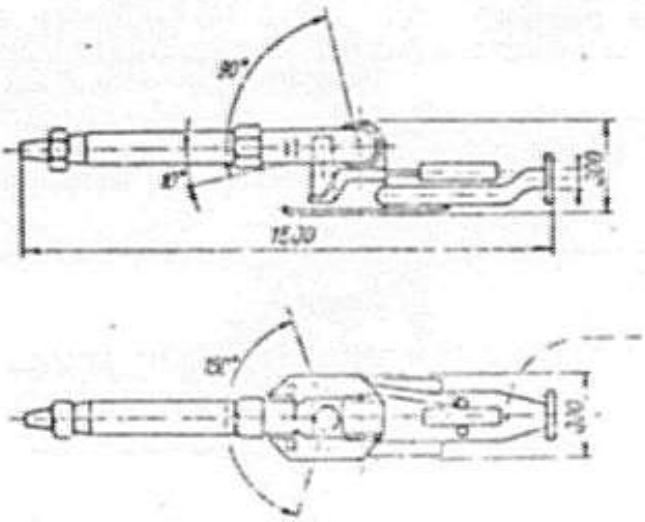
DATA SHEET 5.7.1-21

DATA ON COMPONENTS AND SUB-SYSTEMS

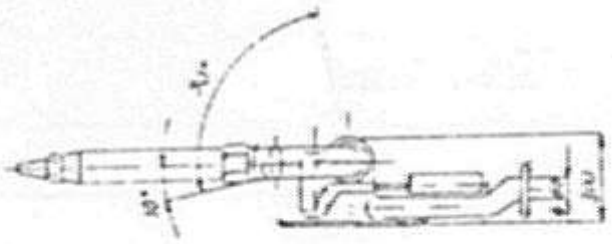
1. A. Name and Model Number	Monitor DH-30
B. Country of Origin	Czechoslovakia
C. Distinguishing Characteristics	Tested with "Plate" nozzle, mobile and "walking" monitor (later model)
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Skid, nozzle, barrel, swivels, cylinders for rotation
5. Design Parameters	
6. Performance Parameters A. Input	Working pressure 50 atm (40 to 90 atm)
B. Output	Nozzle diameter 17, 19, 22, and 25 mm
C. Performance Capacity	Working range: 3-6 m
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	For working thin and thick seams
7. Size of Equipment A. Length	Maximum 1800 mm
B. Width	300 mm
C. Height	300 mm
8. Weight of Equipment	120 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Ministry of Fuels - Institute for Pit Mechanisation (UDM) in Prague
11. Status of Development	Tested 1958

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Ostrava Branch of the Mining Mechanisation Institute
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Ostrava-Karvina Coalfield Association
15. Designation of Mines where Used	Tested at Hlubina Pit and the Czechoslovak Army Mine I, Karvina
16. Type of Control A. Input	Remote
B. Comments	Rotation in horizontal plane 150°, vertical plane up 80° to down 10°
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	543, p. 4
25. Drawing(s)	492, p. 296, fig. 253; 543, figs. 5, 6, 7, 8 and 9 (last page)
26. Photograph(s)	



Obr. 252. Hydromonitor DH-30



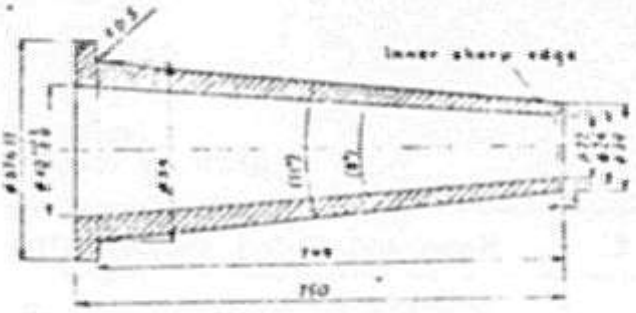


Fig. 6

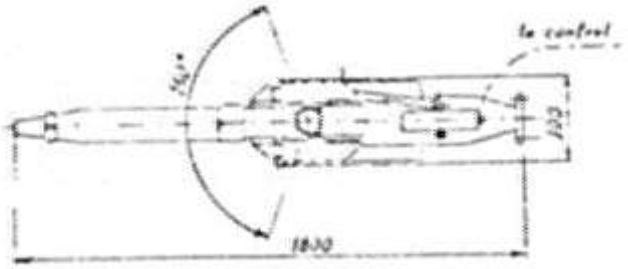


Fig 5 Hydromonitor type DH 30

1	Max length	1800 mm.	7	Nozzle used	ø 17, 19, 22, 25 mm.
2	Max width	300 mm.	8	Optimum distance from heading front	3-6 m
3	Max height	300 mm	9	Angle of elevation	-10° +80°
4	Weight	120 kg	10	Angle of edge (side	120°
5	Working pressure	40 90 kg	11	C. trol	Remote
6	Testing pressure	150 atm			

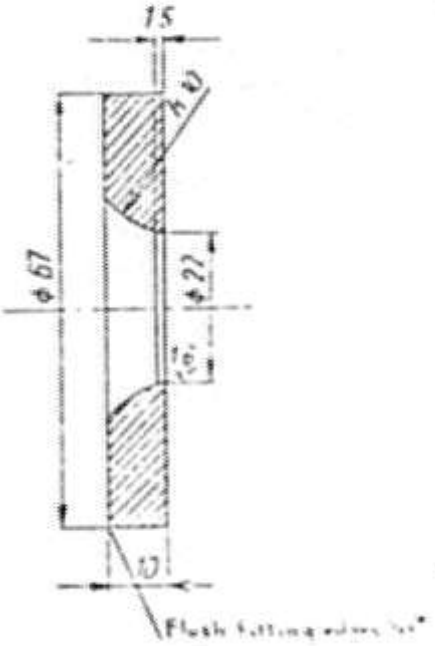


Fig 7.

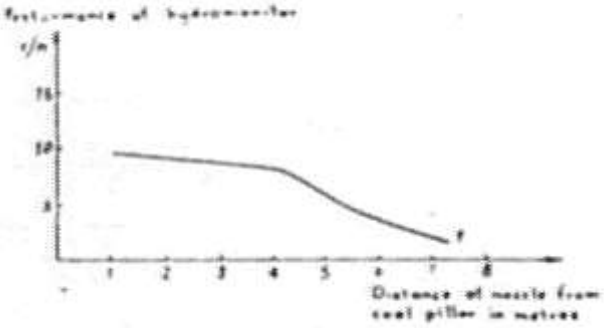


Fig 8. 1- Cutting of Roads (Heading)

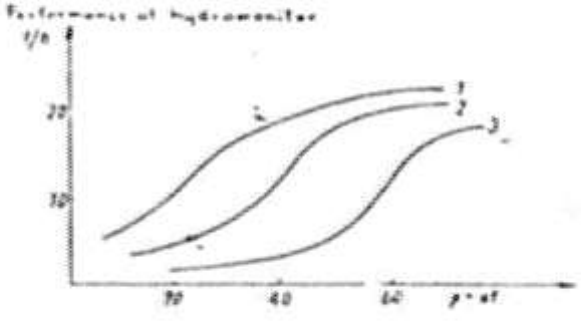


Fig 9. 1- Soft coal; 2- Medium hard coal; 3- Hard coal.

DATA SHEET 5.7.1-22
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor DH-40
B. Country of Origin	Czechoslovakia
C. Distinguishing Characteristics	
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Skid, Nozzle, barrel, swivels, cylinders for rotation
5. Design Parameters	
6. Performance Parameters A. Input	Working pressure 50 atm
B. Output	Working pressure 50 atm Nozzle diameter 17, 19, 22, and 25 mm
C. Performance Capacity	
D. Efficiency	Range less than 25 ft
E. Limiting Environmental and Coal Seam Conditions	Coal hardness up to at least f = 1.2
7. Size of Equipment A. Length	(with short head) 1630 mm to 1675 mm max.
B. Width	655 to 720 mm maximum
C. Height	700 to 910 mm maximum
8. Weight of Equipment	190 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Ministry of Fuels - Institute for Pit Mechanisation (UDM) in Prague
11. Status of Development	in use 1958

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Ostrava Branch of the Mining Mechansation Institute
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Ostrava-Karvina Coalfield Association
15. Designation of Mines where Used	Czechoslovak Army Mine I, Karvina
16. Type of Control A. Input	Remote
B. Comments	Rotation in horizontal plane 150°, vertical up 80° down 10°
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	492, p. 297; 543, p. 4; 549
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.7.1-23
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor - Roslyn # 9 Mine
B. Country of Origin	USA
C. Distinguishing Characteristics	Hand held monitor or monitor mounted on screw type roof jack
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	3/4" schedule 40 pipe, hose connection, handle, nozzle connection, nozzle, 18" dia. rubber shield, high pressure hydraulic hose
5. Design Parameters	Nozzle diameter 0.100, 0.125, 0.138, 0.148 and 0.150 mm
6. Performance Parameters A. Input	40 gpm @ 4500 psi
B. Output	
C. Performance Capacity	With 0.150 inch nozzle and 3500 psi water pressure. flowrate of 38.5 gpm, productivity was 0.74 tons/min and 16.6 tons/man-shift
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	6 ft 6 in.
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	BuMines
11. Status of Development	Tests completed 1963

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	BuMines
13. Number of Units Manufactured (and Time Period)	Prototype
14. Using Agency	Coal Department, Northern Pacific Railroad
15. Designation of Mines where Used	Roslyn # 5 Bituminous coalbed in the Roslyn # 9 mine, Roslyn, Washington
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	"Deadman" switch on monitor and pushbutton located 30' from face
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	49; 155; 662, p. R4-48; 153
25. Drawing(s)	49, fig. 6, 7, table 1; 155 fig. 2
26. Photograph(s)	49, fig. 8, 10; 155, fig. 1, 2; 662, fig. 10, 11

TABLE 1. - Summary of pillar hydraulic mining results

Nozzle diameter, inches	Water pressure, psi	Water rate, gpm	Total coal mined, tons	Total man-shifts	Average production, tons per man-shift	Average cutting rate, tpm
0.100	3,000	13.0	191	13	14.7	0.37
.100	3,500	14.5	305	25	12.2	.43
.125	2,500	18.0	136	12	11.3	.49
.125	2,800	18.2	161	10	16.1	.46
.125	3,000	19.0	154	20	7.7	.28
.138	4,000	33.0	2,079	125	16.6	.63
.150	3,000	30.0	3,663	268	13.7	.44
.150	3,500	38.5	3,377	203	16.6	.74

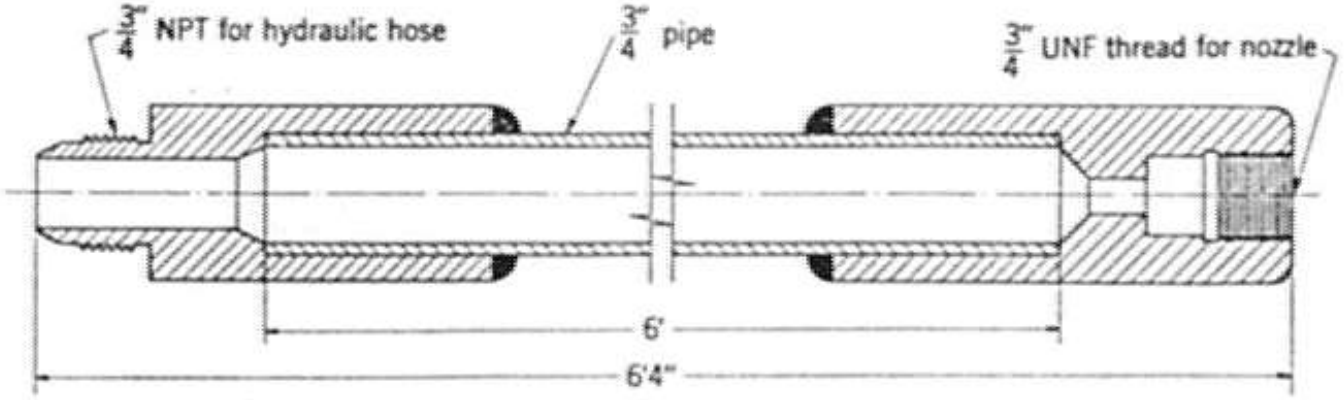


FIGURE 6. - Hydraulic Monitor.

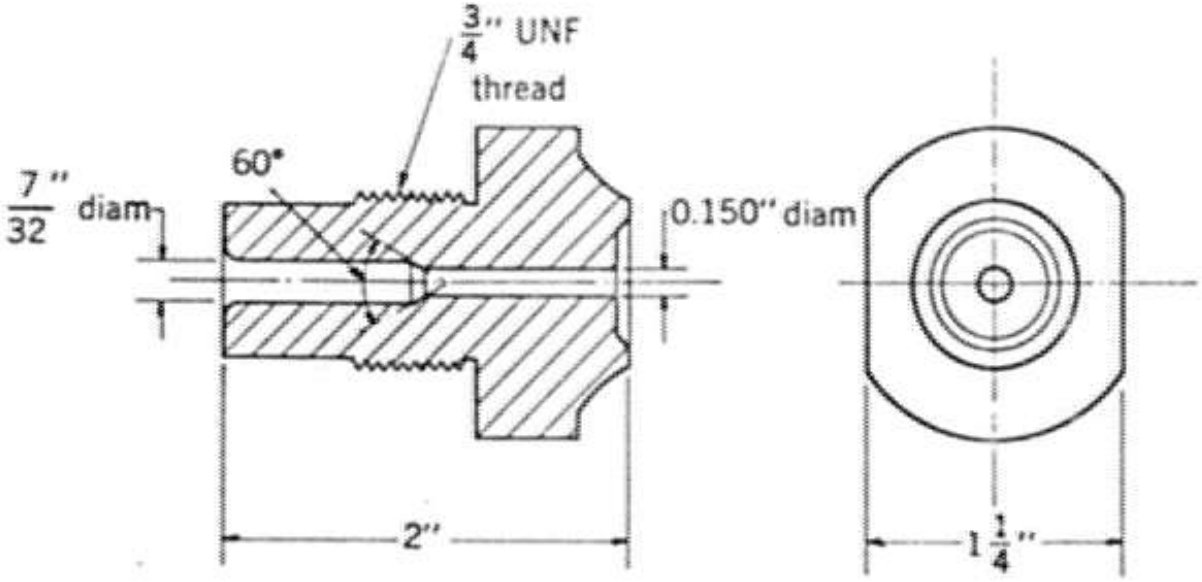


FIGURE 7. - Hydraulic Nozzle.

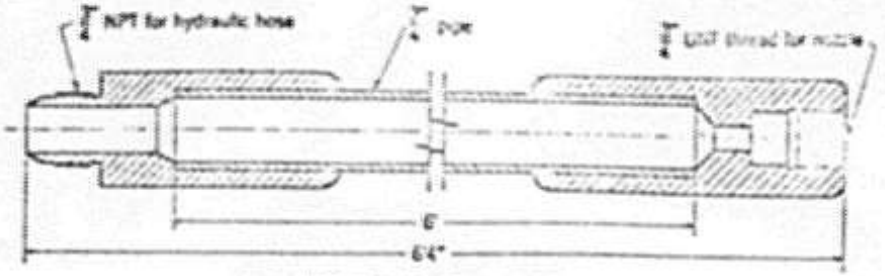


FIG. 1–Roslyn monitor.

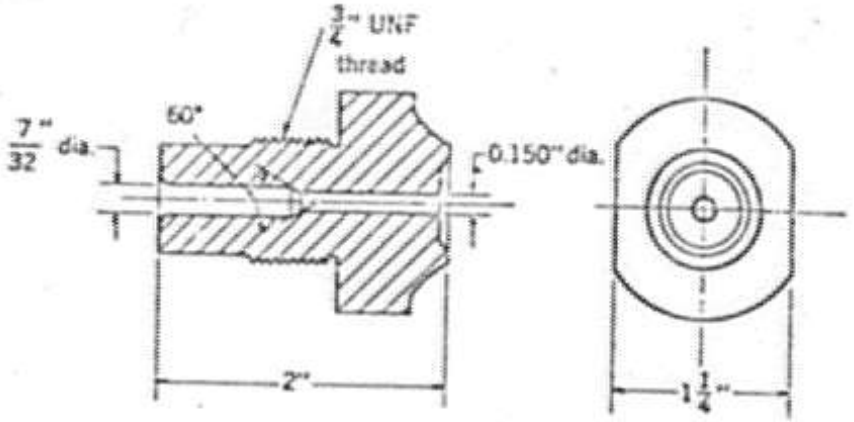
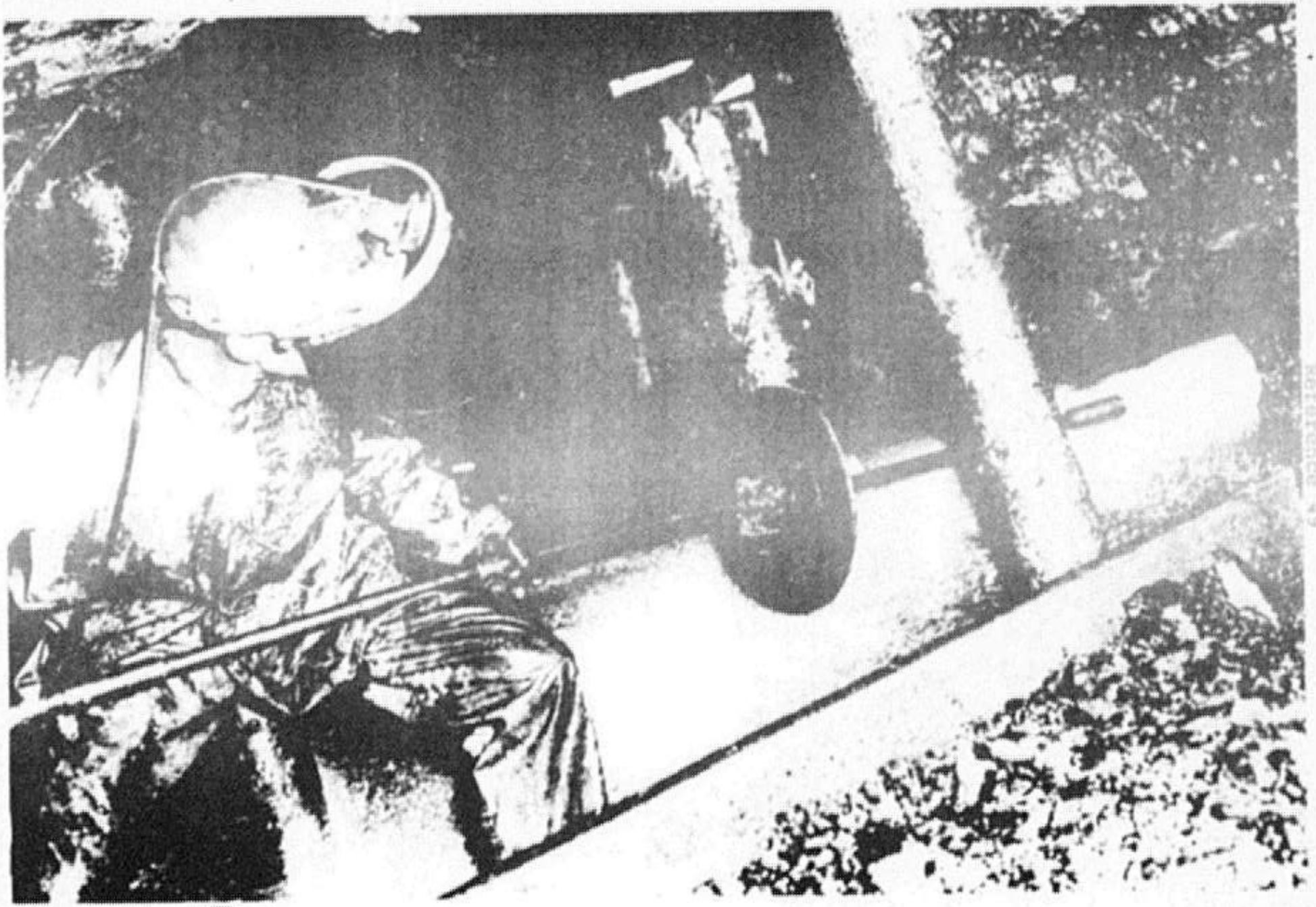


FIG. 2–Roslyn nozzle.



Reproduced from best available copy.

FIGURE 8. - Mining Pillar Coal With Hand-Held Monitor.

DATA SHEET 5.7.2-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor, Self-propelled GDP-2m (GDP-2)
B. Country of Origin	USSR
C. Distinguishing Characteristics	Small scale monitor propelled by telescoping jacks, remote control panel at 10 m distance, oil hydraulic drive
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Telescopic jacks, barrel, rotation & elevation control cylinders, elbows, remote control unit, oil tank and pump
5. Design Parameters	
6. Performance Parameters A. Input	Up to 162 m^3/hr water at pressure to 80 kg/cm^2
B. Output	Nozzle diameter 16-25 mm
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	For thin gently pitching and steep seams above 0.6 m thickness
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	270 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKrNIIgidrougol Institute - Donbass
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Irminsk Hydraulic Equipment & Factory
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	Automatic programmed drive angle of swing in horizontal plane 60° to 200°. angle of shaft rotation in vertical plane 55°, hydraulic drive oil pump (30 kg/cm^2) by drill motor SGR-3M at 65 kg/cm^2 water pressure
B. Comments	Moves by telescoping jacks, maximum rate of traverse over face at standoff of 1 to 3 m is 1 to 1.5 m/second
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 12; 277, p. 8; 238, p. 17, 696, p. 38
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.7.2-2
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor, Self-propelled GPS-1
B. Country of Origin	USSR
C. Distinguishing Characteristics	Semi-automatic remote control (oil hydraulic) Self-propelled by caterpillar track
2. Function	Break coal and drive development headings
3. Designation of Mining Systems for which Applicable	
4. Major Components	Barrel, track carriage, oil-pump unit driven by water vane pump G-12-15-A, remote control panel, high pressure hoses, track rotating mechanism, roof jacks
5. Design Parameters	Nozzle diameters 16-25 mm High pressure feed hose diameter: 76 mm
6. Performance Parameters A. Input	Water flow rate: 150 to 180 m^3/hr Operating pressure 100-120 kg/cm^2
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Medium and thick seams up to 15° maximum dip; rate of travel on horizontal plane: 200 m/hr maximum
7. Size of Equipment A. Length	2750 mm
B. Width	1000 mm
C. Height	1015 mm
8. Weight of Equipment	1100 kg (with control panel
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	VNIIgidrougol Institute - Kuzbass
11. Status of Development	In 1967, a group of units were tested with the AK-1 automated program control

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Experimental Plant of VNIIgidrougol Institute
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	"Krasnogorskaya" mines in the Kuzbass
16. Type of Control A. Input	Semi-automatic remote control panel with oil tank and manual oil pump at 65 Atm pressure Maximum distance to control panel - 10 m
B. Comments	Automatic swinging of barrel with remote control of angle; angle of barrel rotation horizontal plane 120°-200°. vertical up 90° to down 30°
17. Reliability	
18. Safety	Monitor has shield PSHCHG, behind which is installed the control panel
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 14; 238, p. 14; 696, p. 39; 1074, p. 9
25. Drawing(s)	696, p. 40, fig. 3
26. Photograph(s)	238, p. 15, fig. 63

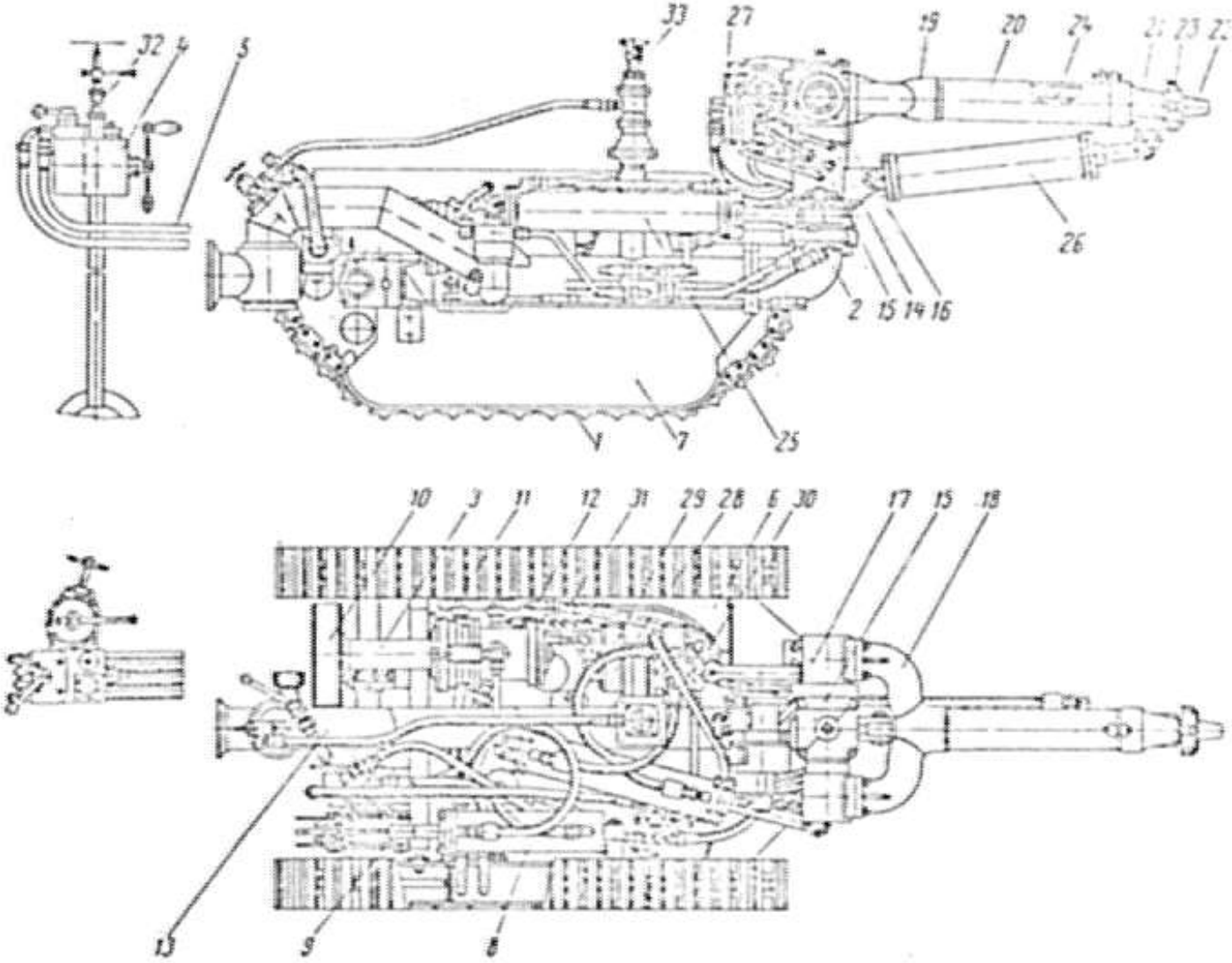


Fig.3 (from 1057)

Self-propelled semi-automatic remote-controlled hydromonitor GPS

1) Crawler; 2)hydromonitor; 3) oil pump plant; 4) remote control panel; 5) high-pressure hoses; 6) platform; 7) caterpillar frame; 8) hydraulic jack drive; 9) ratchet gear; 10) hydraulic turbine; 11) planetary reducer; 12) vane pump; 13) feed pipe; 14) semi-vertical axis; 15) crosshead; 16) hollow trunnion (?); 17)swivel head; 18) by-pass knees; 19) T-bend; 20) shaft; 21) shaft's cone; 22) interchangeable nozzles; 23) nut; 24) honeycomb damper; 25) & 26) jacks; 27) & 28) automatic swinging blocks; 29) rod; 30) jack; 31) decoder; 32) remote control panel's stand; 33) pedestal on the machine framework to assure hydromonitor stability by GPS' undercarriage thrust between the floor and the roof of the seam.

15

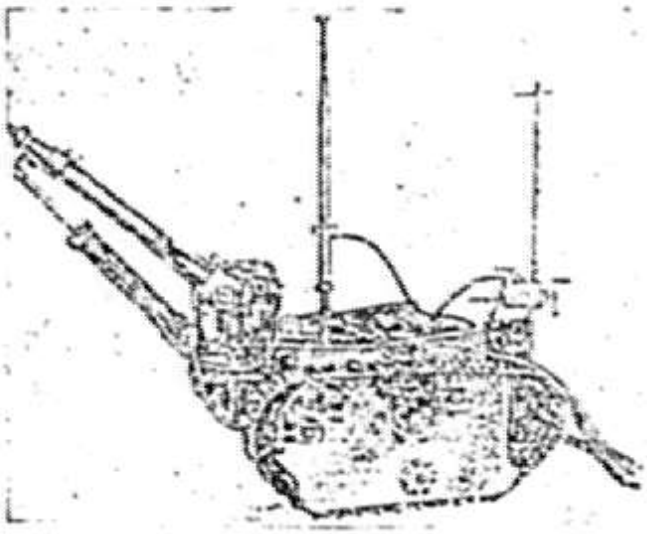


Fig.63
A General view of the self-propelled semi-automatic hydromonitor GPS-1

DATA SHEET 5.7.2-3
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor, Self-propelled GP-1
B. Country of Origin	USSR
C. Distinguishing Characteristics	Self-propelled by caterpillar track
2. Function	Break coal in development and winning faces in thin seams
3. Designation of Mining Systems for which Applicable	
4. Major Components	Crawler carriage, barrel, elbow, remote control unit
5. Design Parameters	
6. Performance Parameters A. Input	Up to 180 m^3 water per hour
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	Nozzle diameter 15-25 (35) mm
B. Width	
C. Height	
8. Weight of Equipment	With control panel and oil pump 367 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UkrNIIgidrougol - Donbass
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	Both manual and remote
B. Comments	Rotation angle in horizontal 210°, vertical 20° up to 15° down - same as GMDTS-2 except has hinged joints
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738
25. Drawing(s)	738, p. 11, fig. 61
26. Photograph(s)	



Figure 61.
THE GP-1 UNIFLOW HYDROMONITOR

DATA SHEET 5.7.2-4
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor, Self-propelled GD-1T
B. Country of Origin	USSR
C. Distinguishing Characteristics	Telescoping movers (from GDP-2M monitor), program-remote monitor with horizontal nozzle supplied by flexible hose
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Barrel, parallelogram support arms, barrel elevating and rotating jacks, water feed hose, telescoping movers
5. Design Parameters	Barrel remains parallel to floor during elevation
6. Performance Parameters A. Input	Operating pressure up to 100 kg/cm^2
B. Output	Diameter of nozzle 19, 20, and 25 mm
C. Performance Capacity	Water flow rate to 150 m^3/hr
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Gently pitching seams up to 1 m thick and 26° dip
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	DonUGI - Donbass
11. Status of Development	Manufactured for testing in 1966

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Irminsk
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Donbass
16. Type of Control A. Input	Programmed remote control, angle of rotation in horizontal plane total 180°, by jack 90°
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Barrel moves parallel to floor which eliminates scouring of roof and floor and increases efficiency by 30%
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 14; 238, p. 17
25. Drawing(s)	238, p. 17 (Unit without telescoping movers or remote control)
26. Photograph(s)	

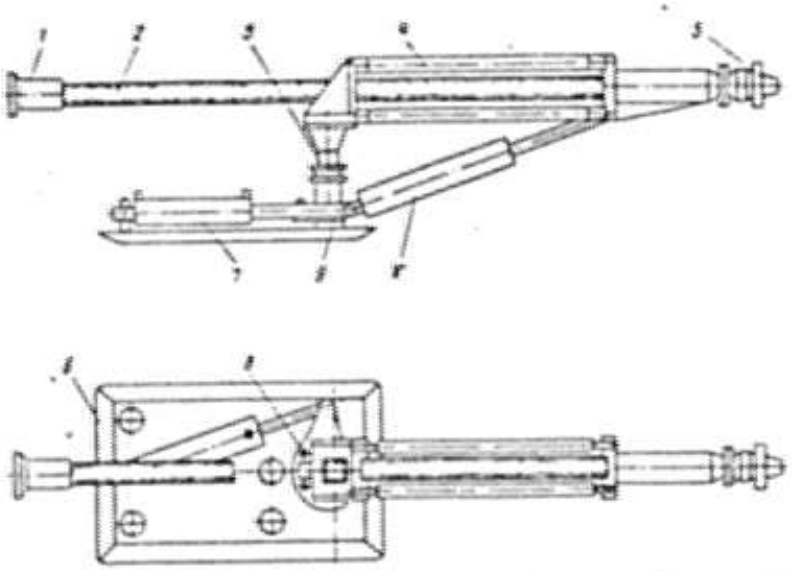


Fig.64. Diagram of the DonUGI hydromonitor with a horizontal nozzle

1 - flange; 2 - high-pressure hose; 3 - rotational body; 4 - hollow rods; 5 - nozzle; 6 - slide rails; 7 - hydraulic jack for horizontal shaft rotation; 8 - disengaging gear; 9 - stand; 10 - hydraulic jack for lifting

DATA SHEET 5.7.2-5

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor, Self-propelled GD-2
B. Country of Origin	USSR
C. Distinguishing Characteristics	Program - remote monitor with nozzle held parallel to seam by parallelogram structure. Self-propelled on caterpillar tracks
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Barrel, parallelogram support arms, barrel elevating and rotating jacks, water feed line, caterpillar tracks
5. Design Parameters	
6. Performance Parameters A. Input	Operating pressure up to 100 kg/cm^2 Water flow rate up to 150 m^3/hr
B. Output	Diameter of nozzle 19, 20, and 25 mm
C. Performance Capacity	
D. Efficiency	Jet is parallel to cleavage plane
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	3740 mm
B. Width	800 mm
C. Height	560 mm
8. Weight of Equipment	Monitor 1175 kg, entire unit 1820 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	DonUGI - Donbass
11. Status of Development	1966 new test model GD-1T that has telescoping jacks for movement instead of caterpillar tracks

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Irminsk Factory
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Donbass
15. Designation of Mines where Used	
16. Type of Control A. Input	Programmed remote control, angle of rotation in horizontal plane total 180° - by jack 90°
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Barrel moves parallel to floor which eliminates scouring of roof and floor thereby increasing efficiency
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 13; 1074, p. 8
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.7.2-6
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor, Self-propelled using PDG Pressure Intensifier
B. Country of Origin	USSR
C. Distinguishing Characteristics	Uses pressure intensifier to increase jet pressure to 400 kg/cm^2, monitor is mounted on tracked vehicle and remote controlled
2. Function	Break coal, including development headings
3. Designation of Mining Systems for which Applicable	
4. Major Components	Double-acting pressure intensifier, monitor control panel, caterpillar track with traction drive mechanism
5. Design Parameters	Jet pressures up to 400 kg/cm^2
6. Performance Parameters A. Input	80 to 90 kg/cm^2 water pressure at inlet
B. Output	Jet pressures up to 400 kg/cm^2 (usually 250-350 kg/cm^2), waste water at 10 to 15 kg/cm^2
C. Performance Capacity	
D. Efficiency	Specific energy = 4-8 kw-hr/m^3 of coal; with good nozzles & cracked coal: 2 kw-hr/m^3
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	VNIIGidrougol - Kuzbass
11. Status of Development	Production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Kuzbass
15. Designation of Mines where Used	
16. Type of Control A. Input	Throttle controls rate of swing and pitch of monitor
B. Comments	Remote control at up to 20 m
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 19; 158; 785
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.7.2-7
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor, Thompson Creek Mine
B. Country of Origin	USA
C. Distinguishing Characteristics	Monitors mounted on screw type jacks
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Timber jack for mounting, barrel, nozzle shield
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	Flow rate 151 l/m, pressure 310 bars, 38 mm nozzle 0.35 tons/minute
C. Performance Capacity	21.1 tons per face/manshift
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	BuMines, Coal Mining Research Center
11. Status of Development	Tests completed

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	BuMines
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Thompson Creek Mine, Carbondale, Colorado "A" coalbed
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18 Safety	Not good, two men at face
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	662; 153
25. Drawing(s)	
26. Photograph(s)	662, fig. 11

DATA SHEET 5.7.2-8

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor - Roslyn # 10 Mine
B. Country of Origin	USA
C. Distinguishing Characteristics	Monitor mounted on a self-advancing hydraulic support unit similar to that used for roof support in a longwall
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Hydraulic valves, control lines and jacks, monitor barrel, nozzle and high pressure water hose
5. Design Parameters	Nozzle diameter = tapering from 64 or 95 mm to 2.86 mm with straight sections (Collimators); 276 bars water pressure, 1,136 l/min, 2, 3, or 5 mm diameter length of collimator
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Tests completed of one prototype

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	BuMines
13. Number of Units Manufactured (and Time Period)	1 Prototype
14. Using Agency	BuMines
15. Designation of Mines where Used	Roslyn # 10 mine, Washington State
16. Type of Control A. Input	Remote hydraulic
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	662; 487; 153
25. Drawing(s)	662, fig. 12; 487, fig. 5, 6; 153, fig. 12
26. Photograph(s)	487, fig. 1, 7

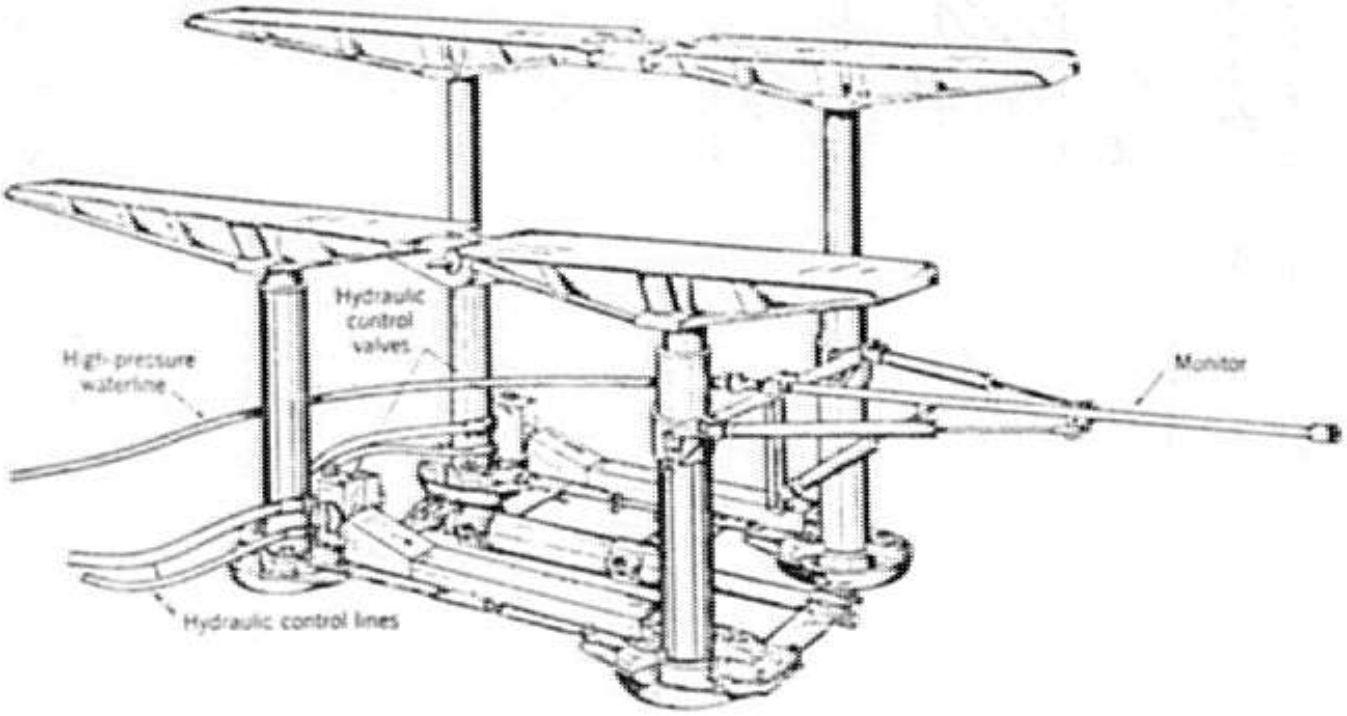
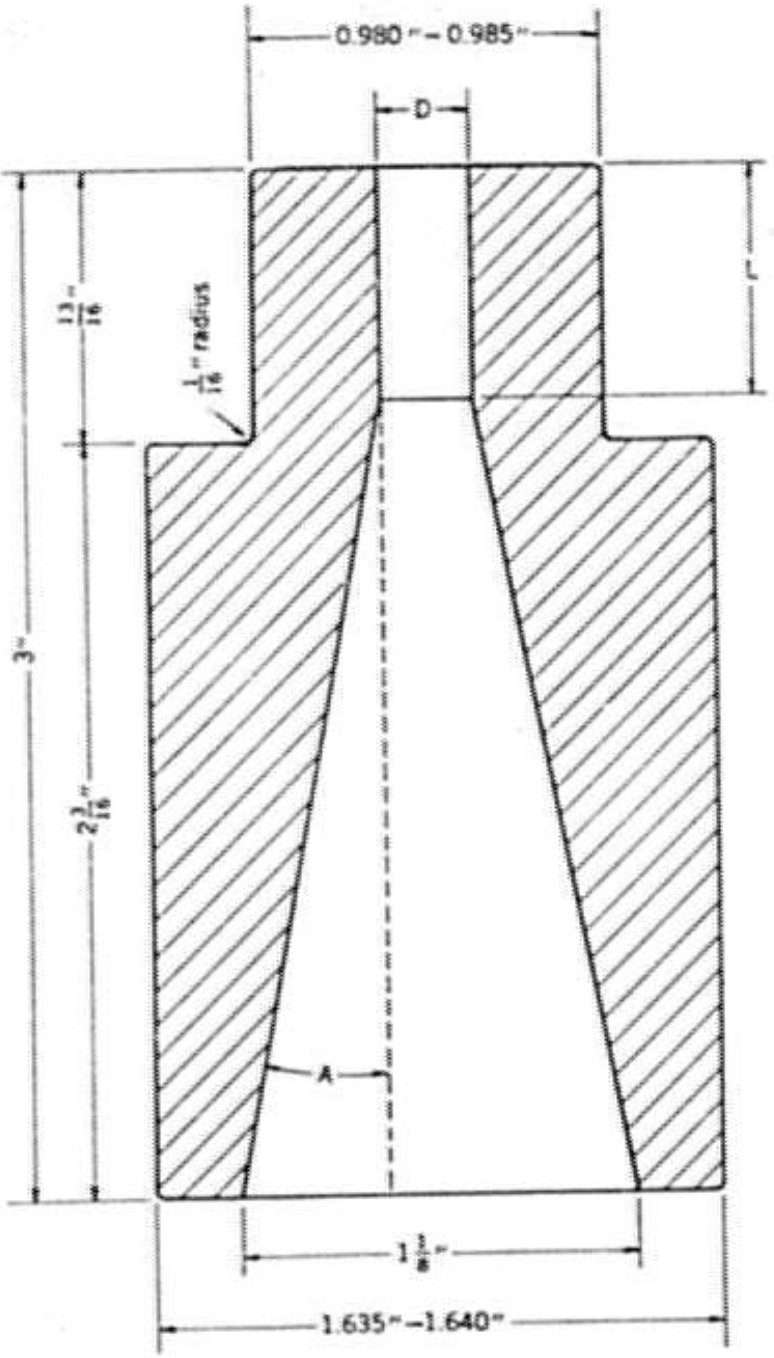


FIGURE 5. - Hydraulic Mining Machine.



D	L	A
1/4"	2D = 1/2"	9°55'
3/8"	3D = 1 1/8"	11°19'
1/4"	5D = 1 1/4"	14°2'

Outside corners 1/64" radius

Material, Ketos tool steel

FIGURE 6. - Nozzles Used During Hydraulic Mining.

DATA SHEET 5.7.2-9

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor - Sugar Notch
B. Country of Origin	USA
C. Distinguishing Characteristics	Control cab at face (or "Jumbo")
2. Function	Cut anthracite coal and remove from face by conveyor
3. Designation of Mining Systems for which Applicable	
4. Major Components	Jet, barrel, telescoping mast, slide rack, enclosed operators cab, tram jack, motors and control cylinders
5. Design Parameters	Supplied by a 9-plunger pump, Nozzle diameter: 1.0-1.27 cm
6. Performance Parameters A. Input	300 gpm at 5000 psi 2300 volts to motor (1000 hp)
B. Output	
C. Performance Capacity	Cutting Rate: Ave. 0.79 T/min, chamber 0.914 T/min, crosscut 0.562 T/min
D. Efficiency	16.96 kw-hr per ton mined
E. Limiting Environmental and Coal Seam Conditions	Stator & rotor of electric motor are split to permit transportation underground
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	Approximately 8 tons
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	BuMines, Anthracite Research Ctr., Schuylkill Haven, Pa., in cooperation with Glen Alden Coal Company
11. Status of Development	Mining tests: Aug. 1961 to Dec. 1963

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	BuMines
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Bottom Red Ash Bed, Sugar Notch Mine, Glen Alden Coal Company near Wilkes-Barre, Pa.
16. Type of Control A. Input	Jet moved by hydraulic motors and cylinders along two horizontal sliding racks and a vertical telescoping mast
B. Comments	
17. Reliability	
18. Safety	Operator located in protected control cab
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Explosives eliminated No dust Water helps diffuse methane
B. Disadvantages	Full face coverage by jet provided by mounting on telescoping jack for vertical & sliding rack for horizontal
24. Pertinent Reference Documents	166; 164; 153; 662, p. E4-49
25. Drawing(s)	166, p. 10; 164, table 1, fig. 1, 2
26. Photograph(s)	166, p. 9, 10, 11; 164, p. 2, 5, 6; 153, fig. 6; 662, p. E4-59, fig. 16, 17

TABLE 1.—Results of Hydraulic Cutting Tests, Pennsylvania Anthracite, U. S. Bureau of Mines, April 28, 1960, and Grindability Indices

Sample Number	Bed	Source	Field	Net weight in pounds	Number of sides encased	Penetration rate, inches per second	Min. input rate, tons per hour	Grindability (Hardgrove) index
1	Mammoth	Strip pit	Eastern Middle	4,540	5	0.60	14.7	37
2	Bottom Red Ash	Strip pit	Northern	6,400	4	[1]	23.4	37
4	Mammoth	Strip pit	Southern	2,200	4	0.18	1.3	45
5	Mammoth	Strip pit	Southern	1,346	5	0.38	9.5	38
6	Kidney	Deep mined	Northern	1,790	5	0.17	15.0	30
7	Mammoth	Strip pit	Western Middle	1,388	1	[2]	[2]	38
8	Mammoth	Strip pit	Western Middle	3,074	5	0.75	13.5	38
A	Pittsburgh[3]	Braveton, Pa.	—	—	—	—	—	60
B	Pittsburgh[4]	West Lebanon, Pa.[4]	—	—	—	—	—	84

[1] No cut formed; open end.
[2] Open sample; "disintegrated."
[3] Bituminous coal.
[4] From the Bureau's Experimental Hydraulic Mine.

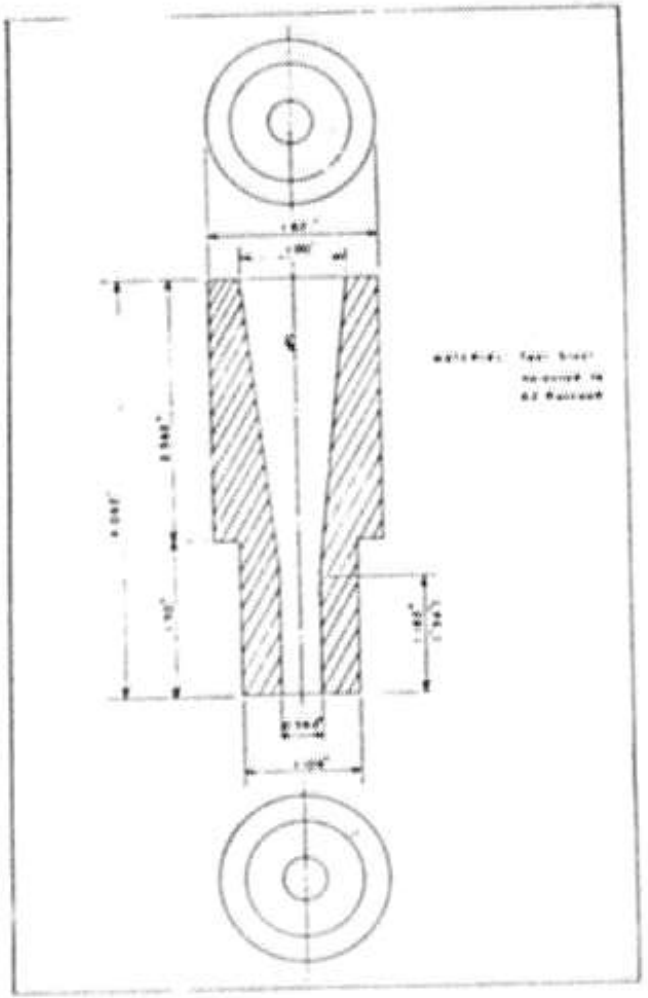


Fig. 1. Bottom Red Ash Bed was mined using nozzle that delivered 300 gpm at 5000 psi

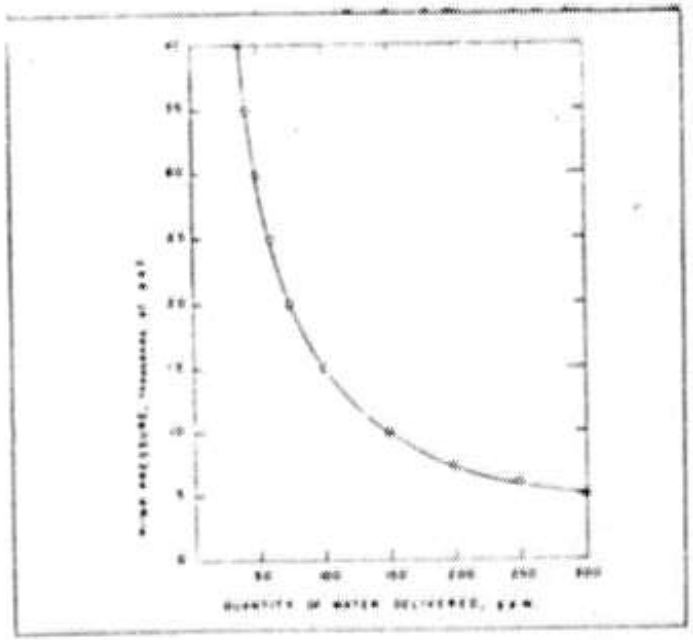
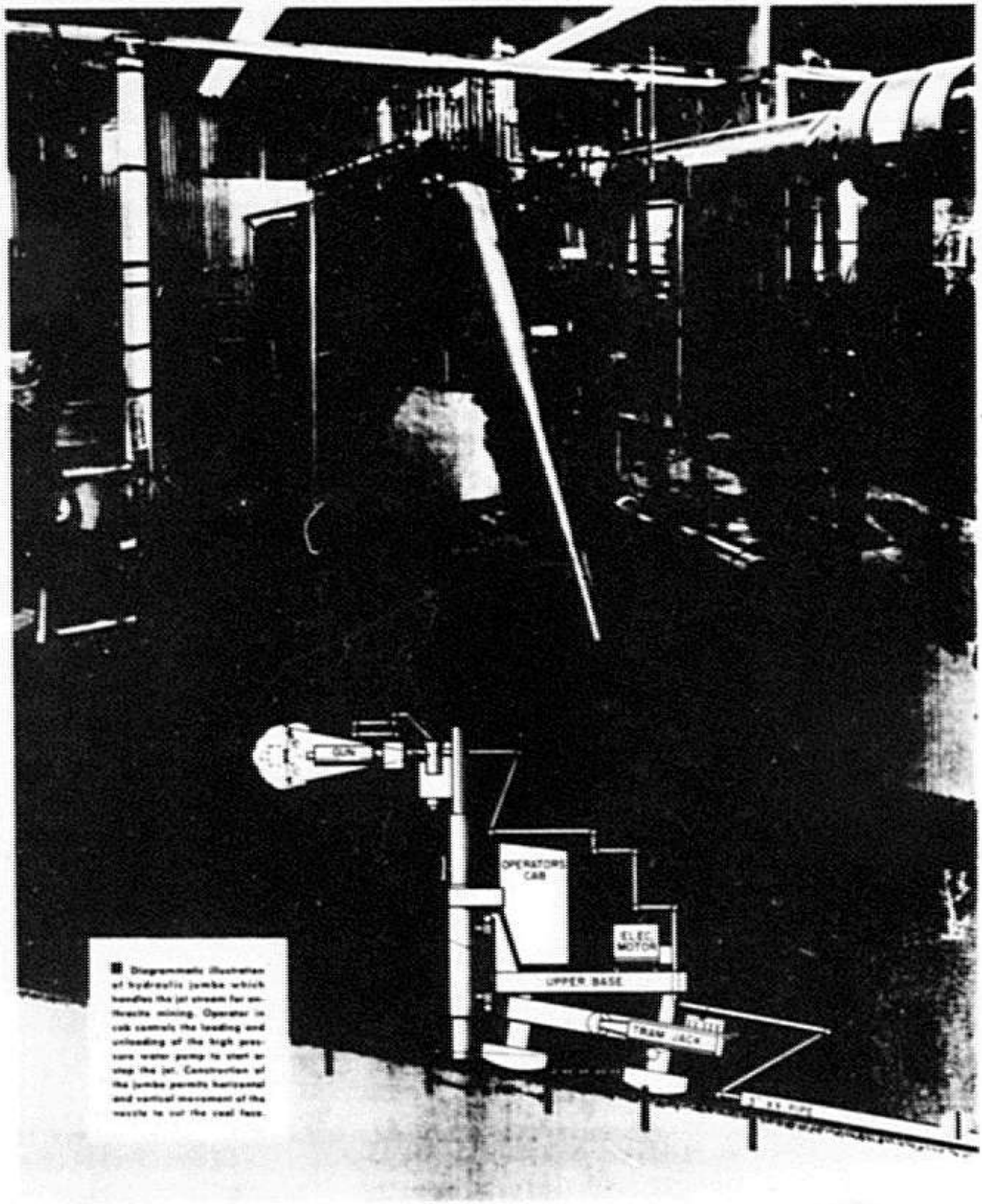
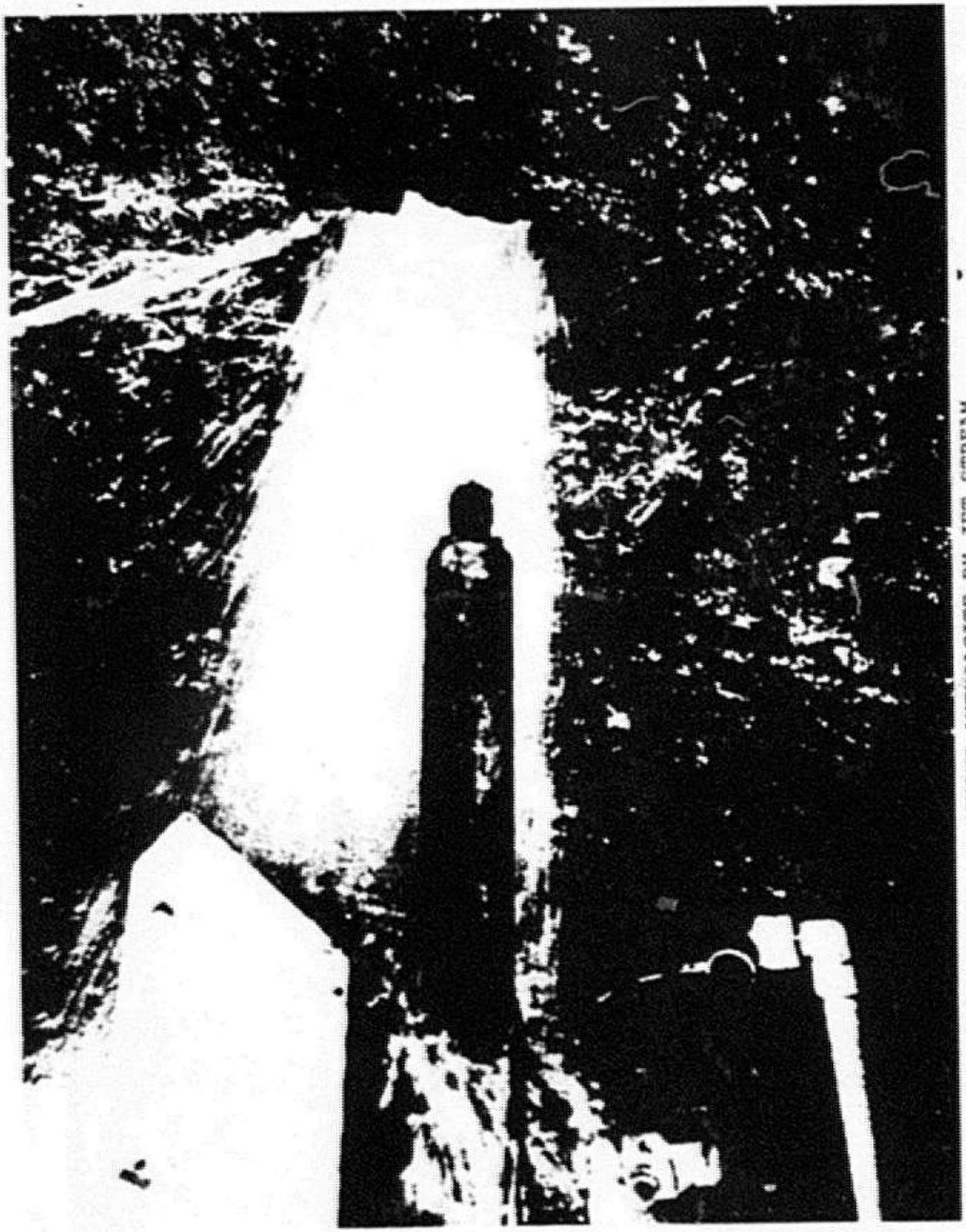


Fig. 2. Gallons of water delivered and corresponding pump pressures for 1000 hp input, based on overall pump and motor efficiency of 87.5 percent

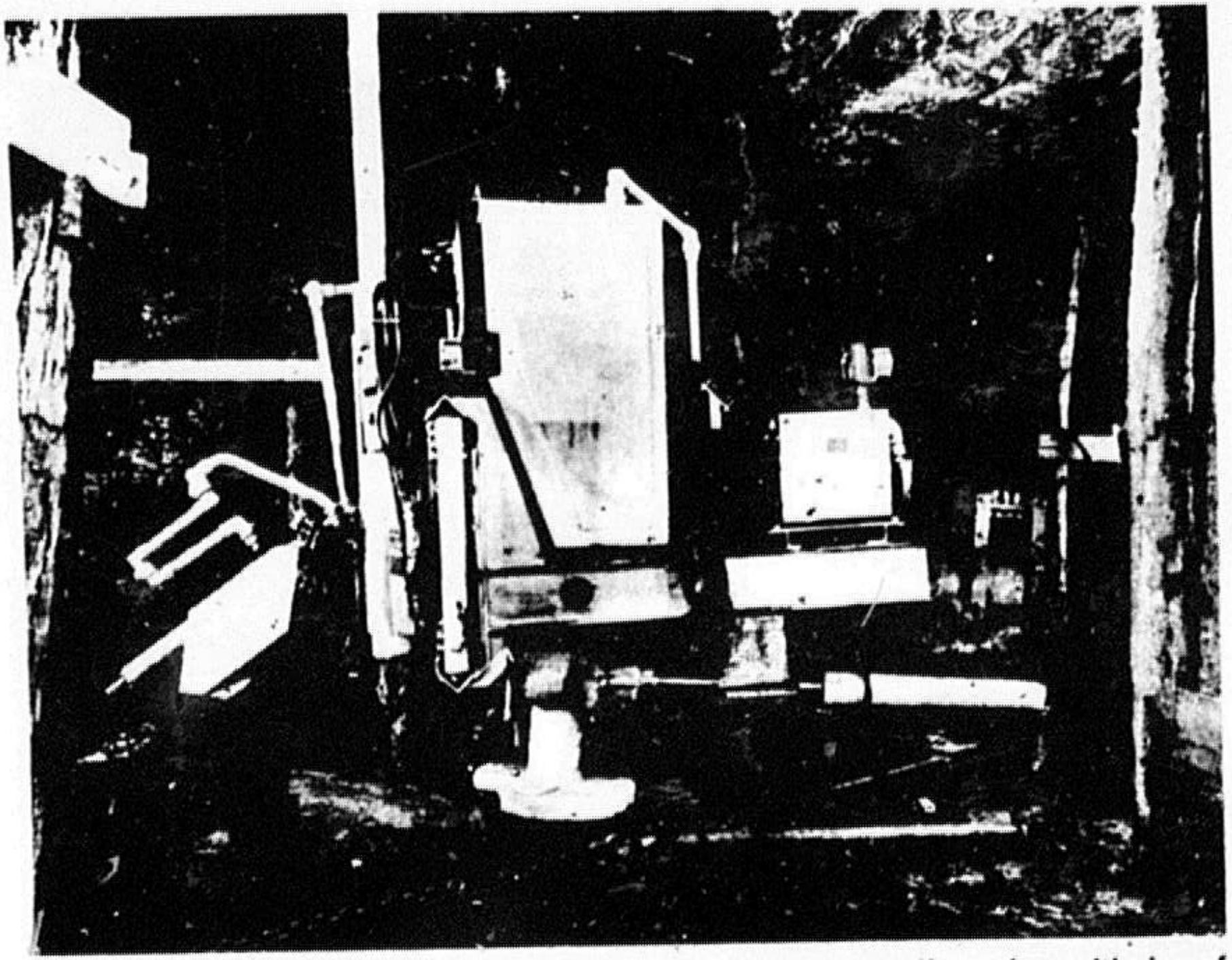


■ Diagrammatic illustration of hydraulic jumbo which handles the jet stream for anthracite mining. Operator in cab controls the loading and unloading of the high pressure water pump to start or stop the jet. Construction of the jumbo permits horizontal and vertical movement of the nozzle to cut the coal face.

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MINING ANTHRACITE BY JET STREAM



The "jumbo" carries on its mast the "monitor" that supports and effects the positioning of the "gun"—timbers were set on six-ft centers

Reference 164

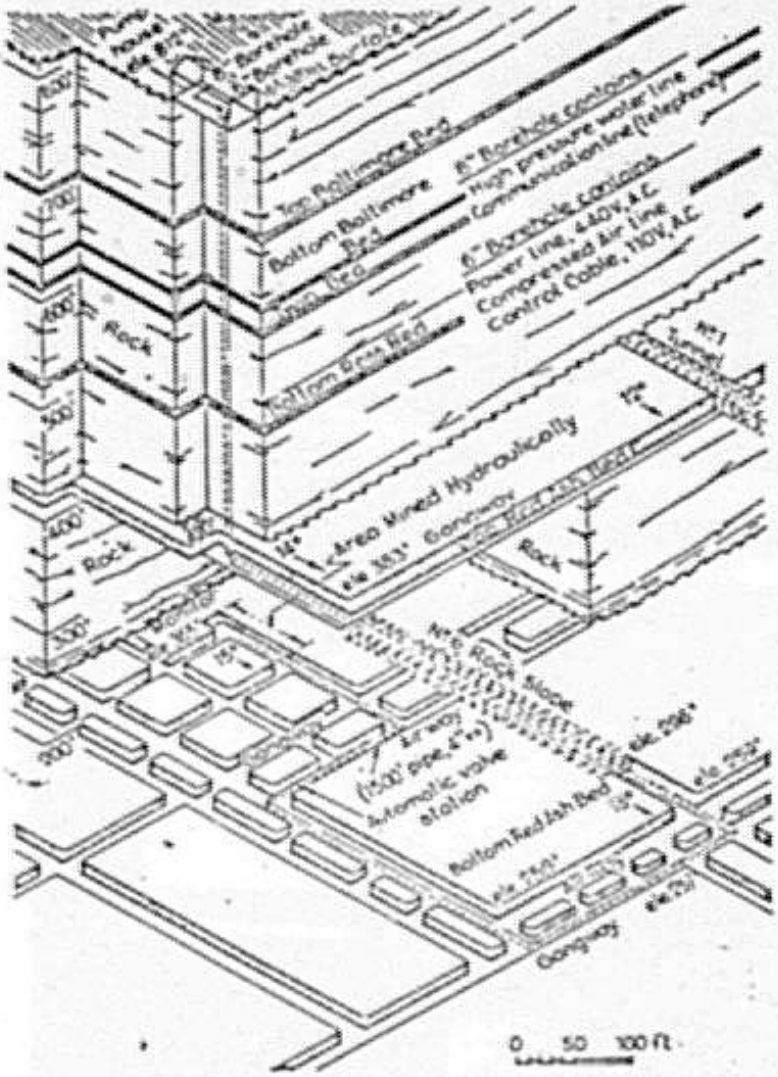
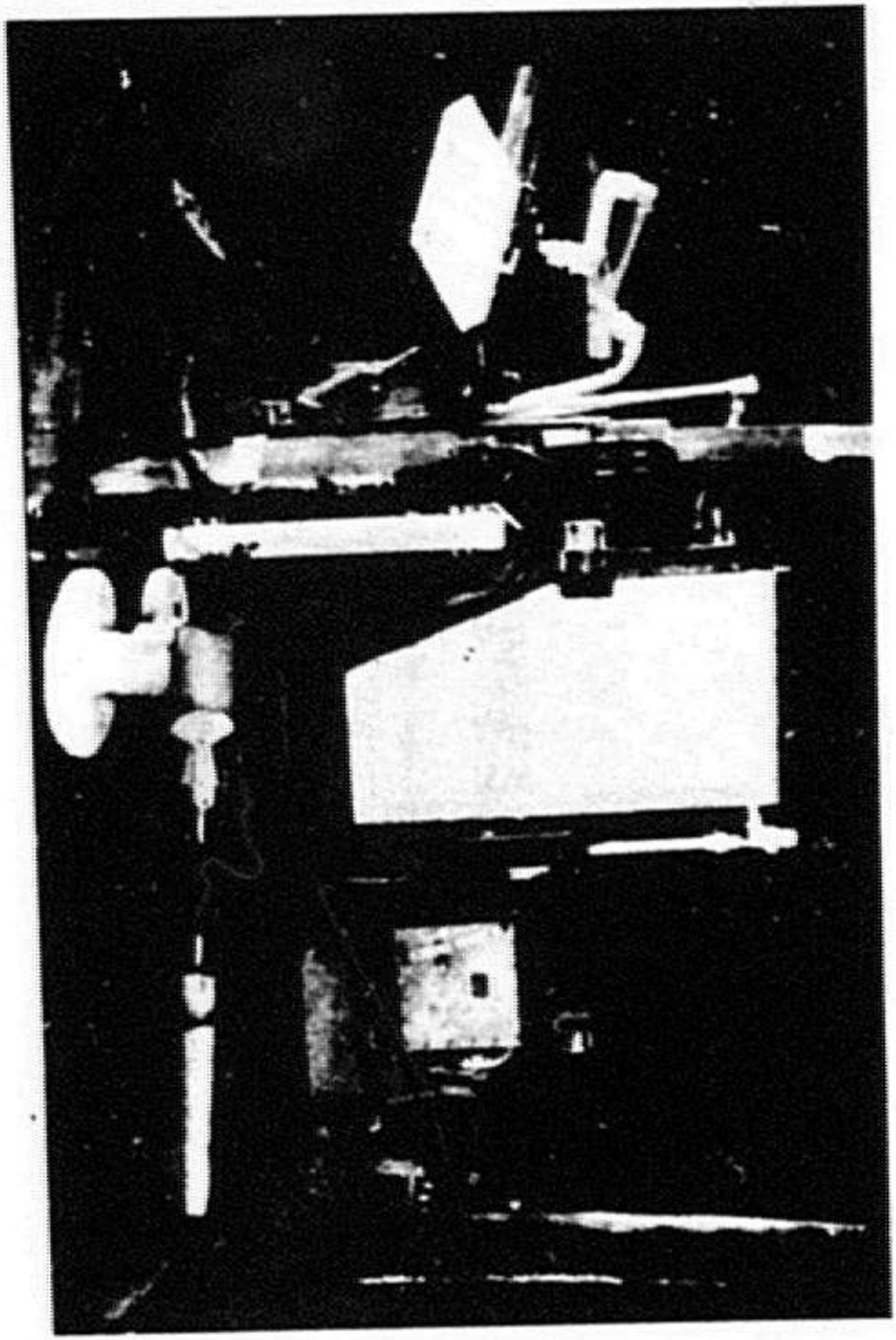


Fig. 6. Cover over the Sugar Notch mine experiment site was about 450 ft



16. Anthracite hydraulic miner.

DATA SHEET 5.7.2-10
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor, Self-propelled - American Gilsonite
B. Country of Origin	USA
C. Distinguishing Characteristics	Compressed air drive for tracks
2. Function	Mine gilsonite
3. Designation of Mining Systems for which Applicable	Hydraulic (gilsonite)
4. Major Components	Tracked vehicle with compressed air drive, frame, two barrels, nozzles barrel aiming hydraulic cylinders
5. Design Parameters	Jet coverage: 18 ft wide by 8 ft high
6. Performance Parameters A. Input	
B. Output	70 gpm @ 2000 psi through each 1/4 in. diameter nozzle
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	American Gilsonite Company
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	American Gilsonite Company
15. Designation of Mines where Used	Eureka Vein, Uinta Basin, Bonanza, Utah
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	Expensive, as this method required timbering, rock bolting and protective floors plus installing and salvaging pipe
24. Pertinent Reference Documents	897, p. 2; 662, p. E4-46
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.7.2-11

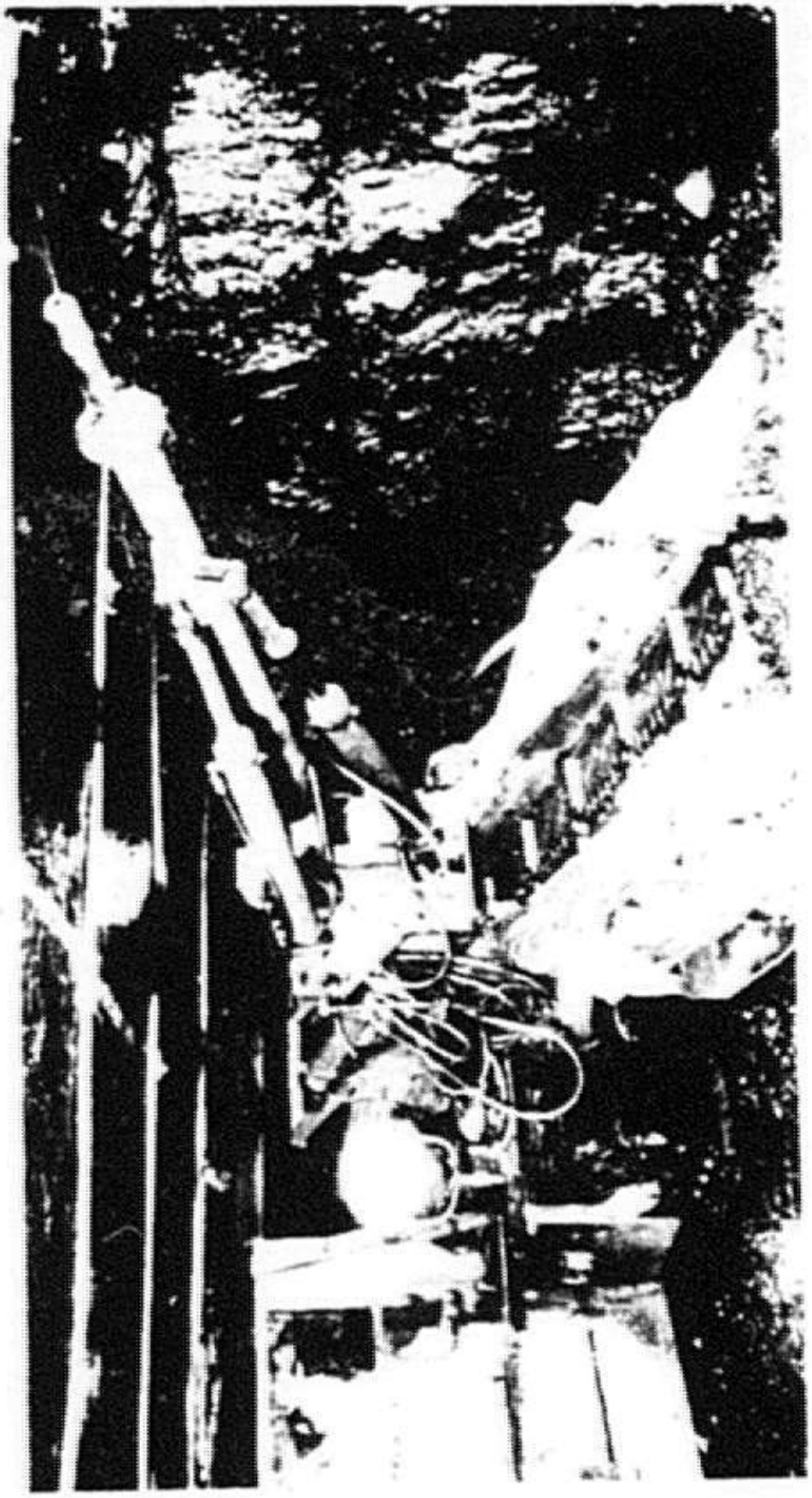
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor - Loading Machine Mounted (W.Lebanon)
B. Country of Origin	USA
C. Distinguishing Characteristics	Monitor loaded on tracked loading machine with gathering arms and conveyor belt
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	0.95 cm "3D" nozzle, 276 bars water pressure
C. Performance Capacity	1.81 tons/minute
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Tested 1958

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	BuMines
15. Designation of Mines where Used	West Lebanon Drift Mine in Western Pennsylvania
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	662, p. E4-47; 153
25. Drawing(s)	662, p. E4-58
26. Photograph(s)	

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9. Monitor mounted on loading machine.

DATA SHEET 5.7.3-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	German Water Jet Drill (Up-Raise Borehole Monitor)
B. Country of Origin	German Federal Republic
C. Distinguishing Characteristics	Jet Drill for boring up-raise holes in thin seams and back-ream rooms
2. Function	Bore up-raise holes in coal and enlarge to rooms to 8-14 m width
3. Designation of Mining Systems for which Applicable	
4. Major Components	Mechanical drilling head, nozzles, boring rods, conventional drilling machine
5. Design Parameters	Four 10 mm nozzles @ 10° from axis for large holes; 5-7 mm nozzles parallel to axis for directional drilling; nozzles @ 50-60° to axis for enlarging rooms
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	Drill up-raise borehole to 100-130 m distance in coal
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Intended for thin seams, less than 1.2 to 1.4 m thick
7. Size of Equipment A. Length	Drill string length up to 130 m
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Steinkohlenbergbauverein Essen
11. Status of Development	Tested prior to 1974

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Steinkohlenbergauverein
13. Number of Units Manufactured (and Time Period)	Developed since 1971
14. Using Agency	Steinkohlenbergbauverein
15. Designation of Mines where Used	Tested apparently in Karl Funke Mine To be used in Hasner Mine
16. Type of Control A. Input	Conventional drilling machine
B. Comments	Use geophone to tell whether jets hit coal or rock and orient jets in the seam
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Reduces cost of driving development drifts (Spacing increases from 25 m to 100 or 130 m on-dip)
B. Disadvantages	Coal recovery only 70% because pillars are left between rooms
24. Pertinent Reference Documents	387, p. 21
25. Drawing(s)	
26. Photograph(s)	387, fig. 11

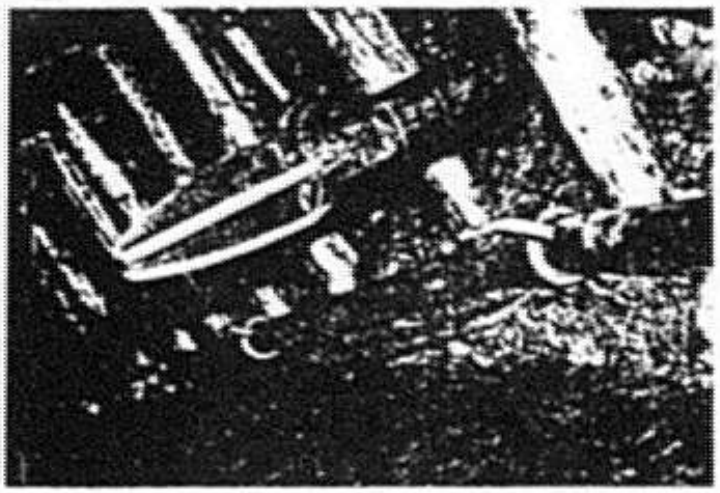


Fig. 11. Hydromechanic drilling tool.

DATA SHEET 5.7.3-2

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Jet Drill System BU-1
B. Country of Origin	USSR
C. Distinguishing Characteristics	Uses rotary - percussion drill BU-1 as principal element, with monitor
2. Function	Drill holes through coal and rock by remote control
3. Designation of Mining Systems for which Applicable	
4. Major Components	Boring machine BU-1-1110-1m, hydraulic jack, monitor barrel, pipes and hoses for remote control, feed lines, valves
5. Design Parameters	Feed thrust 1600-1900 kg Nozzle diameters: 10, 12, 15, 17, 19 or 22 mm
6. Performance Parameters A. Input	Air at 4-5 atm (10-12 m^3/min) Water at 100 atm (150 m^3/hr at 50 atm)
B. Output	Drill 42 mm hole at 1.5-2 m/min (F=4-6) or 0.5-0.85 m/min (F = 8-10)
C. Performance Capacity	3200-3500 blows/minute
D. Efficiency	Produces 69 tons/hour of coal (F = 0.4)
E. Limiting Environmental and Coal Seam Conditions	Seam thickness up to 1.5 m, pitch to 90°, coal hardness to F - 1.0, adjacent rock hardness to F = 14.
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	2600 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Donbass
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	TSEMM Factory
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	In Donbass
16. Type of Control A. Input	Remote control at distance up to 150 m, pressure water for control, cavity washout at F = 0.4 is 2 meters per minute
B. Comments	Swing angle of barrel to 25°, diameter of control hoses 8 mm
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	1074, p. 15
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.7.3-3
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor, Borehole AGS-1		
B. Country of Origin	USSR		
C. Distinguishing Characteristics	System for up-raise workings, monitor head is advanced by adding tubular bars, 960 mm long in a string		
2. Function	Break coal and make up-raise boreholes		
3. Designation of Mining Systems for which Applicable			
4. Major Components	Feeding stand, oil station with controls & control panel, feeding machine, support connectors, drilling bit with nozzles, high pressure hoses		
5. Design Parameters	Rate of feed to 1 meter/minute with 6 tons thrust at 40 atm feed pressure		
6. Performance Parameters A. Input	Water is fed through tubular bars, 80 mm I.D. water consumption to 150 m^3/hr, 2-3 nozzles @ up to 120 kg/cm^2		
B. Output	Diameter of raise = 400 to 800 mm		
C. Performance Capacity	Rate of drilling to 40 meters per shift		
D. Efficiency	Speed of boring: 15 m/hr Production rate of coal: 25 tons/hr		
E. Limiting Environmental and Coal Seam Conditions	Thickness of seam = 0.3 m to 0.8 m, angle of drilling 3-60°, maximum length of hole 150 m @ 25-60° and 100-120 m @ 3-25°		
7. Size of Equipment	Feeding Mechanism	One Section	Total
A. Length	3115 mm		(150 m)
B. Width	1200 mm		
C. Height	725 mm		
8. Weight of Equipment	700 kg	28.3 kg	6500 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)			
10. Developing Agency	UKRNIIGidrougol		
11. Status of Development	Experimental unit manufactured in 1970		

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	UKRNIIGidrougol Experimental Factory
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Samsonovskaya No. 1 after 1970 Donbass
16. Type of Control A. Input	Pump = Rotary GL2-13A, 25 l/min, 65 atm maximum, weight of oil station 90 kg
B. Comments	Nozzles can rotate total 60° from axis and 180° side to side; power of oil pump is too low
17. Reliability	
18. Safety	Lights to observe working face and feed station; control panel located 10-15 m from opening to workings
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	Low power of oil hydraulic system
24. Pertinent Reference Documents	464; 1074, p. 11
25. Drawing(s)	464, fig. 1
26. Photograph(s)	

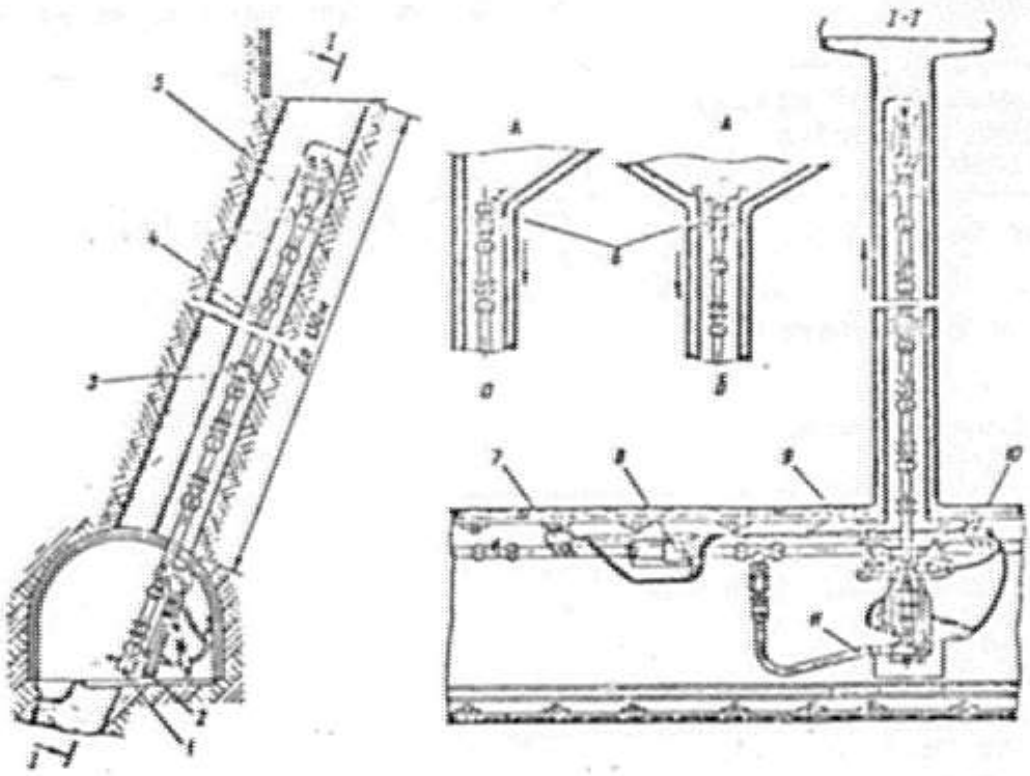


Fig.1. General scheme of operation of the AGS-1 unit

DATA SHEET 5.7.3-4
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor Borehole Unit AGS-2	
B. Country of Origin	USSR	
C. Distinguishing Characteristics	Upraise mining unit supported on frame made of 1 m long sections	
2. Function	Break coal and make up-raise boreholes	
3. Designation of Mining Systems for which Applicable		
4. Major Components	Feeding frame, oil pumping station, control panel, monitor with 3 nozzles	
5. Design Parameters		
6. Performance Parameters A. Input	Operating water pressure 64 atm, water consumption to 100 m^3/hr	
B. Output	Diameter of hole for stoping = 400 mm using 1 or 2 nozzles	
C. Performance Capacity	Rate of advance: during hole boring = 50 m/shift, during stoping 25 m/shift	
D. Efficiency		
E. Limiting Environmental and Coal Seam Conditions	0.4 and thicker seams, 45° and greater dip. Coal strength F = 1, height of level to 140 m	
7. Size of Equipment A. Length	Unit	Feed Machine 2090 mm
B. Width		1500 mm
C. Height		710 mm
8. Weight of Equipment	8540 kg	1450 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)		
10. Developing Agency	UKrNIIgidrougol	
11. Status of Development		

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	UKrNIIgidrougol Experimental Factory
13.	Number of Units Manufactured (and Time Period)	
14.	Using Agency	
15.	Designation of Mines where Used	Industrial tests in Artema Mine of the "Voroshilovgradugol" along ejection prone seam K5
16.	Type of Control A. Input	Pumping station BG-12-24A, rotary type: 50 l/min at 50 atm; drive: piston air motor DR-50
	B. Comments	
17.	Reliability	
18.	Safety	
19.	Major Causes of Failure	
20.	Maintenance Requirement	
21.	Major Overhaul	
22.	Replacement Period	
23.	Comments on Suitability A. Advantages	
	B. Disadvantages	
	Feed Machine	Hydraulic with 600 kg thrust at 50 atm oil pressure; feed rate 0-4 m/minute up, 0-5 m/minute down
24.	Pertinent Reference Documents	1074, p. 13
25.	Drawing(s)	1074, p. 13, fig. 5
26.	Photograph(s)	

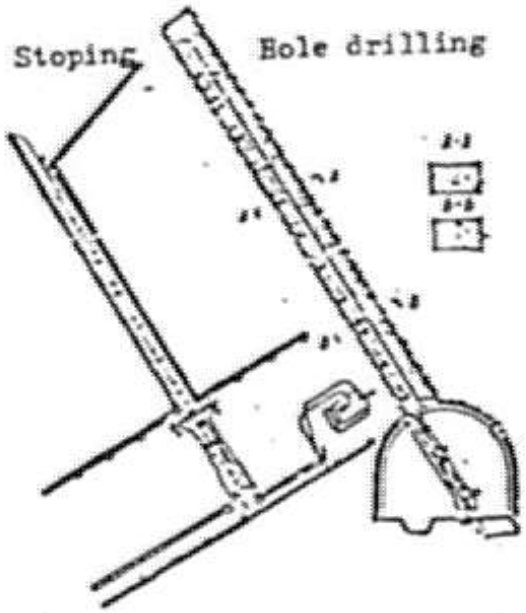


Fig. 5. Hydromonitor Borehole UWIT-AGS-2

DATA SHEET 5.7.3-5
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A.	Name and Model Number	Monitor GVD-1
B.	Country of Origin	USSR
C.	Distinguishing Characteristics	Remote controlled up-raise boring system, high pressure hose used as monitor barrel, with 3 nozzle head
2.	Function	Break coal and make up-raise boreholes (3 nozzles) also stope during downward retreat with one nozzle of 25 mm diameter
3.	Designation of Mining Systems for which Applicable	
4.	Major Components	Remote control panel, high pressure hoses, advance mechanism, monitor rotation & elevation jacks, roof jacks, carriage, directing lights
5.	Design Parameters	
6.	Performance Parameters A. Input	Water consumption to 275 m3/hr Water feed to face 2-3 m^3/min
B.	Output	
C.	Performance Capacity	Rate of advance (meters/shift), in advance to 45 m, in retreat to 14 m
D.	Efficiency	
E.	Limiting Environmental and Coal Seam Conditions	Seam thickness of 0.6 to 1.0 m at dip of 8° to 45°
7.	Size of Equipment A. Length	Total length: 150 m Useful section length: one meter — Monitor 1760 mm
B.	Width	500 mm
C.	Height	735 mm
8.	Weight of Equipment	7145 kg total (Sec. weight = 28 kg) 294 kg total assembly (for 100 m) = 2820 kg
9.	Cost (and Year of Cost Evaluation and Basis for Costs)	
10.	Developing Agency	UKrNIIGidrougol - Donbass
11.	Status of Development	Tests in 1968

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	UKrNIIgidrougol Experimental Factory
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	"Samsonovskaya" # 1 (tests in 1968)
16. Type of Control A. Input	Remote control to advance monitor; carriage gate valve is closed and feed sections added (mouth of cut covered during extension for safety)
B. Comments	Control panel situated 10 m from the entrance of the working being driven
17. Reliability	Straightness of working ensured by rigidity of feed section and by guide lights
18. Safety	Excellent because no workers present in working, unit has no rotating parts, no electrical power at face so unit can be used in hazard prone workings because of sudden outbursts of coal and gas
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 14; 696, p. 32, 46; 1074, p. 10
25. Drawing(s)	738, p. 15, fig. 62; 696, p. 33, fig. 12, p. 46, fig. 20
26. Photograph(s)	

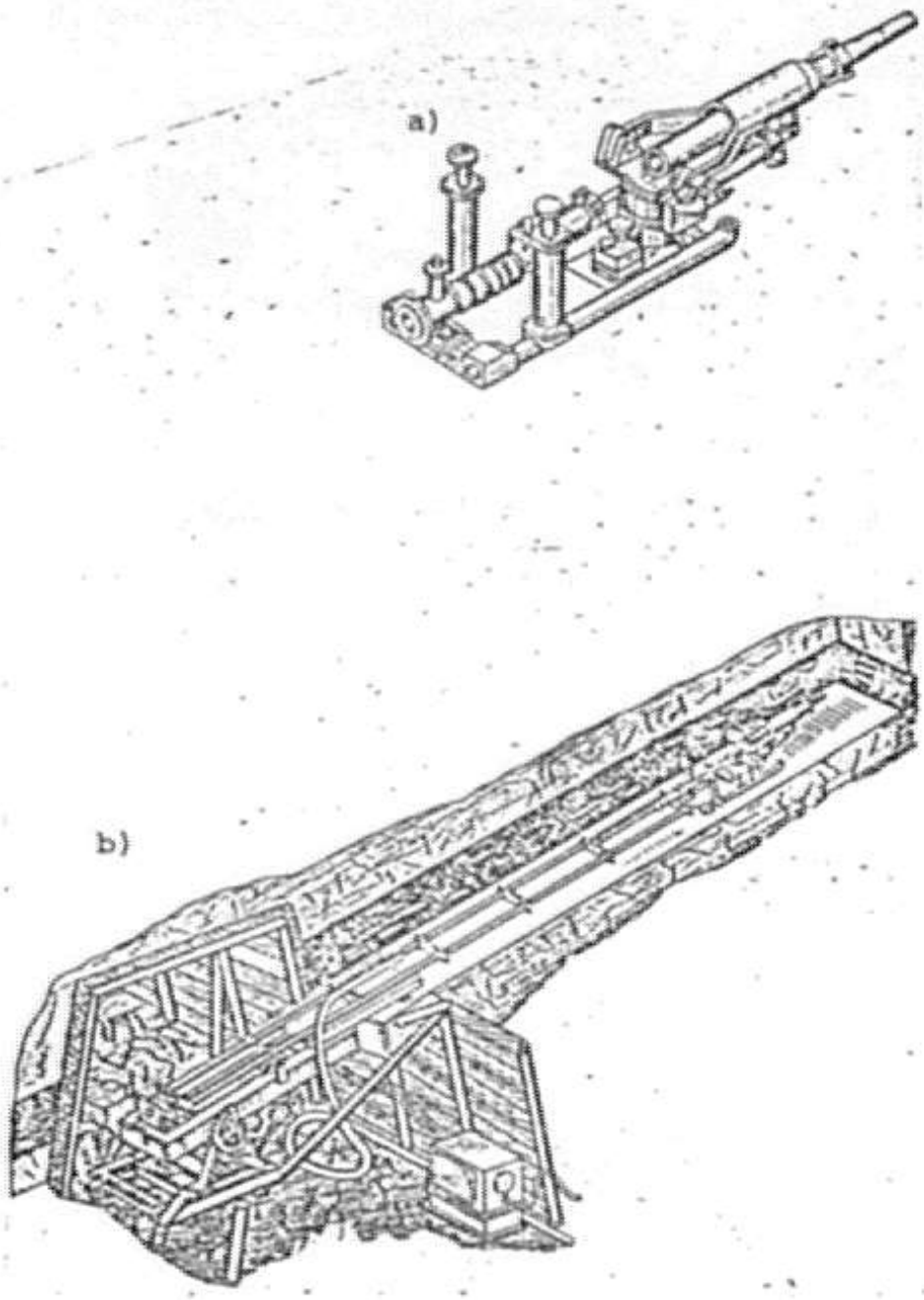


Figure 62.
GVD-1 HYDROMONITOR:
a) overall view
b) plan of driving ascending working.

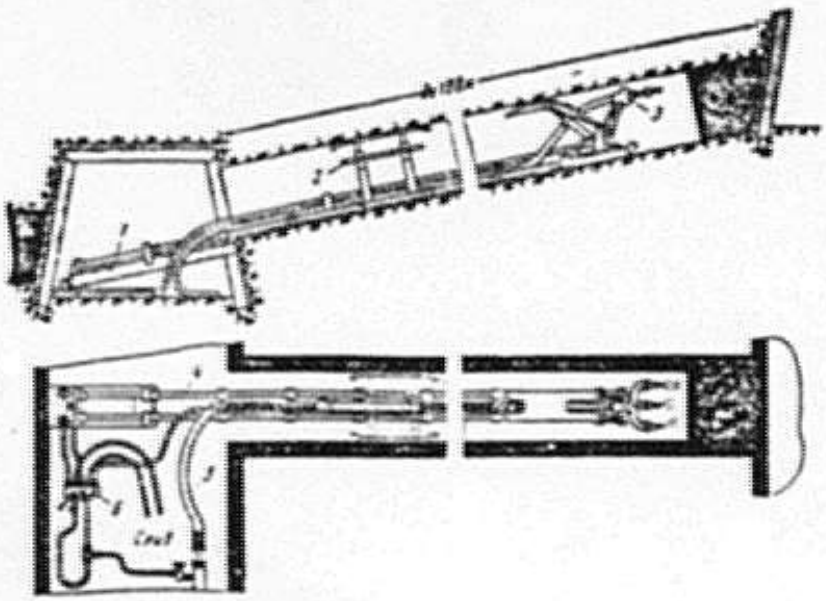


Fig.12. Technological scheme for conducting up raises over coal by the hydromonitor unit GVD-1

1) feeding machine (frame); 2) cross bar (?); 3) hydromonitor; 4) delivery (feed) section; 5) high pressure sleeve; 6) control

DATA SHEET 5.7.3-6
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor (Hose-Suspended) DPG
B. Country of Origin	USSR
C. Distinguishing Characteristics	Remote overhead (suspended) monitor, has a 3 nozzle head, suspended on hose through pre-drilled 300 mm holes in seam
2. Function	Break coal in retreat up a pre-drilled borehole
3. Designation of Mining Systems for which Applicable	
4. Major Components	Removable head, barrel, stabilizer, hoses, 3 nozzle head
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Loose seams of uniform structure and thickness over 0.45 m at pitch of 45°-90°
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKrNIIGidrougol
11. Status of Development	In operation

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Donbass
16. Type of Control A. Input	Ascent of monitor by hoist at upper entry of pilot hole
B. Comments	Monitor head has 3 nozzles diverging at 70° relative to monitor's longitudinal axis, 2 nozzles are disposed in the same plane & make the slot, 3rd in perpendicular plane to the other 2, breaks the coal away
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	238, p. 13
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.7.3-7
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor, American Gilsonite Company, Borehole Type
B. Country of Origin	USA
C. Distinguishing Characteristics	Vertical Rotary Reaming Method
2. Function	Mine Gilsonite
3. Designation of Mining Systems for which Applicable	Hydraulic mining of gilsonite
4. Major Components	Jet head and nozzles, feed and drill pipe (4 1/2" diameter) drill rig, pumps
5. Design Parameters	
6. Performance Parameters A. Input	370 gpm @ 2200 psi pressure
B. Output	Nozzle diameter 9.5 mm
C. Performance Capacity	Average daily production rate 1300 tons
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	American Gilsonite Co.
11. Status of Development	Tests before 1965

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	American Gilsonite Company
15. Designation of Mines where Used	Eureka Vein, Uinta Basin, Bonanza, Utah
16. Type of Control A. Input	Drill stem rotated at 1 rpm and pulled up at 4 to 12 ft/hr
B. Comments	Reaming head consists of two 3/8" diameter nozzles set at right angles to drill stem and 180° apart
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	897; 662, p. 44-46
25. Drawing(s)	
26. Photograph(s)	897, fig. 3

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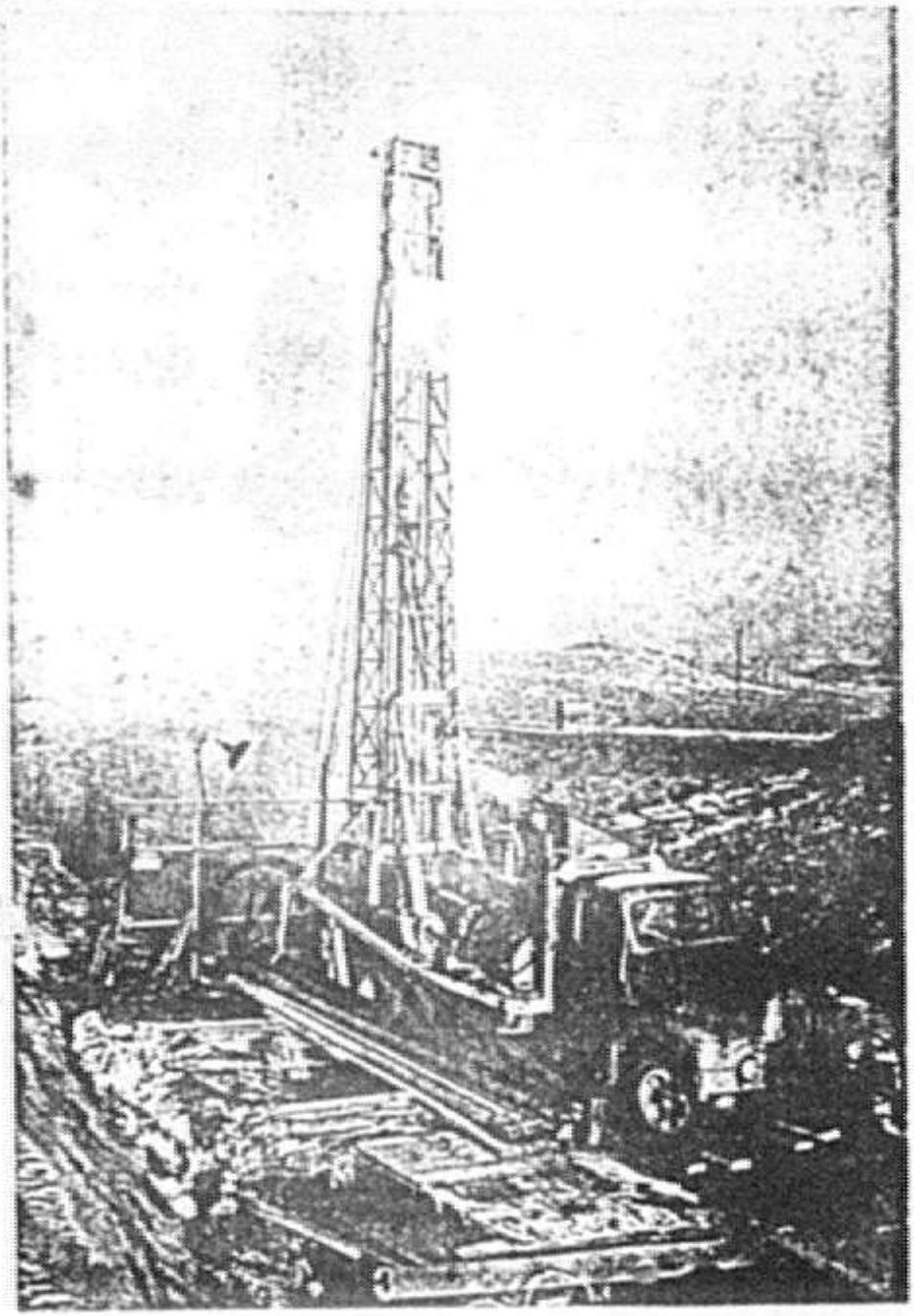


FIGURE 3

" PORTADRILL MODEL 502 USED FOR ROTARY MINING "

DATA SHEET 5.7.3-8
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor, Borehole Type (for Hydraulic Decoking) (Pacific Pumps Div., Dresser Ind.)
B. Country of Origin	USA
C. Distinguishing Characteristics	Methods and hardware for hydraulic decoking of 26 ft diameter drums
2. Function	Hydraulically remove coke for drums
3. Designation of Mining Systems for which Applicable	
4. Major Components	Nozzles opposed to each other at 180° and nearly perpendicular to feed and rotating pipe
5. Design Parameters	Drum must be decoked in 4 hours
6. Performance Parameters A. Input	3000 psi and 950 gpm, provided by multi-stage, barrel-type high pressure pump driven by a variable steam turbine
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Pacific Pumps
11. Status of Development	Tests prior to 1970

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Dresser Industries, Inc.
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Places where Used	Great Canadian Oil Sands - delayed coking unit
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	623
25. Drawing(s)	623, fig. 1-9
26. Photograph(s)	

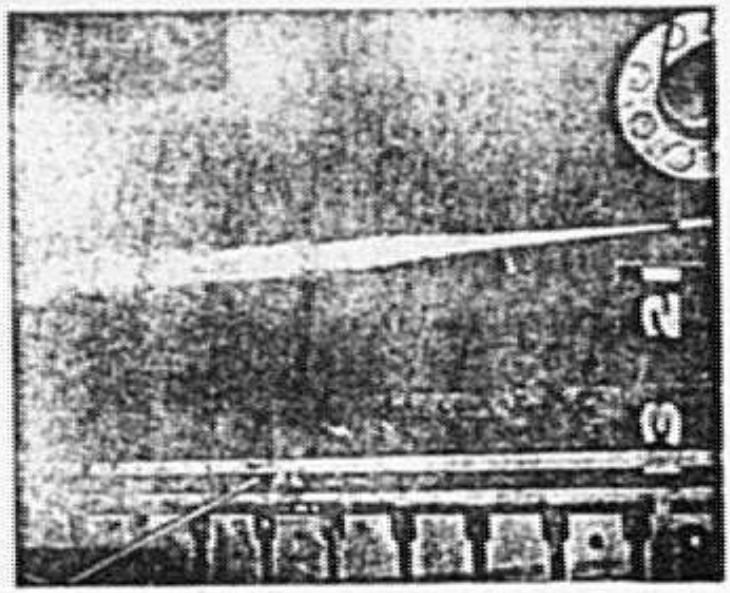


Fig.4

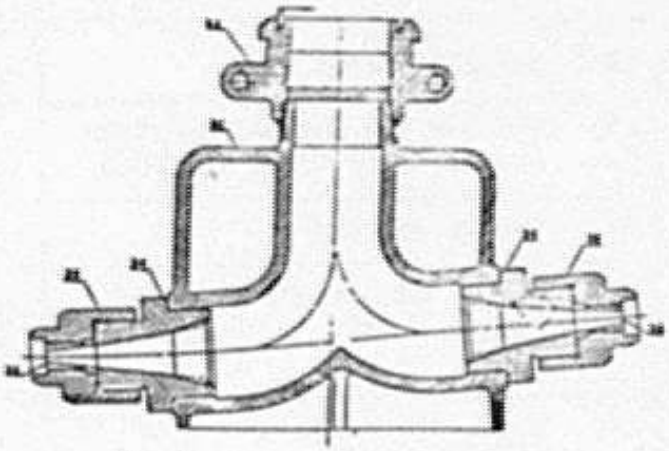


Fig.6 Final cutting nozzle

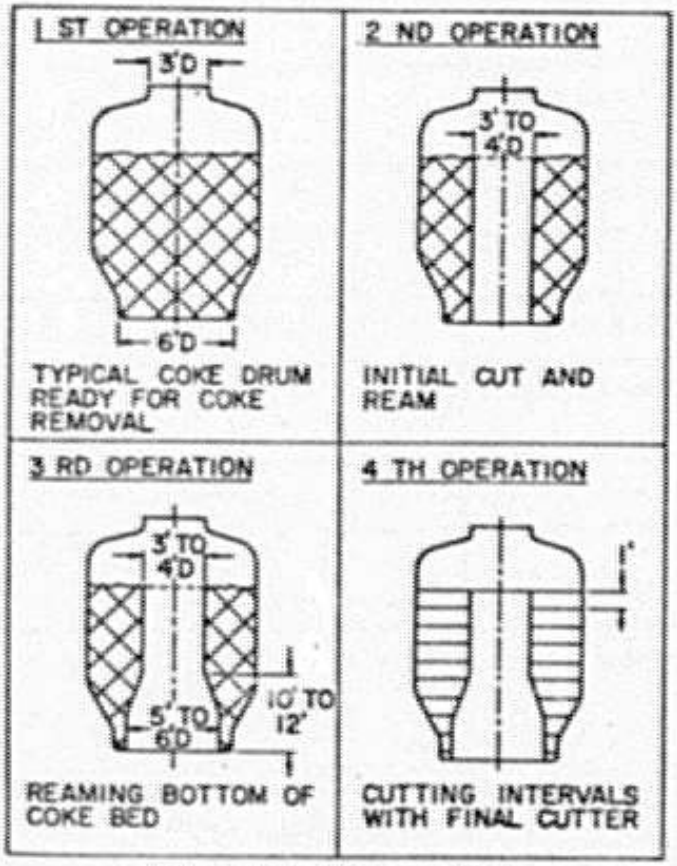


Fig.7 Decoking operation

		1	2	3	4	5
Hydraulic Conditions						
Capacity (pump)	("US" GPM)	700	985	985	1000	875
Pump RPM	(RPM)	4600	4800	5000	5100	5200
Water Pressure (pump)	(PSIG)	2700	2700	2875	3000	3320
Water Pressure (top deck)	(PSIG)	2570	2625	2725	2850	3175
Water Temperature	(°F)	34	34	34	34	34
Pump Energy Output						
Liquid Horsepower	(HHP)	1105	1550	1650	1750	1700
	KW	825	1155	1230	1305	1270
Operating Conditions						
Heater Outlet Temperature	(°F)	900	900	900	900	900
Drum Vapor Temperature	(°F)	825	825	825	825	825
Cutting Time						
Pilot	(Minutes)	10-15	10-15	10-15	10-15	10-15
Final	(Hours)	6.20	2.55	2.50	2.50	2.30
Coke Quality						
VCM	(Weight, %)	N/A	7.550	8.150	7.325	6.875
Density (pycnometer test, not ASTM D292)	(Lbs/cu ft)	N/A	76.11	77.35	67.85	81.1
Coke Volume	(Cubic ft)	N/A	23,750	22,000	22,750	22,750
Coke Weight	(S. tons)	N/A	913	853	775	920
Hardgrove Grindability Index	(HGI)	38-39	38-39	38-39	38-39	38-39

Fig.5 Coke cutting test averages

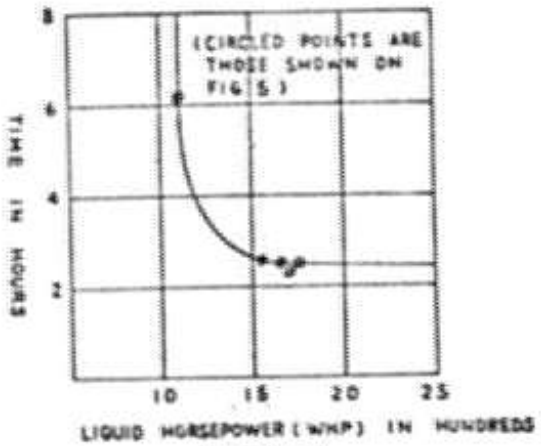


Fig.8(a)

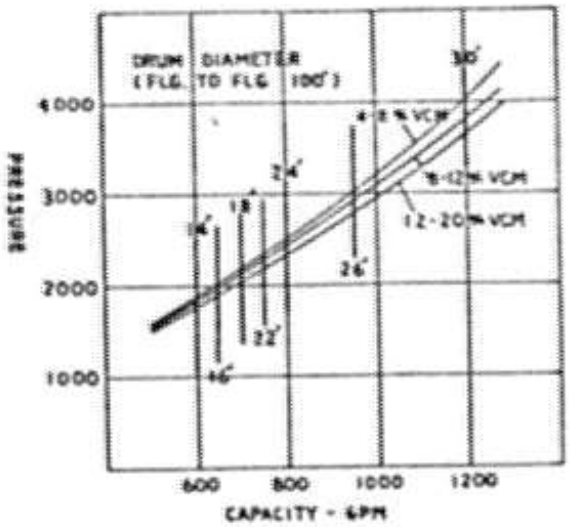


Fig.8(b) Hydraulic design for 4 hr cutting time

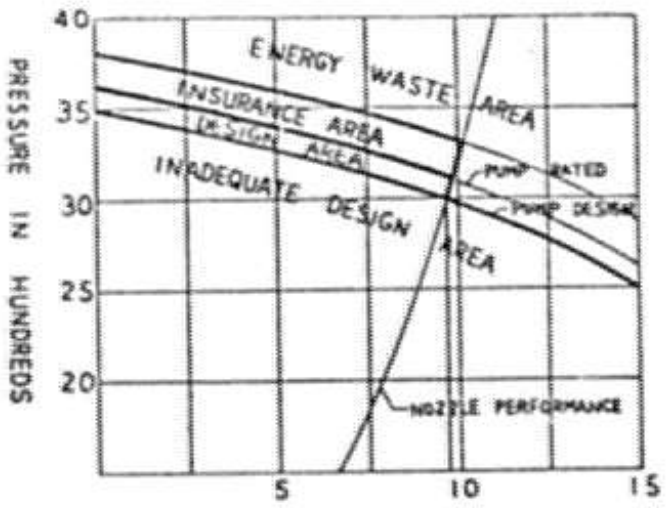


Fig.9 Gallons per minute in hundreds

DATA SHEET 5.7.3-9
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Down-the-Borehole Monitor (Mining Method) FMC Corporation
B. Country of Origin	USA
C. Distinguishing Characteristics	
2. Function	Drill into and mine a subterranean deposit of granular ore, such as phosphate
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	FMC Corporation
11. Status of Development	Patented May 1, 1973

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	770
25. Drawing(s)	770, fig. 1, 2
26. Photograph(s)	

FIG. 1

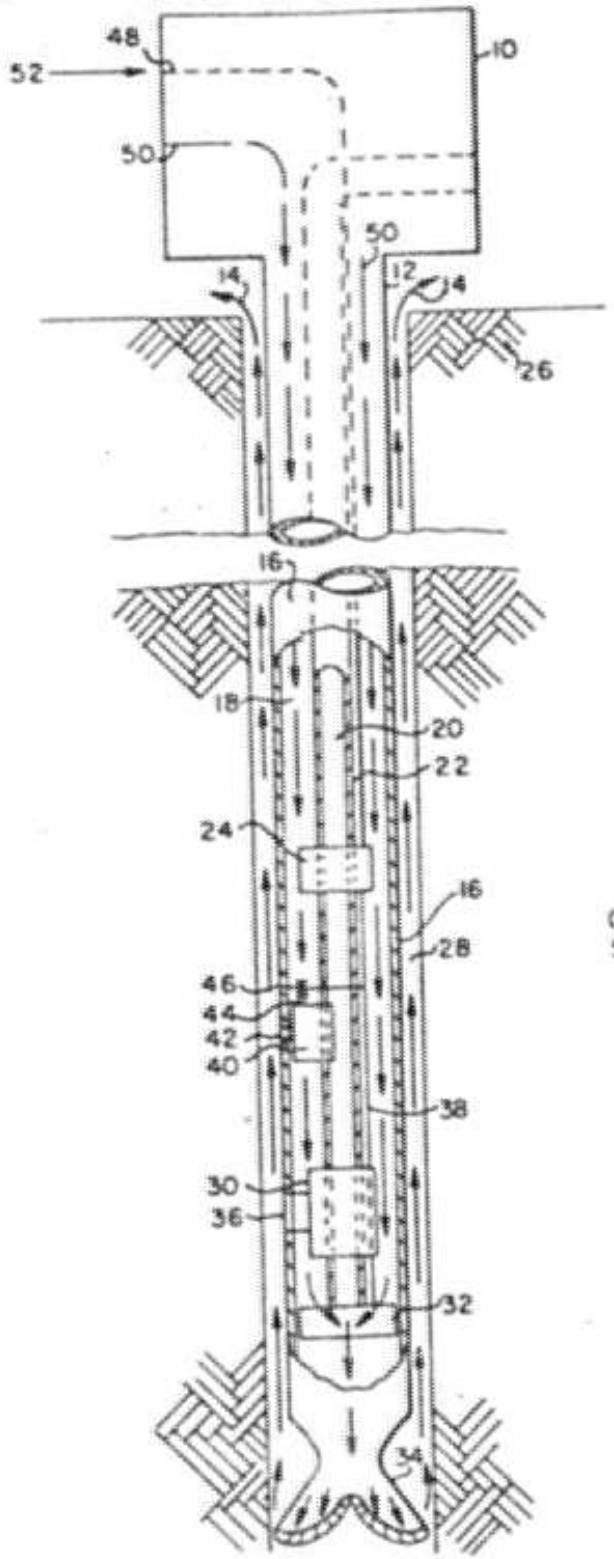
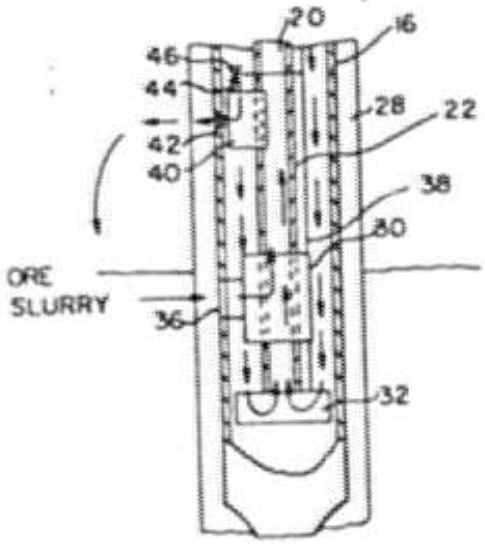


FIG. 2



INVENTORS
WILLIAM Z. WENNEBORG
BOBBY R. PAYNE
PHILIP R. BUNNELLE
BY

DATA SHEET 5.7.3-10
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monitor, Borehole Type (Hydro-Jet Services, Inc.)
B. Country of Origin	USA
C. Distinguishing Characteristics	Jet Cutting and solids removal from small diameter borehole
2. Function	Mine deposits from surface borehole
3. Designation of Mining Systems for which Applicable	
4. Major Components	Hydraulic borehole from surface, jet pressure pipe to rock bit, pump jet nozzle, jet pump venturi, jet pump barrel, drill pipe, H.P. pipe, kelly & swivel, H.P. swivel, H.P. mud pump, settling pits, tri-cone rock bit, fluid and cuttings, suction screen
5. Design Parameters	Mine subsurface mineral deposit through boreholes (16 in.)
6. Performance Parameters A. Input	
B. Output	60% solids in slurry by weight 1 yd^3/min
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	350 deep maximum, 30 ft maximum radius from borehole
7. Size of Equipment A. Length	
B. Width	16 in. diameter
C. Height	to 350 ft deep maximum
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Hydro-Jet Services, Inc. (Mr. Fly)
11. Status of Development	Field application to date (1970) has been increasing the fluid production from oil and water wells

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Hydro-Jet Services, Inc.
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	Excellent
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	Excessive maintenance costs on H.P. pumps. Excessively high cutting rates in softer formations
24. Pertinent Reference Documents	531; 707 (patent)
25. Drawing(s)	531, p. B1-7, fig. 1, 2, p. B1-8, fig. 3
26. Photograph(s)	

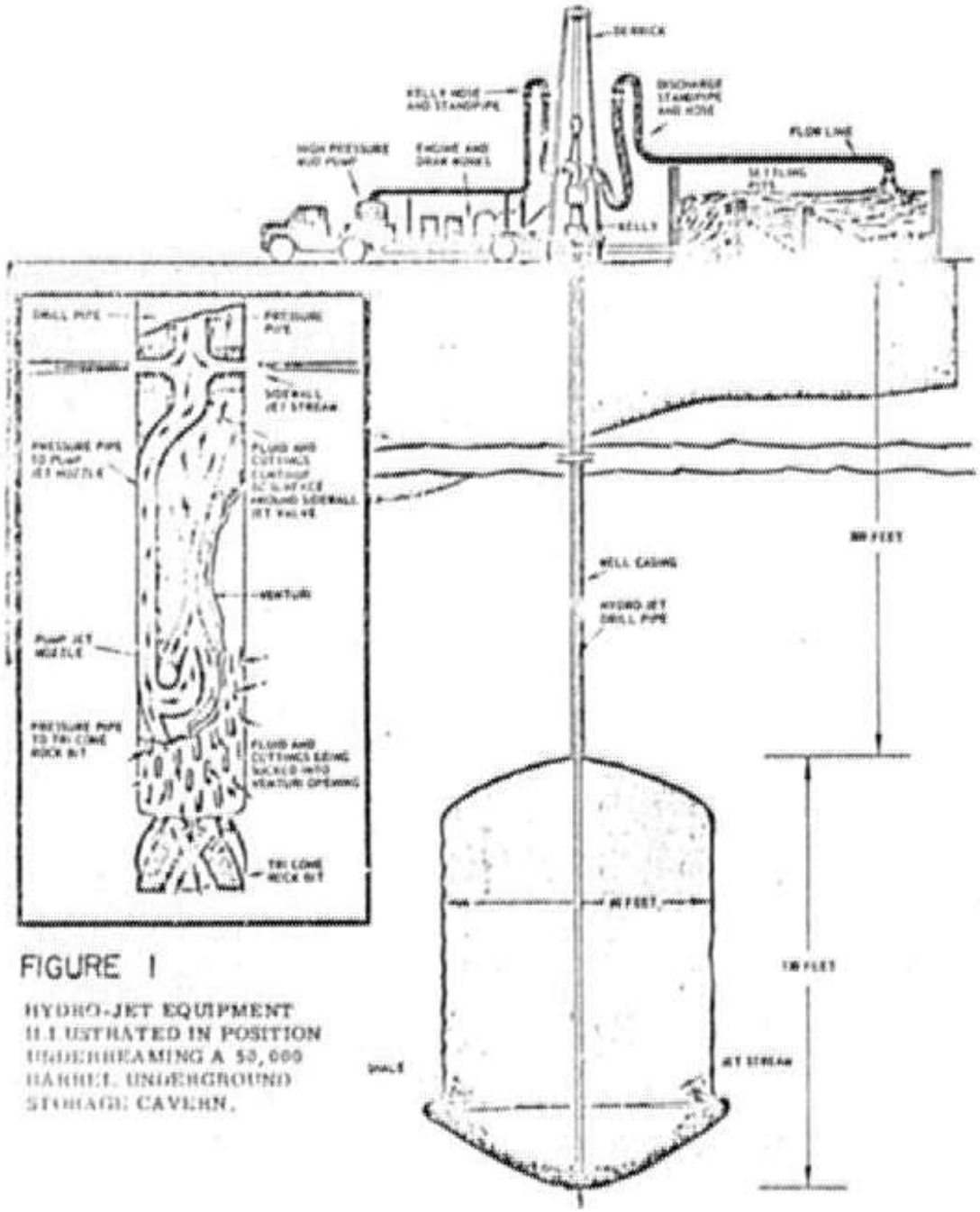
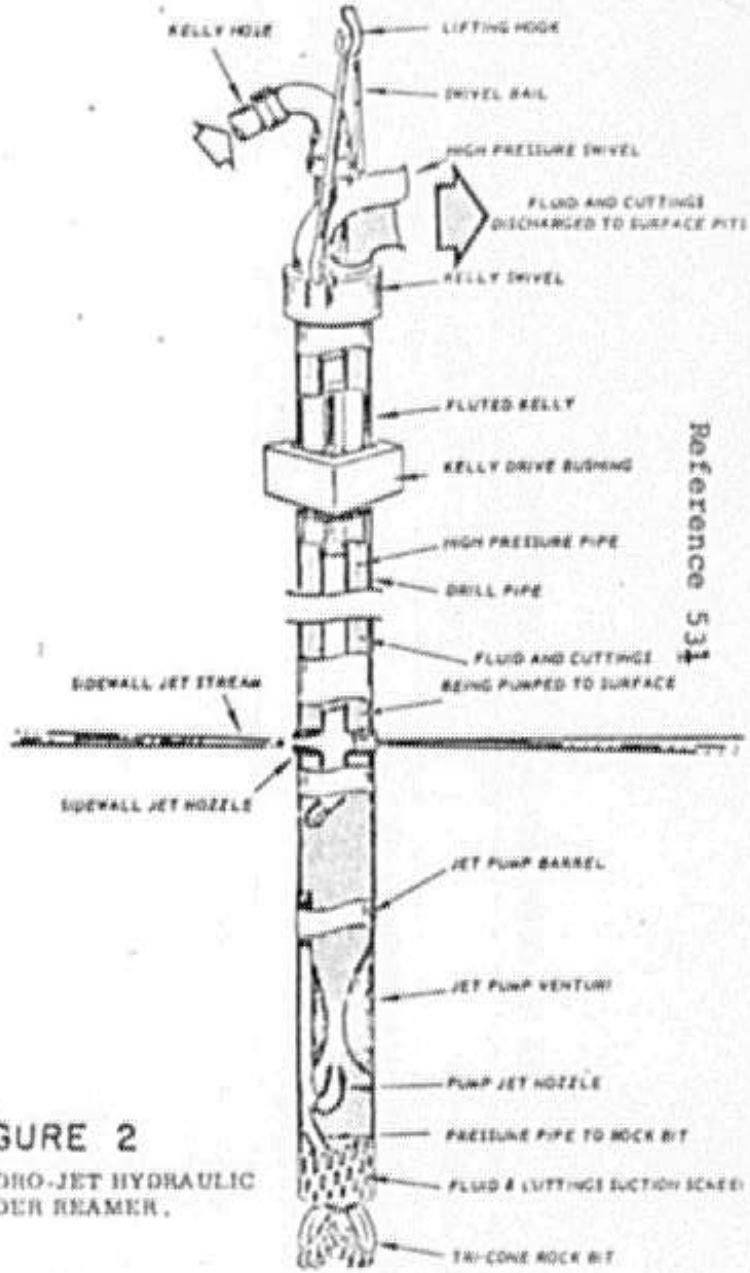


FIGURE 1

HYDRO-JET EQUIPMENT ILLUSTRATED IN POSITION UNDERREAMING A 50,000 BARREL UNDERGROUND STORAGE CAVERN.



Reference 534

FIGURE 2

HYDRO-JET HYDRAULIC UNDER REAMER.

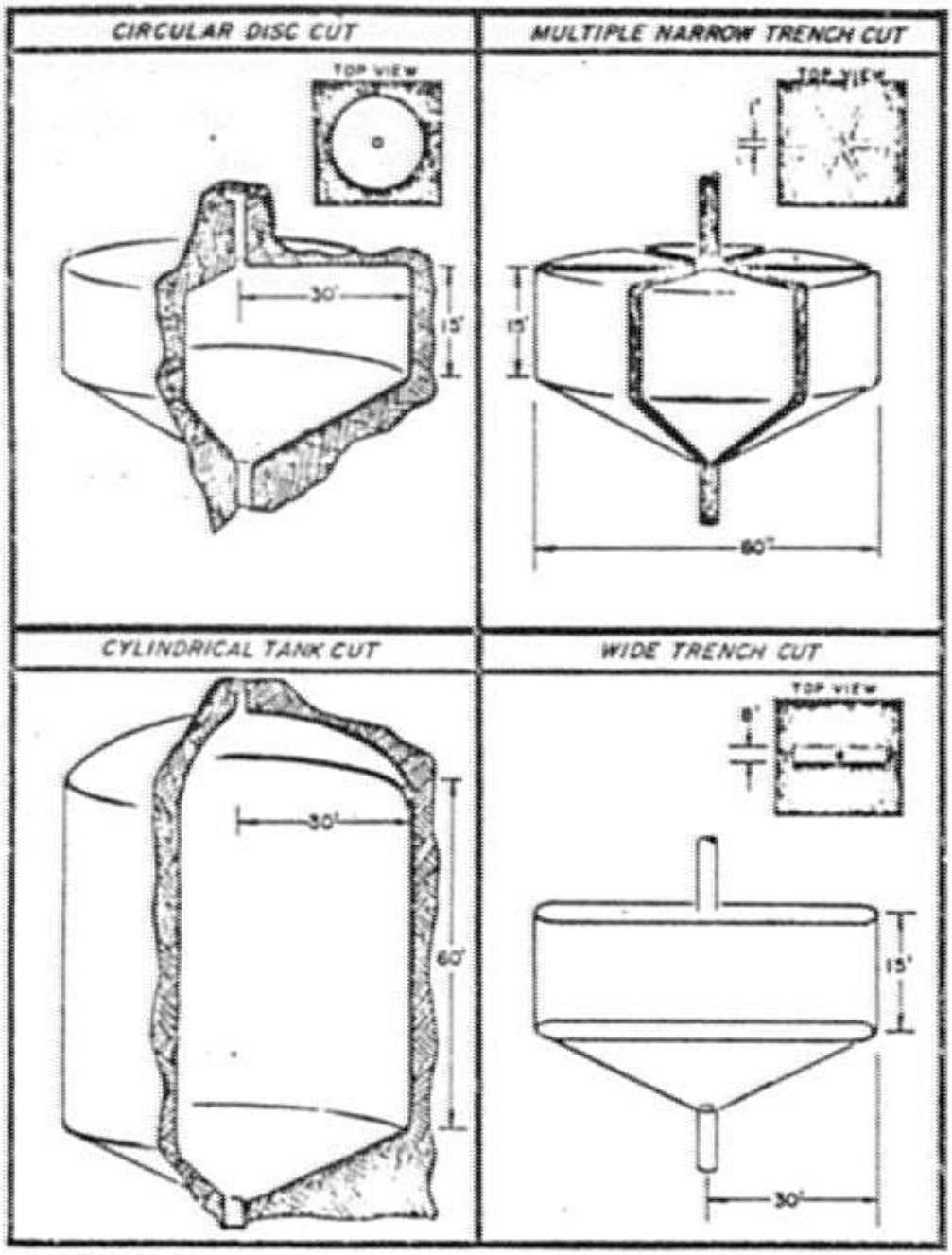


FIGURE 3 VARIOUS BASIC SHAPES OF SUBSURFACE EXCAVATIONS.

DATA SHEET 5.8-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Roadheader, Jet-Mechanical Cutter Type ENUS-1
B. Country of Origin	USSR
C. Distinguishing Characteristics	Thin jet development heading machine using pumps some distance to supply high pressure water
2. Function	Break coal, drive drifts
3. Designation of Mining Systems for which Applicable	
4. Major Components	8 Twin jet cutters, cutter head, cutter feed & rotation mechanism, machine advance mechanism, jacks
5. Design Parameters	
6. Performance Parameters A. Input	Water at 350-400 kg/cm^2 fed to nozzles 1.2-2.5 mm in diameter
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	For driving in gently pitching seams of hard coal 1-1.5 m thick, drift is 2.2 m wide, hardness less than F = 4
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Designed by A.A. Skochinsky Mining Institute
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	A. A. Skochinsky Mining Institute
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	During kerf forming by jets, cutters are inserted to at least 300 mm into kerf and coal between kerfs is broken out by bits mounted on cutters
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	Cuttings, mechanical loading on to a conveyor or by gravity hydraulic fluming
24. Pertinent Reference Documents	737, p. 24, 26; 738, p. 26
25. Drawing(s)	737, p. 26, fig. 58; 738, p. 26
26. Photograph(s)	

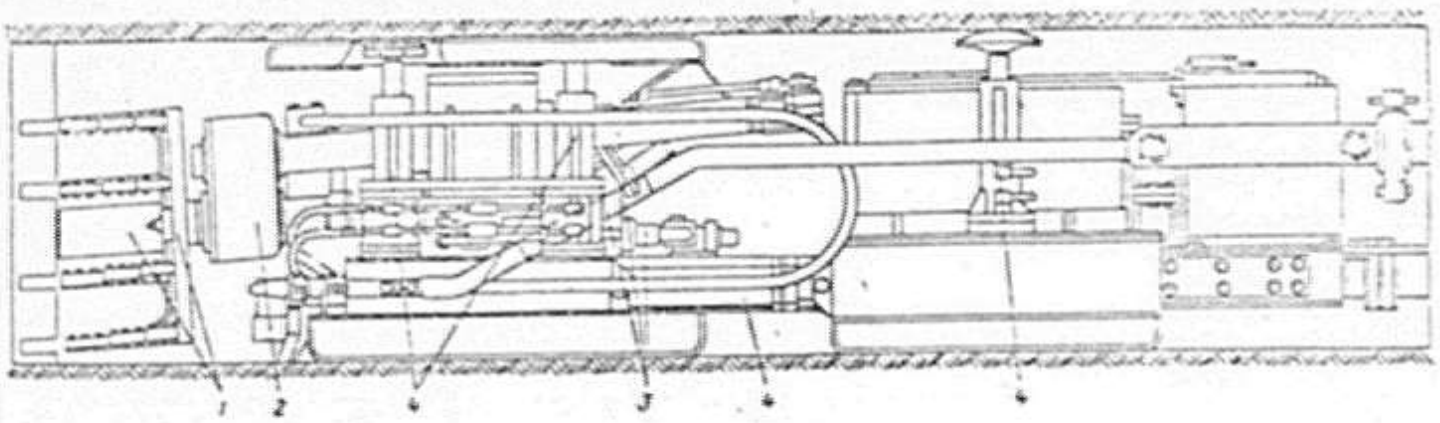


Figure 58.
THIN-JET DEVELOPMENT HEADING MACHINE, THE ENUS-1:
1) cutter head; 2) reducer; 3) feed and rotation unit of the cutter head; 4) creeping support mechanism.

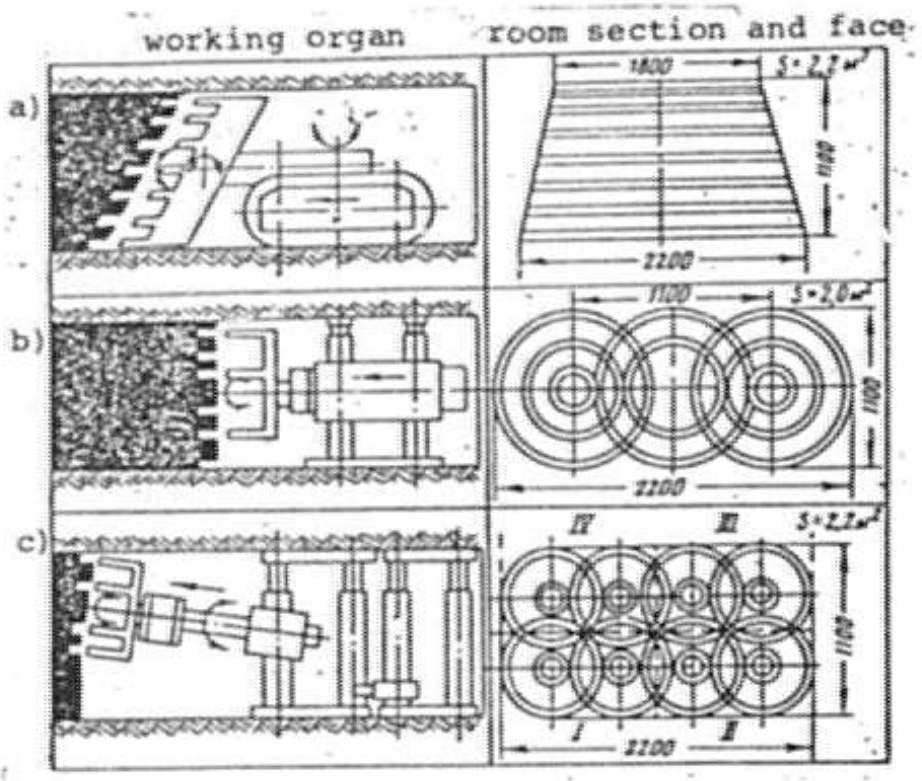


Figure 68.
DESIGN OF COMPONENTS OF CUTTING MACHINE WITH THIN-JET CUTTER ELEMENTS

DATA SHEET 5.8-2
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Roadheader, Jet-Mechanical Type PKG-4
B. Country of Origin	USSR
C. Distinguishing Characteristics	Cutterhead cuts 4 concentric slots, webs are broken by shearers. Electrically powered, water supplied for fluming
2. Function	Drive development headings in coal and rock up to F = 4 at pitch up to 30°
3. Designation of Mining Systems for which Applicable	
4. Major Components	Floor & roof caterpillar treads, operators seat & controls, roof & wall thrust jacks, drill bit, disc cutters, berm cutters, shearers, nozzles to wash away cuttings
5. Design Parameters	Cut slots 40 mm wide by 100 mm deep
6. Performance Parameters A. Input	Cutterhead - 75 kw; crawler - 9 and 4,2 kw; 3 m^3 water per ton of coal (180-200 m^3/hr)
B. Output	Advance 15.5-19.9 m/hr
C. Performance Capacity	110 tons/hr maximum
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Seam pitch up to 30° coal and rock up to F = 4
7. Size of Equipment A. Length	6310 mm
B. Width	1800 mm
C. Height	1800 mm
8. Weight of Equipment	10 tons
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Giprouglemash Institute
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Giprouglemash Institute
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Zarechnaya Mine - Kuzbass
16. Type of Control A. Input	
B. Comments	Simple to control
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	More economical driving of development headings
B. Disadvantages	Too long, needs specially developed stoping areas; too low power; not measureable
24. Pertinent Reference Documents	738, p. 28; 696, p. 47; 658, p. 781; 1058, p. 18
25. Drawing(s)	696, p. 48, fig. 71;
26. Photograph(s)	658, p. 782, fig. 11

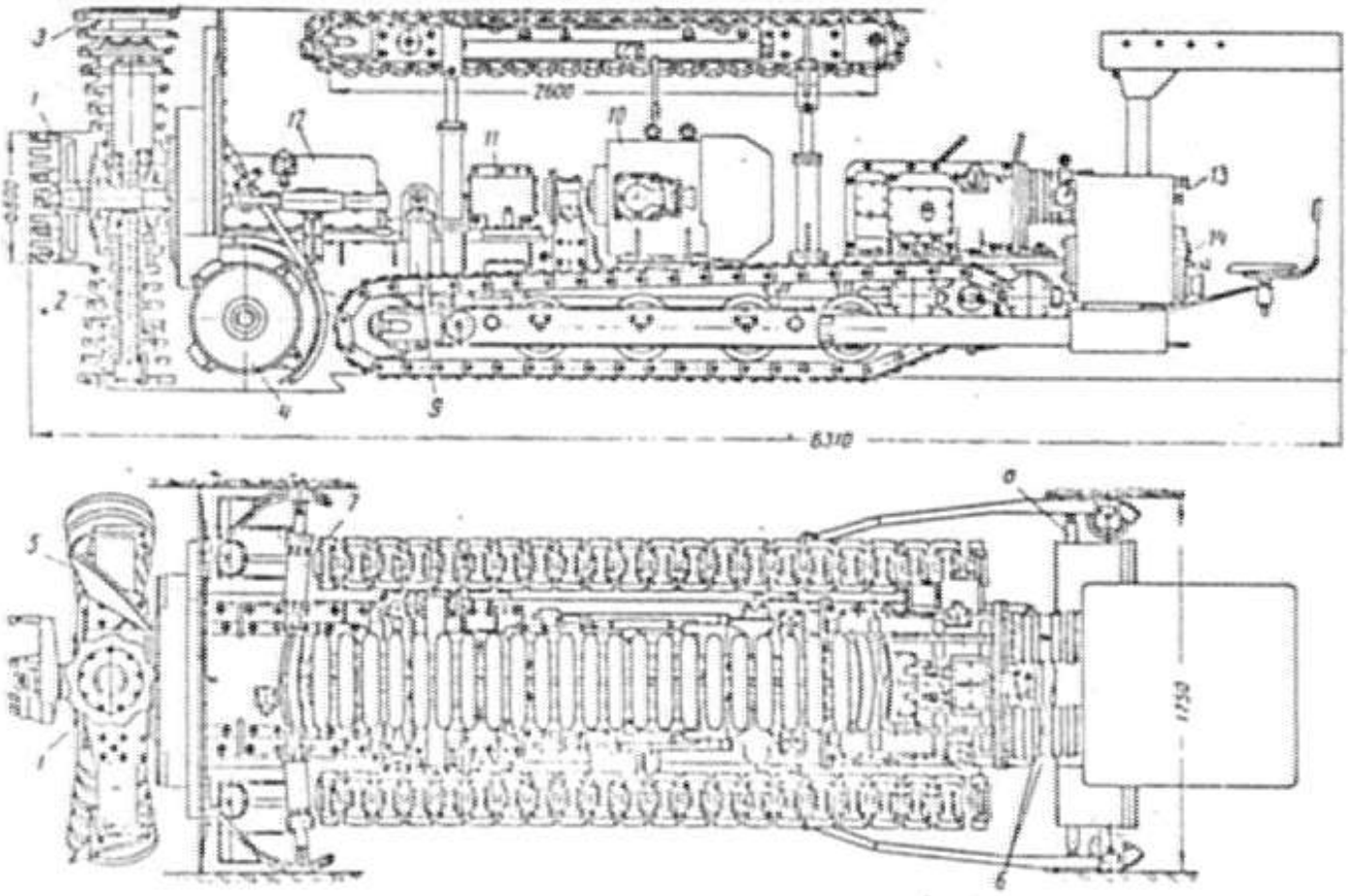


Fig.71 (From Okhrimenko book)
Mechano-Hydraulic Combine PKG-4

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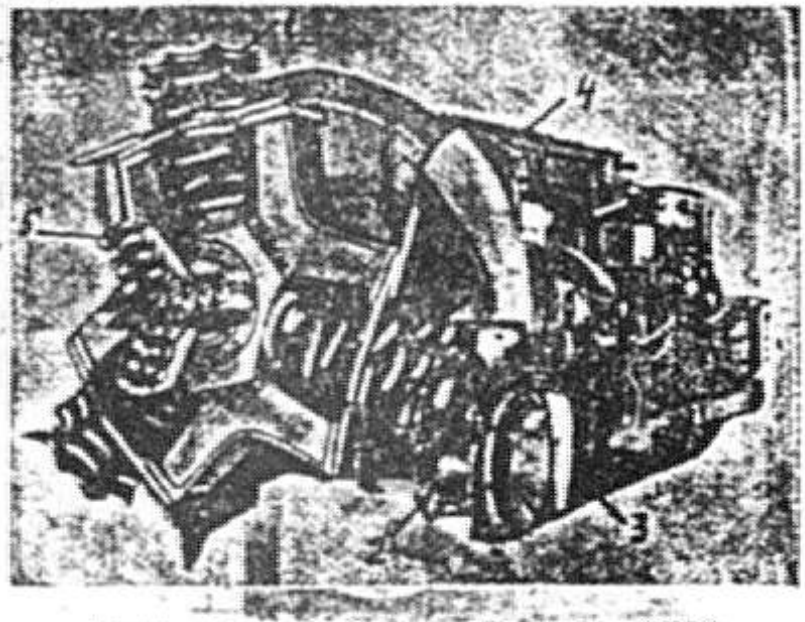


Fig. 11. Mechanical-hydraulic tunnelling machine, PKG-4.
1—Boring bit; 2—Berm cut; 3—Floor caterpillar; 4—Roof caterpillar; 5—Pilot drilling bit.

DATA SHEET 5.8-3
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Roadheader 4PU
B. Country of Origin	USSR
C. Distinguishing Characteristics	Combination cutter, crusher and loader unit, electically powered
2. Function	Roadheading on seams up to 15° up or down, 1.5 m thick minimum, of coal or rock to F = 4
3. Designation of Mining Systems for which Applicable	Mechanical-hydraulic
4. Major Components	Cutter head, loader to conveyor belt, caterpillar tracked chassis, hydraulic system & tank, netting and dust collection systems
5. Design Parameters	Cut size: height 1.5-2.85 m, width 2.6-3.3 m, cross section area 4.0-8.2 m^2, shape - trapezoid, rectangular or arched
6. Performance Parameters A. Input	
B. Output	Rate of tramming: operating 2.4 m/min, maneuvering 2.4-4.8 m/min
C. Performance Capacity	Breaking - to 1 ton/min Drivage to 5 m/hr
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	5.6 m
B. Width	Over tracks 1.25 m
C. Height	2.35 front edge
8. Weight of Equipment	10 tons
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Units built

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Kopeysk Machine Works
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	Electrical motors - 66.3 kw, electrical motor control - 22 kw, voltage - 380/660, 6 motors
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Small size, high maneuverability, telescoping cutting head, roof bolting, easy transportability
B. Disadvantages	
24. Pertinent Reference Documents	1074 , p. 18
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.8-4
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Mining Machine K-56MG
B. Country of Origin	USSR
C. Distinguishing Characteristics	Rotating cutterhead, caterpillar mounted with water fed to suppress dust & wash away cuttings, electrically powered
2. Function	For development and production
3. Designation of Mining Systems for which Applicable	Mechanical-hydraulic
4. Major Components	Caterpillar carriage, cutting head, head swing & elevate jacks, operators station, controls, electric eqpt., 4 electric motors
5. Design Parameters	Depth of sumping: 0.4-0.5 m, size of cut - height 1.9-2.5 m; width 2.0-3.4 m; cross section area 4.0-8.5 m^3
6. Performance Parameters A. Input	Water consumption: 120 m/hr for dust suppression & removal of cuttings; electrical power 67 kw for 4 electric motors
B. Output	Water pressure 10-15 kg/cm^2, 135 tons/hr maximum, travel speed 1.82 m/min
C. Performance Capacity	
D. Efficiency	Monthly output per worker in mechanical-hydraulic mining is 545-557 tons
E. Limiting Environmental and Coal Seam Conditions	Hardness of rock up to F = 4
7. Size of Equipment A. Length	5.2 m - 6.5 m
B. Width	1.34 m
C. Height	1.5 m
8. Weight of Equipment	12.7 tons
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Mass produced

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Kopeyskiy Machine Works
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Kuzbass and Donbass Hydromines
16. Type of Control A. Input	Cutter head power - 2 drill EBK-5
B. Comments	Travel - hydraulic jacks by ratchet
17. Reliability	
18. Safety	Water fed to cutter head for dust suppression & cuttings transport
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	686, p. 44; 738, p. 29; 786; 1074, p. 18
25. Drawing(s)	
26. Photograph(s)	696, p. 44, fig. 19

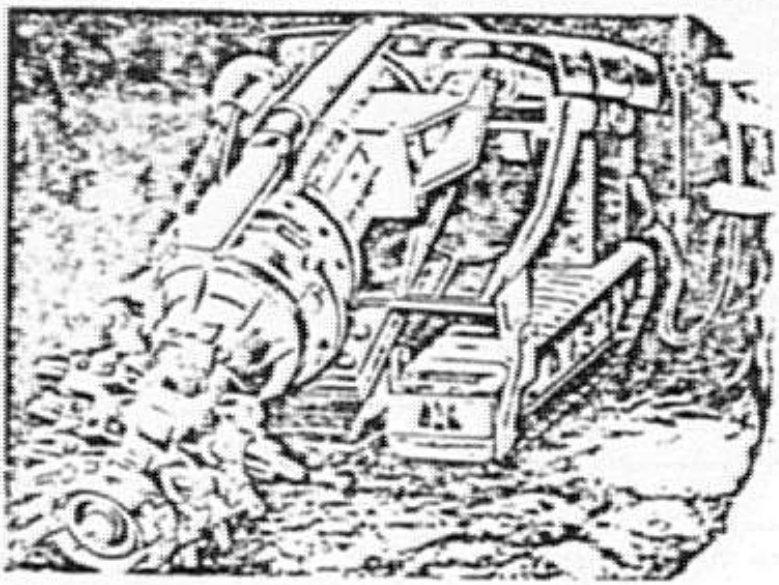


Figure 19. MECHANO-HYDRAULIC SHEARER (COMBINE) K-56MG

DATA SHEETS 5.8-5
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Mining Machine K-56M
B. Country of Origin	USSR
C. Distinguishing Characteristics	Mechanical-hydraulic combine for shearing coal in shortwalls, electrically powered
2. Function	Mine coal in shortwalls in flat seams of 1.8-2.5 m thickness
3. Designation of Mining Systems for which Applicable	Mechanical-hydraulic
4. Major Components	Cutting head, under carriage, turn plate, electrical equipment, hydraulic system
5. Design Parameters	Size of workings: height 1900-2500 mm width to 3400 mm, area of workings 6.3-8.5 m^2
6. Performance Parameters A. Input	4 electric motors total power 67 kw, cutter-head electric motor MAO-191/10, 1500 rpm 47 kw/hr
B. Output	135 tons/hr
C. Performance Capacity	Tramming speed 1.82 m/min
D. Efficiency	Water consumption for hydraulic washout & transport of 1 ton of coal = 3 m^3
E. Limiting Environmental and Coal Seam Conditions	Conduct development workings to 10° in coal or by mixed stope in rocks to F = 3
7. Size of Equipment A. Length	5150 mm
B. Width	2500 mm
C. Height	Minimum 1900 mm Maximum 2500 mm
8. Weight of Equipment	12,735 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Kopeyskiy Machine Works
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Kuzbass & Donbass Hydromines
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	696, p. 44; 738, p. 29; 198; 1058, p. 23
25. Drawing(s)	1058, p. 25, fig. 8
26. Photograph(s)	

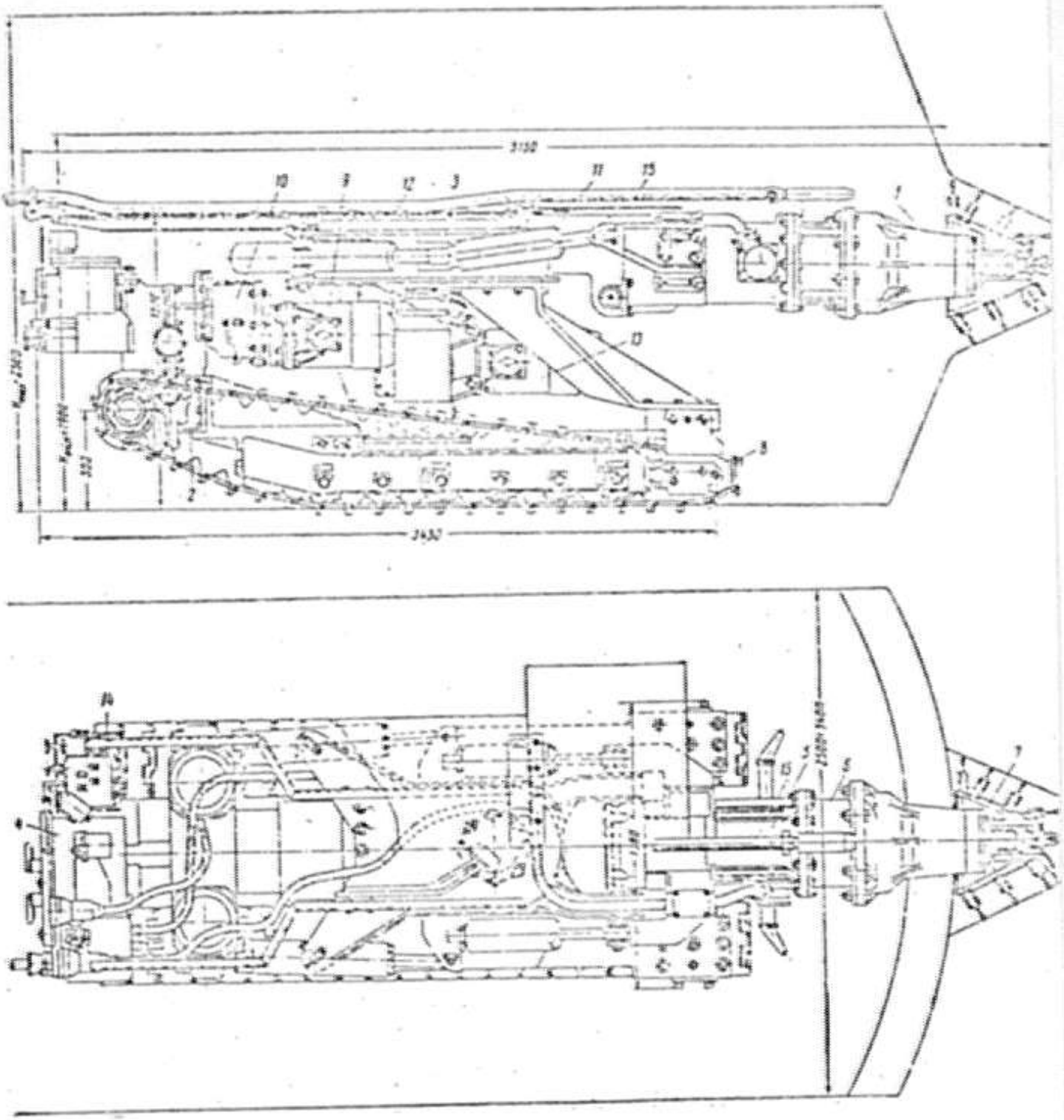


Fig. 8. THE MECHANOHYDRAULIC SHEARER K-56M

DATA SHEET 5.8-6
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Tunnel, Boring Machine, PBM
B. Country of Origin	USSR
C. Distinguishing Characteristics	To bore 1.72 m diameter tunnel in pitching or steep seams, electrically powered
2. Function	Cut hard rock with disc type cutters
3. Designation of Mining Systems for which Applicable	
4. Major Components	Caterpillar tracks, frame, cutting head, electric drive motors, thrust jacks, roof support shield & jacks, roof bolt drill, oil pumps & controls, operators station & controls
5. Design Parameters	Diameter of cutter discs = 270 mm
6. Performance Parameters A. Input	
B. Output	Cutter head rotational velocity = 20.5 rpm
C. Performance Capacity	Driving rate to 12 m/hr, 900 mm advance/cycle
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	1.72 m diameter working, 2.32 m^2 cross section, maximum dip of working 20°, rock hardness to F = 10, minimum turning radius 60 m
7. Size of Equipment A. Length	6490 mm
B. Width	1720 mm
C. Height	1720 mm
8. Weight of Equipment	18,665 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKrNIIGidrougol
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	696, p. 42; 737, p. 31
25. Drawing(s)	696, p. 43, fig. 18
26. Photograph(s)	

Reference 696

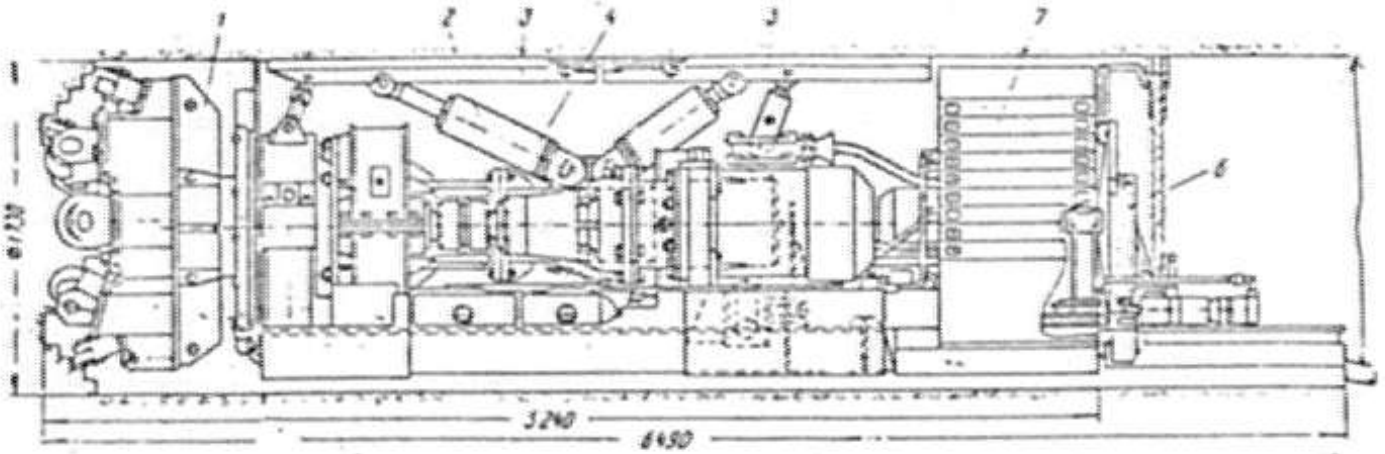


Fig.18. Heading-drilling machine PEM

1) operating rotor element; 2) planetary reducer with electric motor; 3)distance "skis" or braces?; 4) thrust jacks; 5) distance supports or braces; 6) mechanism for hole drilling under anchor support; 7)distance ring.

DATA SHEET 5.8-7
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Mining Machine, Mechanical Cutter PK-3M
B. Country of Origin	USSR
C. Distinguishing Characteristics	Mechanical cutter machine Electrically powered
2. Function	Mine coal and drive headings
3. Designation of Mining Systems for which Applicable	Mechanical-hydraulic
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Probably in Yubileinoye (Combinat Yuzhkuzbassugol)
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	986, p. 1
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.8-8
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Roadheader PK-9r (PK-9)
B. Country of Origin	USSR
C. Distinguishing Characteristics	Electrically powered
2. Function	Roadheading in coal or rock to F = 4
3. Designation of Mining Systems for which Applicable	Mechanical-hydraulic
4. Major Components	Cutter head, loader, conveyor, carriage, electrical equipment, hydraulic and dust suppression systems
5. Design Parameters	Cuts 7 to 16 m^2 cross section
6. Performance Parameters A. Input	Total power 173 kw @ 660 v Cutter power 88 kw
B. Output	Caterpillar carriage speed 2 m/min
C. Performance Capacity	In cutting to 2.5 tons/min Driving to 9.5 m/hr
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Heading height 2.2-3.9 m; width at base 3.3-5.8 m; rock hardness to F = 4; pitch up to 15°
7. Size of Equipment A. Length	7700 mm
B. Width	1800 mm
C. Height	1800 mm
8. Weight of Equipment	30 tons
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Several units built

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	"Yasinovatskiy" Machine Works
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	1 hydraulic drive pump - 63 l/min Hydraulic system pressure - 70 atm
17. Reliability	
18. Safety	Has integral dust suppression system
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Wide range of heading shapes possible
B. Disadvantages	
24. Pertinent Reference Documents	1067; 1074, p. 19
25. Drawing(s)	
26. Photograph(s)	1067, p. 945, fig. 6

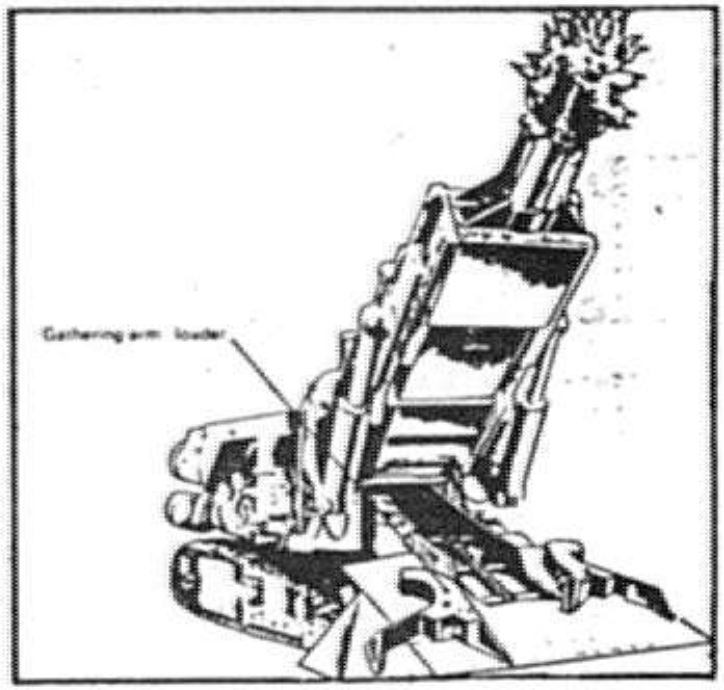


Fig. 6-- Modern Russian PK-9 roadheader with gathering-arms loading system

DATA SHEET 5.8-9
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Roadheader with Water Turbine Drive, KKG
B. Country of Origin	USSR
C. Distinguishing Characteristics	3 Breaker bits for cutting mounted on mobile guide carriage, water turbines for power, cuttings washed away by discharged water
2. Function	Breaking coal in gently pitching seams 0.8 to 1.3 m thick
3. Designation of Mining Systems for which Applicable	Mechanical-hydraulic
4. Major Components	3 breaker-bits of planetary action provided with cutters, mobile guide carriage, water turbines, hoses, and cables
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	2 tons per minute
C. Performance Capacity	advance 1 meter per minute
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Gently pitching seams 0.8 to 1.3 m thick
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Designed by Ya.Y. Gumennik
11. Status of Development	1959 Donbass 1963-1964 "Pioneer"

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Dzerzhinsky Mine of the Kdaiyevugol Combine in 1959, "Pioneer" hydromine in 1963-64
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Possible to cut coal in thin flat seams without supporting the roof
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 28
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.8-10
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Roadheader with Water Turbine Drive, MGP-2
B. Country of Origin	USSR
C. Distinguishing Characteristics	Water turbine driven. Four rotating cutting heads mounted on swinging arm. Two caterpillars grip floor and roof
2. Function	Break hard coal and soft rocks
3. Designation of Mining Systems for which Applicable	Mechanical-hydraulic
4. Major Components	Bottom caterpillar, top caterpillar, rotating cutter heads, swinging head, high press. water feed pipe, jacks for positioning of head, water turbine, controls, chassis
5. Design Parameters	Dimensions of cut: width 1500 mm, height 1800-2100 mm, cross section 2.7-3.15 m^2
6. Performance Parameters A. Input	Working press. 20 to 40 atm, water consumption to 180 m^3 per hour
B. Output	Water turbine power 60 to 100 kw
C. Performance Capacity	Drivage = to 15 meters per hour coal output = up to 60 tons per hour
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Up to 20° pitch
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	5000 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	When working seams of 15 to 20°, a top (roof) caterpillar is used which presses against the roof by jacks
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Can operate in 15° to 20° pitch
B. Disadvantages	
24. Pertinent Reference Documents	658, p. 784
25. Drawing(s)	658, p. 784, fig. 13
26. Photograph(s)	

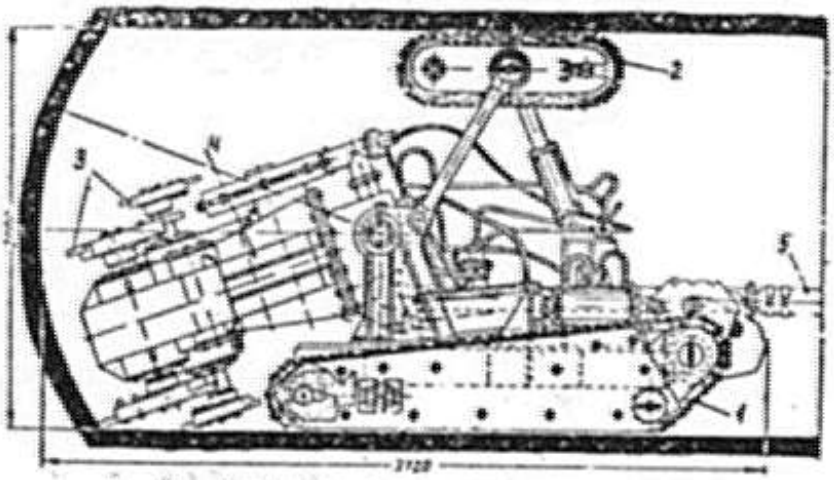


Fig. 13. Mechanical-hydraulic driving machine, MGP-2.
1—Bottom caterpillar. 2—Top caterpillar. 3—Rotating cutting heads. 4—Swinging ram. 5—Water feeding pipe line.

DATA SHEET 5.8-11
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Roadheader with Water Turbine Drive, LMGP-5 (LMGP-3)
B. Country of Origin	USSR
C. Distinguishing Characteristics	Light weight mechanical-hydraulic machine powered by 2 water turbines
2. Function	Drive development workings in coal seams with dip to 15° and on steep seams with thickness larger than 2.2 m
3. Designation of Mining Systems for which Applicable	
4. Major Components	Caterpillar cart, sliding carriage, hydraulic jacks, water turbine powered rotating cutter drum
5. Design Parameters	
6. Performance Parameters A. Input	Water pressure 25 kg/cm^2 Water consumption 100 m^3/hour
B. Output	Cutter drum drive - 2 Pelton turbines of 53 kw total power
C. Performance Capacity	3-4 meters per hour advance rate 25-33 tons per hour production rate
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Shape of workings: trapezoidal, height: 1800-2350 mm, width at bottom: 2200-2700 mm, width at top: 2000-2200 mm, area of cut cross section: 2.8-5.7 m^2
7. Size of Equipment A. Length	3760 mm
B. Width	1660 over cutter drum, 1260 over carriage
C. Height	1770 mm
8. Weight of Equipment	3.3 tons
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In operation

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Kuzbass hydromines
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	696, p. 52; 658, p. 782 (LMGP-3); 1058, p.21
25. Drawing(s)	696, p.53, fig. 23; 1058, p. 22, fig. 7
26. Photograph(s)	658, p. 783, fig. 12 (LMGP-3)

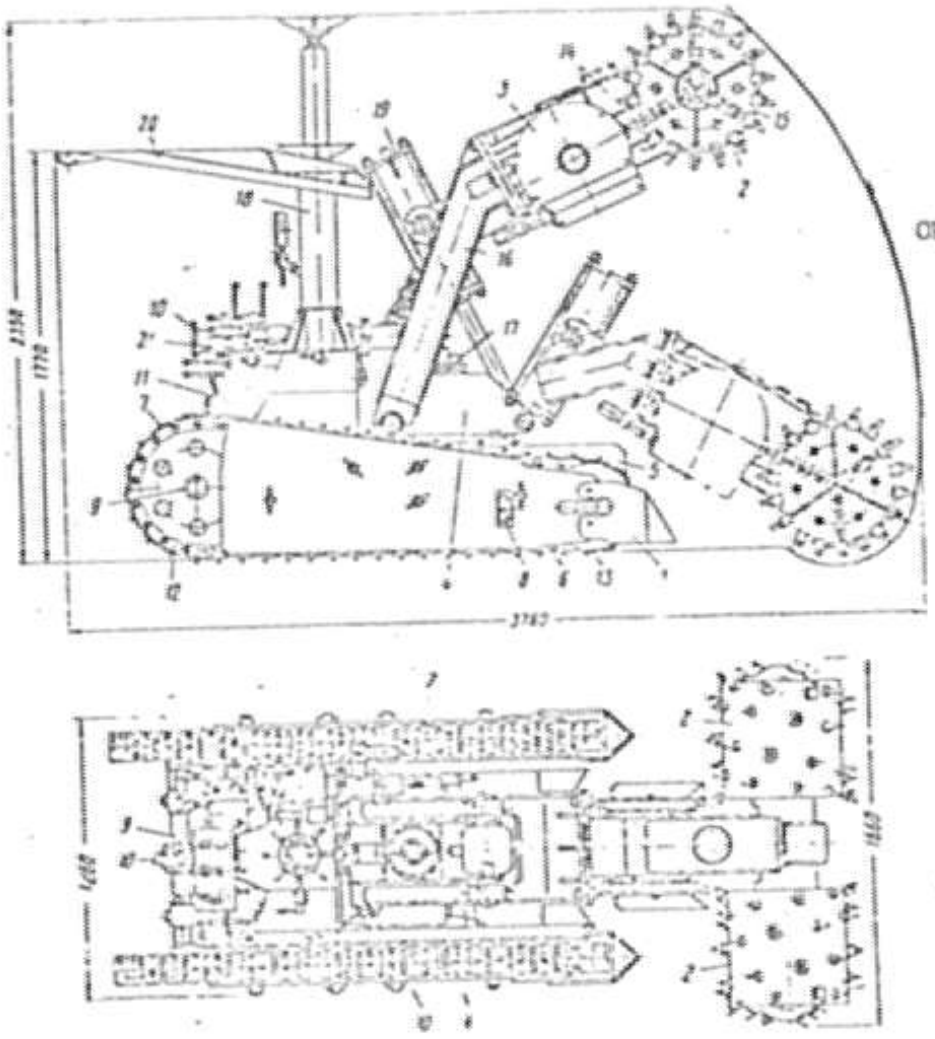


Fig.73 b
from
Okhrimenko book
page 150
(profile)

Fig.23
from the
current
book
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Fig.23. Light Mechano-Hydraulic Roadheading Machnine LMGP-5

1) Caterpillar cart; 2) Working element or piece; 3)Its drive; 4)Movable carriage; 5) guiding frame; 6) pole; 7)caterpillar track; 8) stretching device; 9) drive shaft; 10) ratchet wheel; 11)hydraulic jack; 12) guiding chain gears; 13) tension roller; 14) reducer; 15) cutter drum; 16) pole; 17) rotating column; 18) vertical spreading hydraulic jack; 19)hydraulic jack; 20) protective cover ; 21) hydraulic control block

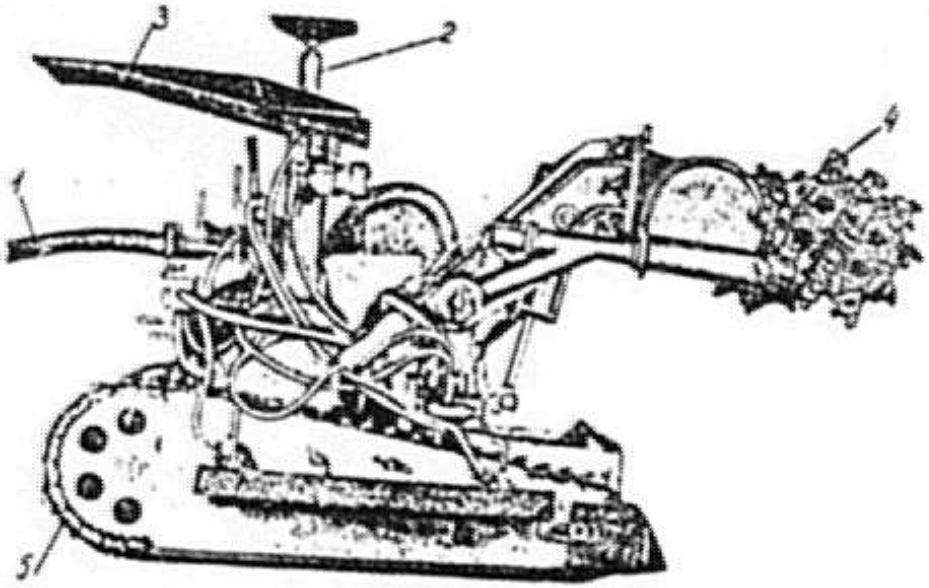


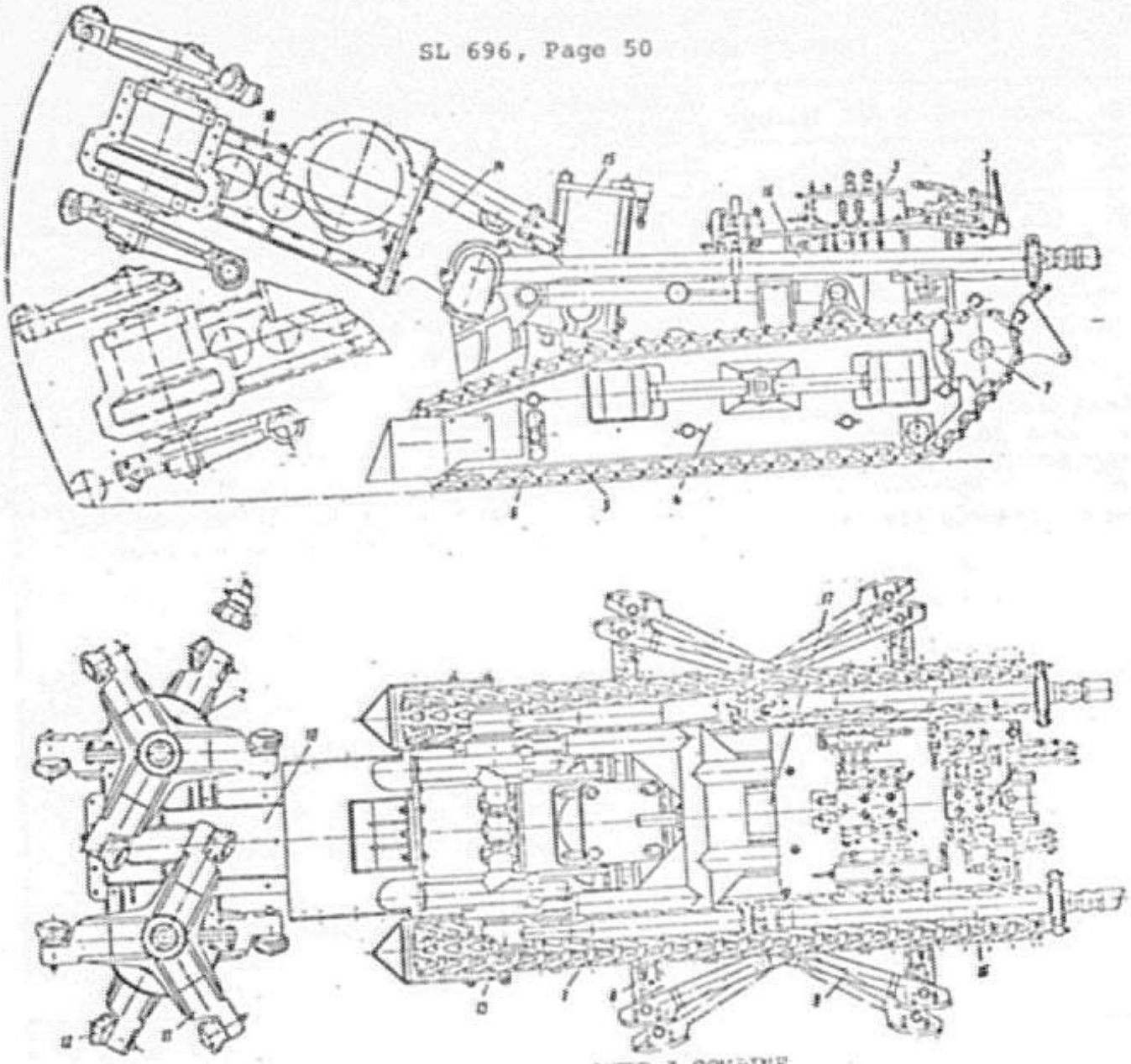
Fig. 12. Portable mechanical-hydraulic driving machine, LMGP—3.
1—High pressure water pipe. 2—Supporting vertical ram. 3—Canopy.
4—Cutting rotating unit. 5—Caterpillar.

DATA SHEET 5.8-12
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Roadheader with water turbine drive MGPP-3 (MGPP-3A)
B. Country of Origin	USSR
C. Distinguishing Characteristics	For Coal heading with wall rocks. Four Crown heads fitted with rod or rotating cutters
2. Function	Break coal and rocks to F=5
3. Designation of Mining Systems for which Applicable	Mechanical-Hydraulic
4. Major Components	Two hydraulic turbines, reducer, cutter heads, caterpillar tracked chassis, hydraulic control panel, jacks, high pressure water supply.
5. Design Parameters	
6. Performance Parameters A. Input	25-30 kg/cm^2 water to operate 2 Pelton turbines to give 44.5-81.5 kw total power at 180-200 m^3/hr water consumption
B. Output	
C. Performance Capacity	1.2 tons per min at hardness F=5, cuttings washed away by turbine discharge water
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Shape of workings: rectangular, width: 2,200 mm, height: 2,200-2,400 mm, slope to 15°, area of working cross section: 4.8-5.2 m^2
7. Size of Equipment A. Length	5,270 mm
B. Width	2,070 mm over cutter heads 1,540 mm over tracks
C. Height	In transport position: 1,650 mm
8. Weight of Equipment	12,600 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	VNIIGidrougol Institute
11. Status of Development	1969 MGPP-3A developed

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	MGPP-3 Yasinovatskiy Machine Works, MGPP-3A Mfg. in experimental shop of VNIIGidrougol
13. Number of Units Manufactured (and Time Period)	"Badayevskaya-Severnaya" hydromines Region I in Seam # 22 driving 1000 m of roadways
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	696, p. 49; 1058, p. 26; 738, p. 32
25. Drawing(s)	696, p. 50, Fig. 9
26. Photograph(s)	



MUPP-3-COMBINE

Fig.9 (from Boyko & Parinskiy 1988)

1) Caterpillar tread; 2) Cutter head; 3) Hydraulic controll panel; 4) 2 cheeks; 5) Crawler track; 6) stretching device; 7) star-shaped drive; 8) four spacing jacks; 9) support braces; 10) five-stage reducer; 11) four tricone bits; 12) twelve cutters, rod or rotary; 13) pivot; 14) feed rocker arm; 15) cylinder of the swinging jack; 16) pipes for pressure water supply.

DATA SHEET 5.8-13
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Roadheader with Water Turbine Drive, "URAL-38"
B. Country of Origin	USSR
C. Distinguishing Characteristics	Cutter head and tracks driven by hydraulic turbines, cuttings washed away by low pressure water
2. Function	Break hard coal in seams more than 3° dip, 0.8 to 1.8 m thick
3. Designation of Mining Systems for which Applicable	Mechanical-hydraulic
4. Major Components	Caterpillar tracked frame, drive turbines and speed reducers, cutting head, head controls, jacks
5. Design Parameters	
6. Performance Parameters A. Input	Water consumption for hydraulic washout and coal transport 150-300 m^3 per hour, pressure to 30 atm
B. Output	
C. Performance Capacity	To 2 tons per minute of coal Crawler speed 1.97 meters per minute
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	0.8 to 1.8 thick seams over 3° pitch Useful web width = 3m
7. Size of Equipment A. Length	5780 mm
B. Width	1600 mm
C. Height	700 mm
8. Weight of Equipment	9,600 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Kopeyskiy Machine Works (S.M. Kirov)
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	"Pioneer" hydromine
16. Type of Control A. Input	
B. Comments	4 electric motors, total power 52 kw, 380 volts
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	696, p. 41; 738, p. 28; 1074, p. 17
25. Drawing(s)	696, p. 42, fig. 17
26. Photograph(s)	

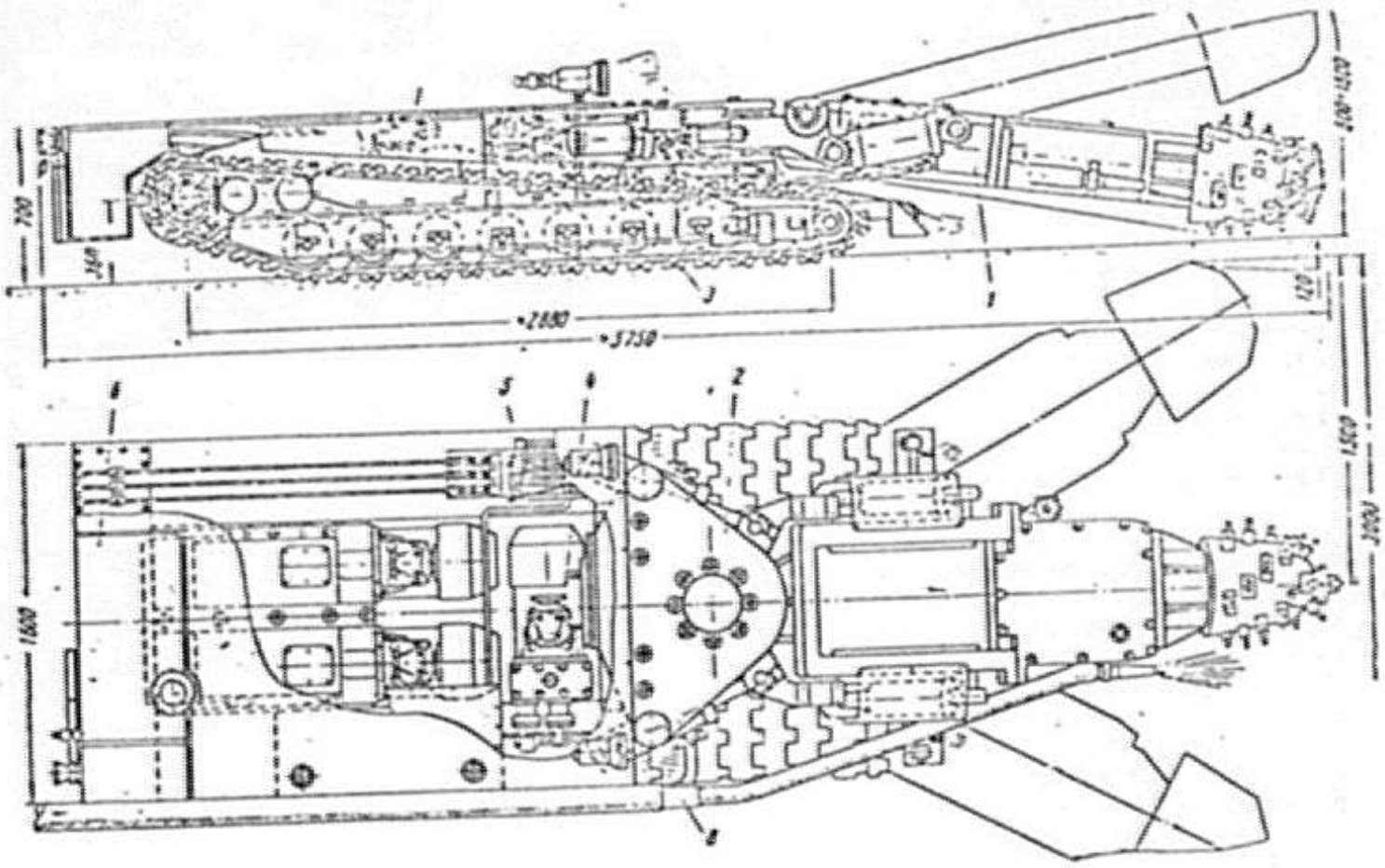


Fig. 17

The Cutter-Loader Combine "URAL-38"

DATA SHEET 5.8-14
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Jet-Mechanical Longwall Mining Machine (Skochinskiy Type)
B. Country of Origin	USSR
C. Distinguishing Characteristics	Uses jet kerfing at floor and roof and swinging jet to cut rear kerf, with rubber hydraulic pillow to break off web more than 0.25 m thick
2. Function	Longwall mining
3. Designation of Mining Systems for which Applicable	
4. Major Components	Stationary floor & roof kerf nozzles, swinging nozzle arm, hydropillow, structure, drive system & conveyor
5. Design Parameters	Web advance more than 250 mm
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Skochinsky Mining Institute USSR
11. Status of Development	Experimental

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Skochinskiy Mining Institute, Lubertsy, USSR
13. Number of Units Manufactured (and Time Period)	One (?)
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 33
25. Drawing(s)	738, p. 33, fig. 69
26. Photograph(s)	

Refeeence 738

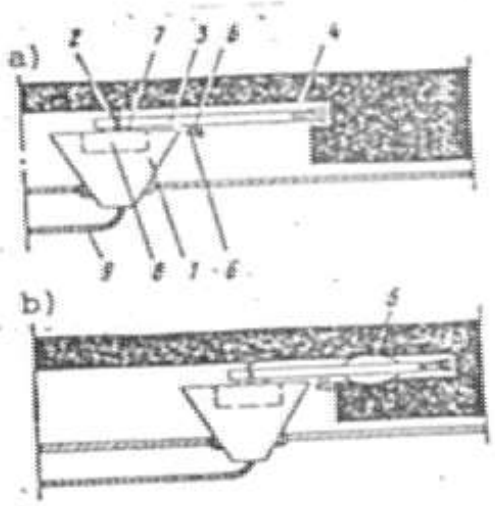


Figure 69.
HYDRAULIC-MECHANICAL LONGWALL MINING MACHINE
DESIGNED BY THE SKOCHINSKY IHD.

DATA SHEET 5.8-15
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Jet-Mechanical Longwall Mining System MVU, Incorporating MVM Machine
B. Country of Origin	USSR
C. Distinguishing Characteristics	Incorporates MVM with jet cutter head, with hydraulic roof supports (SPM-87D) and high pressure pump to supply water
2. Function	For longwall mining with reduced dust generation
3. Designation of Mining Systems for which Applicable	
4. Major Components	MVM hydraulic-mechanical mining machine, SPM-87D hydraulic roof supports, ShNu-1 high pressure pump (300 kg/cm^2)
5. Design Parameters	Up to 1.4 m seam; longwall length - 150 m @ 8 m/min; web advance - 0.2-0.5 m per pass @ 1.7 m/sec
6. Performance Parameters A. Input	Water at 500 kg/cm^2 - 4 nozzles (2.48 & 2.51 mm); power - 20-50 kw
B. Output	
C. Performance Capacity	312 tons/hr in 1 m seam
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Seam thickness = 0.95-1.4 m; longwall length up 50 150 m; pitch of seam up to 18°
7. Size of Equipment A. Length	5.24 m
B. Width	1.15 m
C. Height	0.82 m
8. Weight of Equipment	8000 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKrNIIgidrougol, USSR
11. Status of Development	Undergoing tests in Donbass in 1973-1974

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Odesskaya-Komsomolskaya No. 4 (Modern version called MVU)
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Low dust generation (5-7 mg/m^3) Low output of coal fines (16% less than 6 mm)
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 34
25. Drawing(s)	738, p. 35, Fig. 70
26. Photograph(s)	

Reference 738

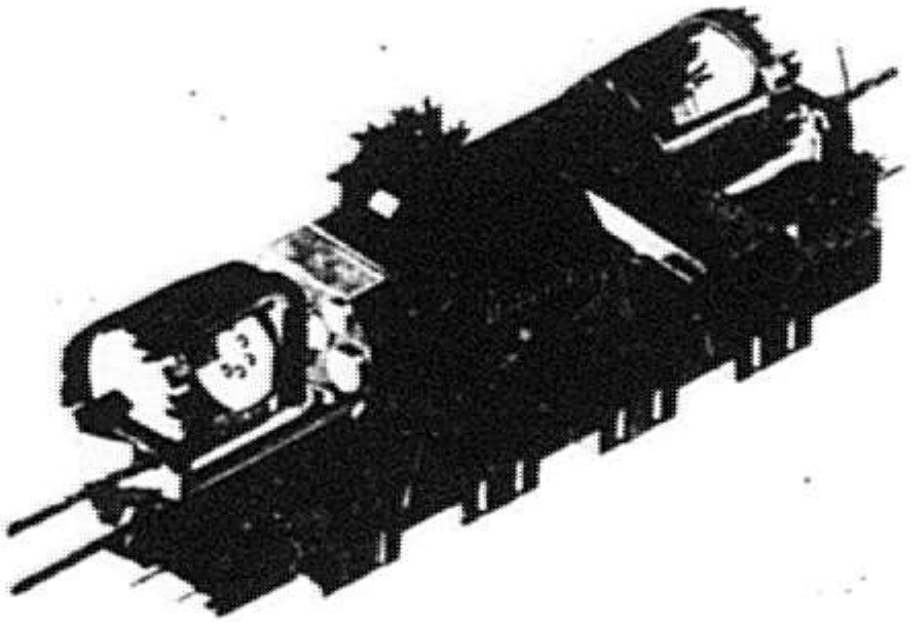


Figure 70.
MVM HYDRAULIC-MECHANICAL LONGWALL MINING MACHINE

DATA SHEET 5.8-16
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Jet-Mechanical Longwall Mining Machine, MVM
B. Country of Origin	USSR
C. Distinguishing Characteristics	Use high pressure thin jets on rotating head, combined with shearing head to break off coal onto conveyor
2. Function	For longwall mining with reduced dust generation
3. Designation of Mining Systems for which Applicable	
4. Major Components	Hydraulic-mechanical cutter head, scraper conveyor, automatic hose-reel, head thrust drive, and oil hydraulic system
5. Design Parameters	Cutter head uses 4 nozzles of 2.48 or 2.51 mm diameter rotating at 39 rpm (1.7 m/s traverse velocity) Web advance 0 2-0.5 m at 8 m/min
6. Performance Parameters A. Input	Pressure = 500 kg/cm^2 Power = 20 to 50 kw
B. Output	
C. Performance Capacity	312 tons/hr in 1 m seam when used in MVU system
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Seam thickness = 0.95 to 1.4 m Longwall length up to 150 m Pitch of seam up to 18°
7. Size of Equipment A. Length	5.24 m
B. Width	1.15 m
C. Height	0.82 m
8. Weight of Equipment	8000 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKrNIIgidrougol, USSR
11. Status of Development	Modernized unit undergoing tests in Donbass in 1973-74 in the MVU system

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Odesskaya-Komsomolskaya No. 4
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Reduces dust content of air at longwall from 210-250 mg/m^3 to 5-7 mg/m^3, output of coal sizes less than 6 mm was less than 16%
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 35
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.8-17
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Jet-Mechanical Longwall Machine, GIG-AG
B. Country of Origin	Poland
C. Distinguishing Characteristics	Hydroplough device with jet undercutting
2. Function	Longwall mining
3. Designation of Mining Systems for which Applicable	
4. Major Components	Mobile hydromonitor with traverse drive, wedge cutters, jet undercutter, conveyor structure, hydraulic thrust jacks, high pressure water hoses
5. Design Parameters	Web cut of 250-300 mm
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Polish Peoples Republic - Main Institute of Mining
11. Status of Development	Experimental, made obsolete by Soviety Skochinsky design

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Polish Peoples Republic - Main Institute of Mining
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	Need a web cut greater than 300 mm, which requires mechanical breakage
24. Pertinent Reference Documents	738, p. 33
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.8-18
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Shortwall Mining Machine, Jet Cutter Type - ShGKV using HSU Jet Cutter Head
B. Country of Origin	USSR
C. Distinguishing Characteristics	Uses high pressure jets with rotating and translating action to cut layers 0.1-0.3 m high, cement used for artificial pillars with partial hydraulic stowing
2. Function	Shortwall mining of steep seams by undercutting layers with stressing by lowering shield. Works up-dip
3. Designation of Mining Systems for which Applicable	
4. Major Components	Advancing prop supports, coal gathering shelf, HSU jet cutter system, hydraulic stowing system, cement system for artificial pillars
5. Design Parameters	Advance 1 m per cycle, 3 cycles/shift Length up-dip - 100-200 m
6. Performance Parameters A. Input	40 m^3/hr of water, 310 kw pump
B. Output	4 jets of 3 mm diameter at 350 kg/cm^2, cut layers 0.1-0.3 m high & 1 m deep in one pass
C. Performance Capacity	Production rate 132 T/hr (1260 TPD from 2 faces), Traverse speed 0.3 m/sec
D. Efficiency	2.3 kw per ton per hour
E. Limiting Environmental and Coal Seam Conditions	For seams up to 7 m thick at steep pitch (45-90°), maximum distance from nozzle to face: 100 mm, length of shortwall - 9 m on-strike
7. Size of Equipment A. Length	
B. Width	
C. Height	Works up to 6 m seam thickness in one pass on-strike
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	VNIIGidrougol and Skochinsky Mining Institute
11. Status of Development	Under development 1974

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	VNIIGidrougol
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	Good roof support system
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Permits high recovery from thick pitching seams
B. Disadvantages	Requires cement reinforcing of artificial pillars
24. Pertinent Reference Documents	736, p. 60-62
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.8-19
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Roadheader, Water Cannon Type MPI-2
B. Country of Origin	USSR
C. Distinguishing Characteristics	Uses pulsed water cannon (Chermenskiy type) powered by open cycle water at pressure of 24.5 kg/cm^2
2. Function	Break coal and rock
3. Designation of Mining Systems for which Applicable	For medium and hard coals
4. Major Components	Air reservoir, impact piston, jacks, throttle channels, barrel
5. Design Parameters	Nozzle diameter - 11.1 mm, pressure = 2720 kg/cm^2 (38,600 psi)
6. Performance Parameters A. Input	25-45 kg/cm^2 water pressure
B. Output	Pulse jets at pressures up to 8000 kg/cm^2
C. ..rformance Capacity	Effective jet range: 2-3 m - overall specific energy: 3-5 kg-m/kg
D. Efficiency	20 shots per minute, 60 tons per hour, specific energy of 1.8-3 kw-hr/ton
E. Limiting Environmental and Coal Seam Conditions	Medium and hard coals and rock up to strength of 1000-1200 kg/cm^2 (F = 10-12), Sandstones and limestones and harder friable rock
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	VNIIGidrougol, Novokuznetsk
11. Status of Development	Tested prior to 1972

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	VNIIGidrougol
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	VNIIGidrougol
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	Unit is simple, reliable
18. Safety	Avoids spark hazard
19. Major Causes of Failure	Wear of piston and cylinder by dirt in water
20. Maintenance Requirement	After about 200,000 shots
21. Major Overhaul	After 10^6 shots
22. Replacement Period	
23. Comments on Suitability A. Advantages	No spark hazard
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 24; 999R, p. 26
25. Drawing(s)	738, p. 24
26. Photograph(s)	999R, p. 26

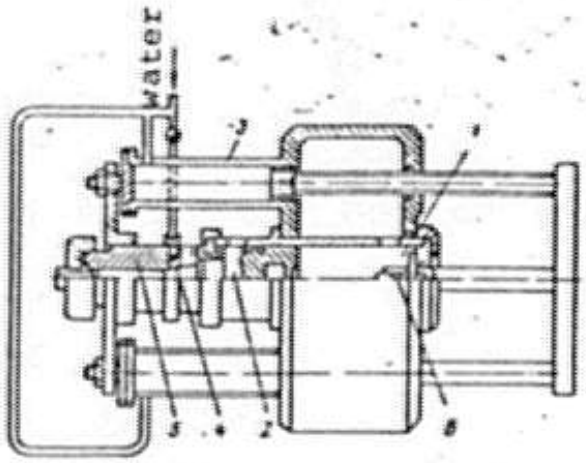


Figure 67.
DESIGN OF PULSED WATER CANNON MPI-2.

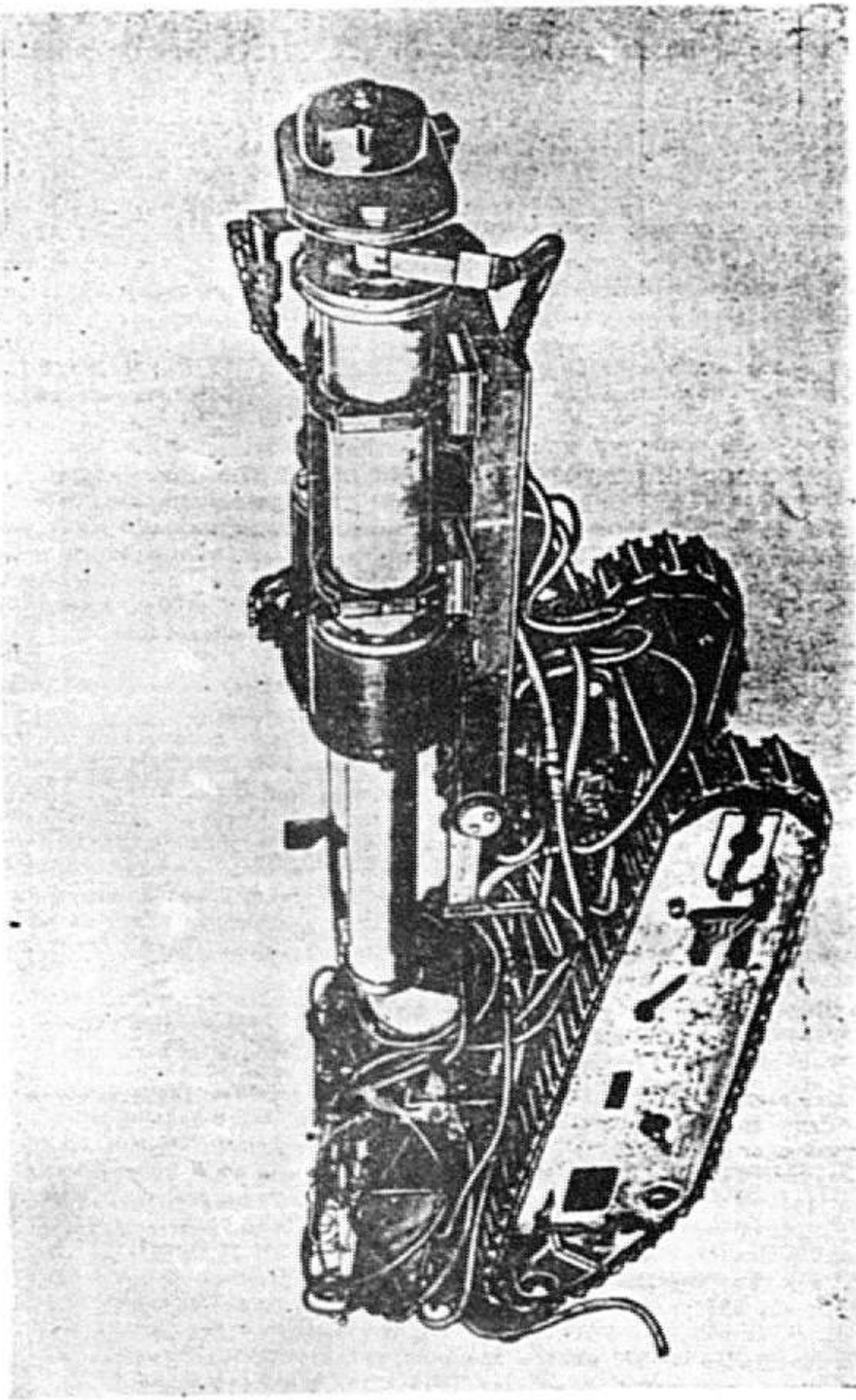


Рис. 1. Общий вид экспериментальной водяной пушки МПП-2

MPI-2 WATER CANNON

DATA SHEET 5.8-20
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Roadheader, Water Cannon Type, PI
B. Country of Origin	USSR
C. Distinguishing Characteristics	Roadheader is PK-3 with cutting element replaced by Voitsekhovsky IV-5 water cannon
2. Function	Break medium to hard rock up to F = 5-10 with pulsed water cannon
3. Designation of Mining Systems for which Applicable	
4. Major Components	Self propelled platform, waste water collection system, high pressure water feed, counter-recoil mechanism, air feed system, water & air lines, remote control firing system, cannon
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	Jet pulses at 7000-8000 kg/cm^2 pressure
C. Performance Capacity	
D. Efficiency	Specific energy = 1.2-5 kw-hr/ton for layered limestone of hardness 5-7
E. Limiting Environmental and Coal Seam Conditions	Sandstone and limestone of hardness F = 5 to 7
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Institute of Hydrodynamics of Academy of Science of USSR
11. Status of Development	In operation prior to 1972 (water cannon under development since 1960)

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	DONGIPROUGLEMASH and Yasinovatsky Machine Works together with Inst. of Hydrodynamics (Novosibirsk)
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	Remote control firing system
B. Comments	Can be fired either automatically or in single shots
17. Reliability	
18. Safety	Equipped with a special cabin to protect the operator against fragments of discharged rock
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	No spark hazard
B. Disadvantages	Cannot be used for rock hardness F = 8-10 (It would require jet pressure of 10,000 - 15,000 atm)
24. Pertinent Reference Documents	738, p. 24-25
25. Drawing(s)	
26. Photograph(s)	

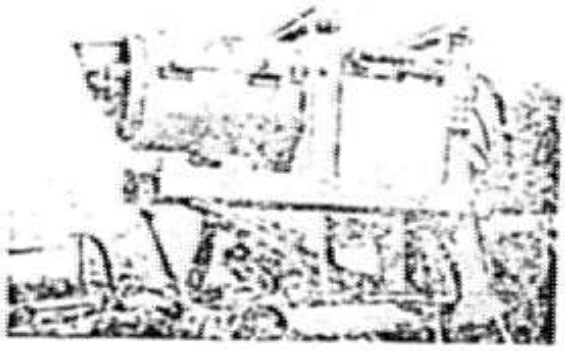
DATA SHEET 5.8-21
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Roadheader, Water Cannon Type IVD
B. Country of Origin	USSR
C. Distinguishing Characteristics	Voitsekhovskiy type piston impact extrusion, open cycle water hydraulic power system (perhaps similar to PI)
2. Function	Break rock
3. Designation of Mining Systems for which Applicable	
4. Major Components	Water cannon, frame, hydraulic jack to control elevation
5. Design Parameters	Peak jet pressure: 8000-10,000 kg/cm^2 Nozzle diameter: 10 or 11.5 mm Pulse rate: 10-12 shots/min
6. Performance Parameters A. Input	Water hydraulic power - 100-120 kw
B. Output	
C. Performance Capacity	Jet velocity 1250 m/sec
D. Efficiency	Effective range 1.2-1.5 m
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	2-2.5 m
P. Width	Diameter 0.7-0.8 m
C. Height	
8. Weight of Equipment	1600-200 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	DONGIPROUGLEMASH & Institute for Hydrodynamics, Academy of Sciences, Siberian Branch
11. Status of Development	Tested 1974

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	DONGIPROUGLEMASH (Donbass)
15. Designation of Mines where Used	
16. Type of Control A. Input	Water hydraulic - automatic firing
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	1110, p. 39-41
25. Drawing(s)	
26. Photograph(s)	1110, p. 39, fig. 1

Reference 1110



DATA SHEET 5.8-22
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Roadheader, Water Cannon Type, TS-1
B. Country of Origin	USA
C. Distinguishing Characteristics	Uses Voitsekhovskiy exponential nozzle to reach peak water jet pressures of 30,000 kg/cm^2 (425,000 psi)
2. Function	Break hard rock for tunneling or at reduced pressures for driving headings in coal and rock
3. Designation of Mining Systems for which Applicable	
4. Major Components	Hydraulic actuator, nozzle, hydraulic power & control unit, water injection & nozzle purging system
5. Design Parameters	Nozzle diameter: 0.33 inch Pulse pressure: 300,000 to 425,000 psi with air in nozzle
6. Performance Parameters A. Input	Oil hydraulic pressure of 2500 psi
B. Output	Single shot water pulses
C. Performance Capacity	Potentially capable of one shot every 3-5 seconds, requires development of water injection system
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Heading height over 6 ft
7. Size of Equipment A. Length	12 ft
B. Width	6 ft
C. Height	6 ft
8. Weight of Equipment	4 tons
9. Cost (and Year of Cost Evaluation and Basis for Costs)	Estimated $100,000 (1975) after development
10. Developing Agency	Terraspace, Inc. for the U.S. Department of Transportation
11. Status of Development	Single shot prototype tested in 1974

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	Terraspace, Inc.
13.	Number of Units Manufactured (and Time Period)	One, 1972-73
14.	Using Agency	Unit delivered to U.S. Army, Ft. Belvoir, Va.
15.	Designation of Mines where Used	Tested in limestone mine in Cockeysville, Md. and quarry in Ft. Belvoir, Va.
16.	Type of Control A. Input	Remote at 30 ft
	B. Comments	Prototype requires manual control
17.	Reliability	Fair
18.	Safety	Good
19.	Major Causes of Failure	Wear of polymer seals
20.	Maintenance Requirement	
21.	Major Overhaul	
22.	Replacement Period	
23.	Comments on Suitability A. Advantages	Can break hard rock, limestone or harder
	B. Disadvantages	Would require inert gas purging or reduction of pressure to avoid methane ignition
24.	Pertinent Reference Documents	347
25.	Drawing(s)	347, p. 2-2, fig. 1
26.	Photograph(s)	347, p. 2-3, fig. 2 also fig. 3

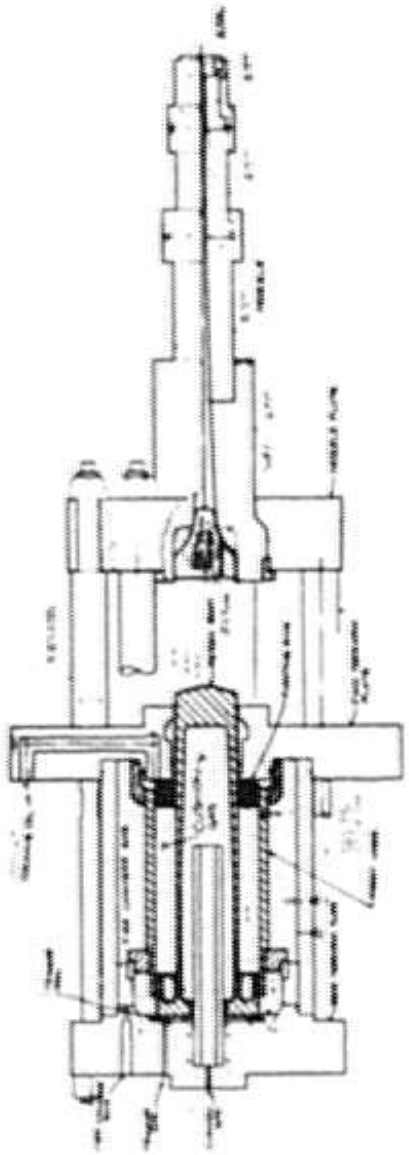


Figure 1.
CROSS SECTION OF WATER CANNON

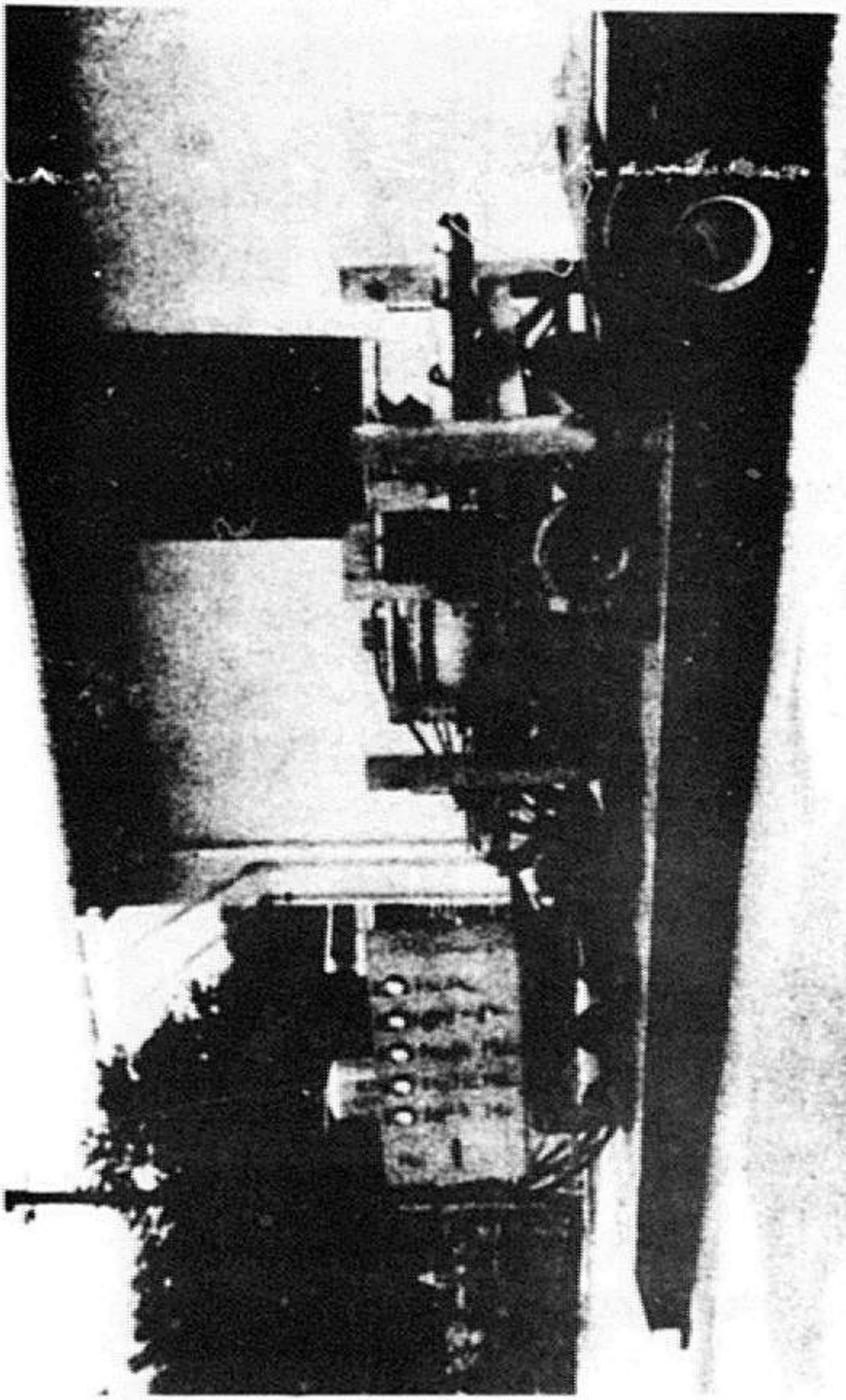


Fig. 2. Power and Control Unit and Water Cannon Assembly on Flat Bed Trailer

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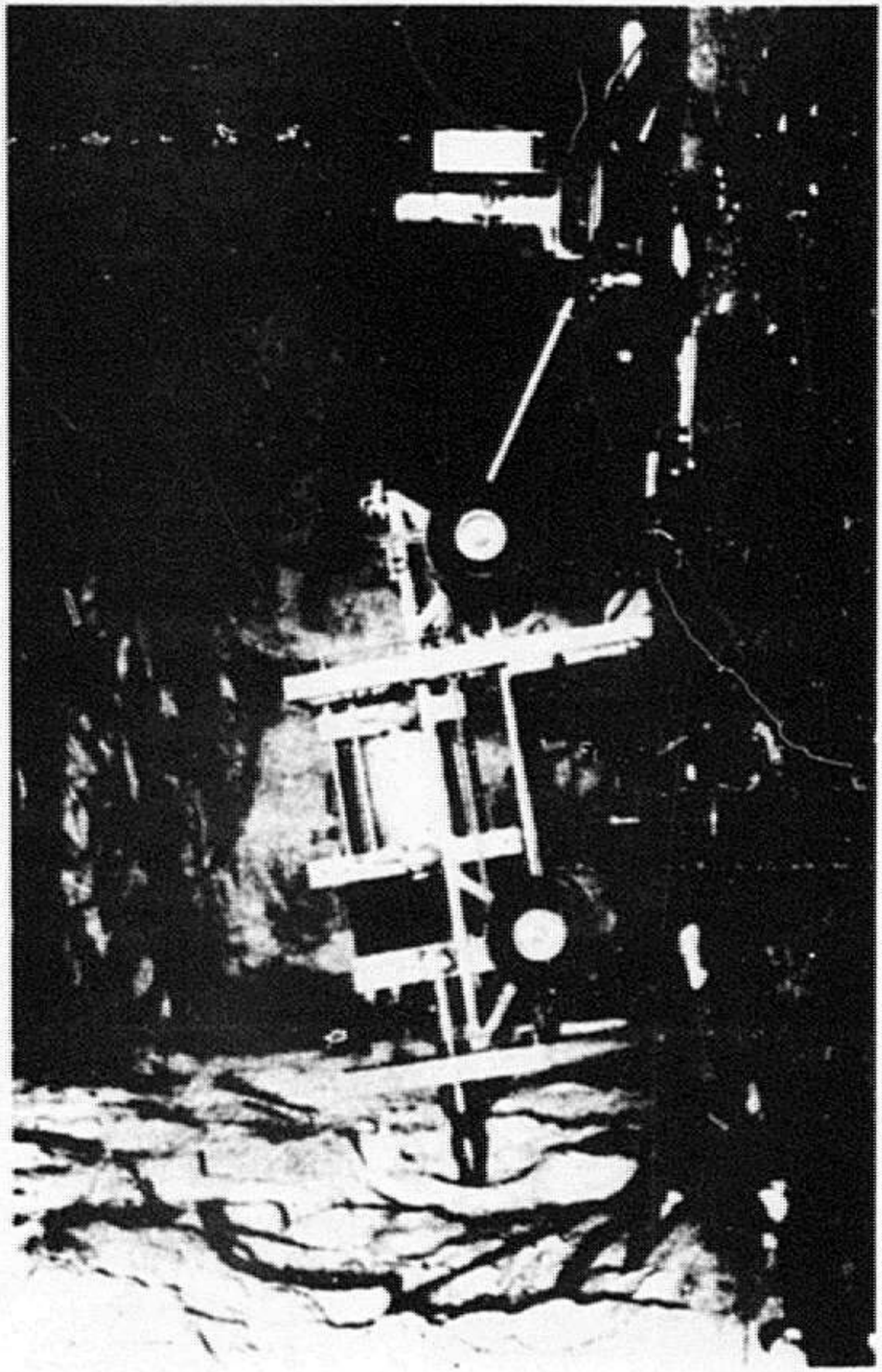


Fig. 3. Water Cannon Assembly with Power and Control Unit in Limestone Mine at Cockeysville, Maryland

DATA SHEET 5-8.23
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Roadheader AP-2 (Drill & Blast Type)
B. Country of Origin	USSR
C. Distinguishing Characteristics	Roadheading by drill & blast through rocks with hydraulic transport of cuttings into the goaf
2. Function	
3. Designation of Mining Systems for which Applicable	Hydraulic with hydraulic stowing
4. Major Components	Self propelled caterpiliar cart, feeder, crusher, hydraulic elevator, hydromonitor and two manipulators, water filter OPSH, frame and loading arms
5. Design Parameters	Minimum cross section of cut: 6.35 m^2 in the clear, 8.3 m^2 in the drivage
6. Performance Parameters A. Input	8 kw each of 2 electric motors for loader arms
B. Output	Crusher has massive rotors with two beaters provides hydraulic stowing of rock cuttings up to 400 mm in size.
C. Performance Capacity	Output 40-70 tons per hour
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Rock hardness to F = 12
7. Size of Equipment A. Length	6160 mm
B. Width	1840 mm
C. Height	2050 mm (in transport position 1800 mm)
8. Weight of Equipment	15.6 tons
9. Cost (and Year of Cost Evaluation and Basis f. - Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	Uses electric motors KOP21-8 (8 kw power, 725 rpm)
B. Comments	Broken rock collected in conjunction with 2PNB-2 machine
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 47; 1074 , p. 21
25. Drawing(s)	738, p. 48, fig. 75
26. Photograph(s)	

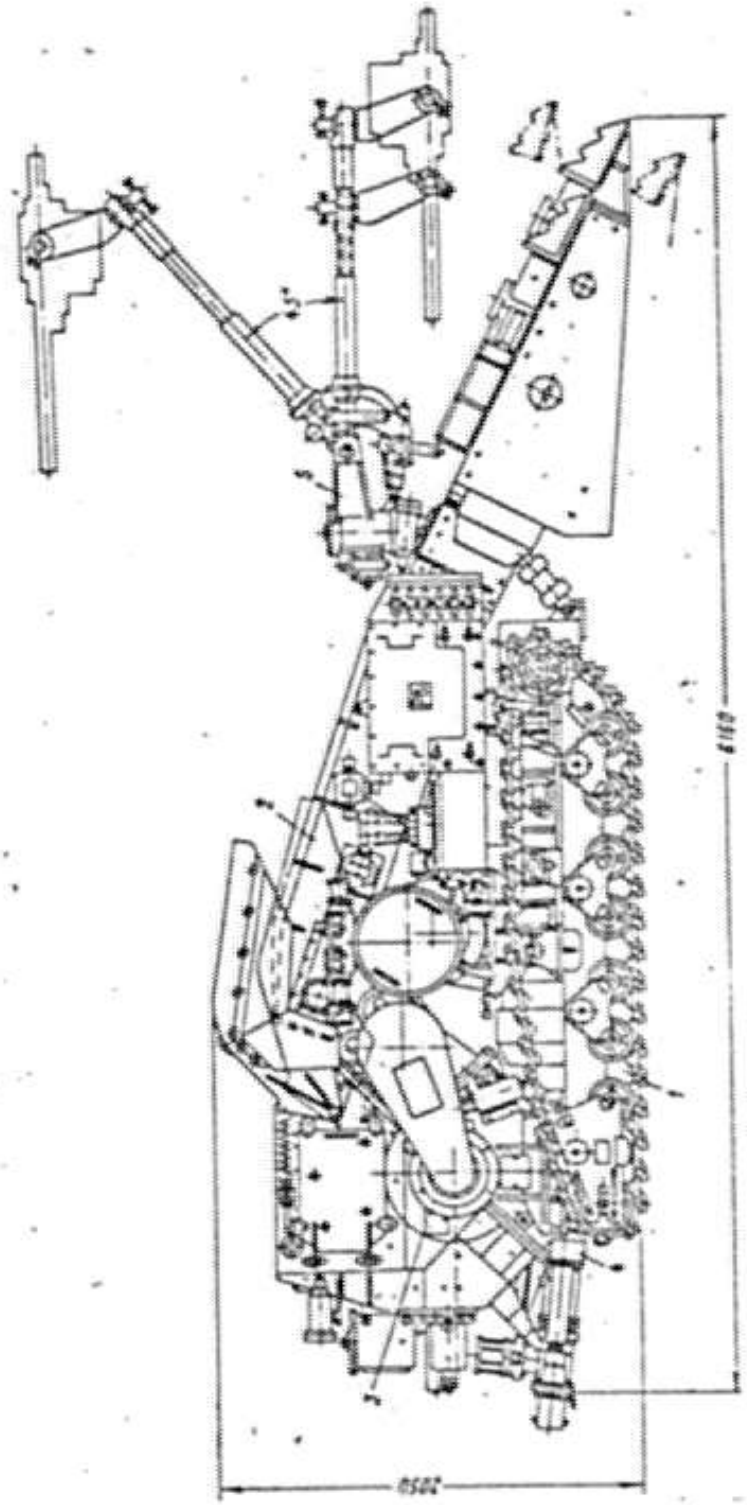


Figure 75.
THE AP-2 ROADHEADER

DATA SHEET 5.10-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Flume Troughs
B. Country of Origin	USA
C. Distinguishing Characteristics	Trapezoidal bent-up sections of steel, with or without lining
2. Function	Flume rock or coal
3. Designation of Mining Systems for which Applicable	Fluming systems
4. Major Components	Bent steel plate, with lining of enamel, ceramic or plastic
5. Design Parameters	12 in wide at base - 10 in. deep (for example in fig. 5.10-1)
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	5 to 10 ft 10 ft
B. Width	1 ft
C. Height	1 ft
8. Weight of Equipment	23 lb/ft for 3/16 in., plus liner
9. Cost (and Year of Cost Evaluation and Basis for Costs)	See Fig. 5.10-1 for 1975 cost estimates
10. Developing Agency	
11. Status of Development	Commercially available on custom order

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Steel suppliers
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	Wear out by abrasion
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Low friction coating permits lower slope
B. Disadvantages	
24. Pertinent Reference Documents	Quotes from potential U.S. suppliers
25. Drawing(s)	
26. Photograph(s)	

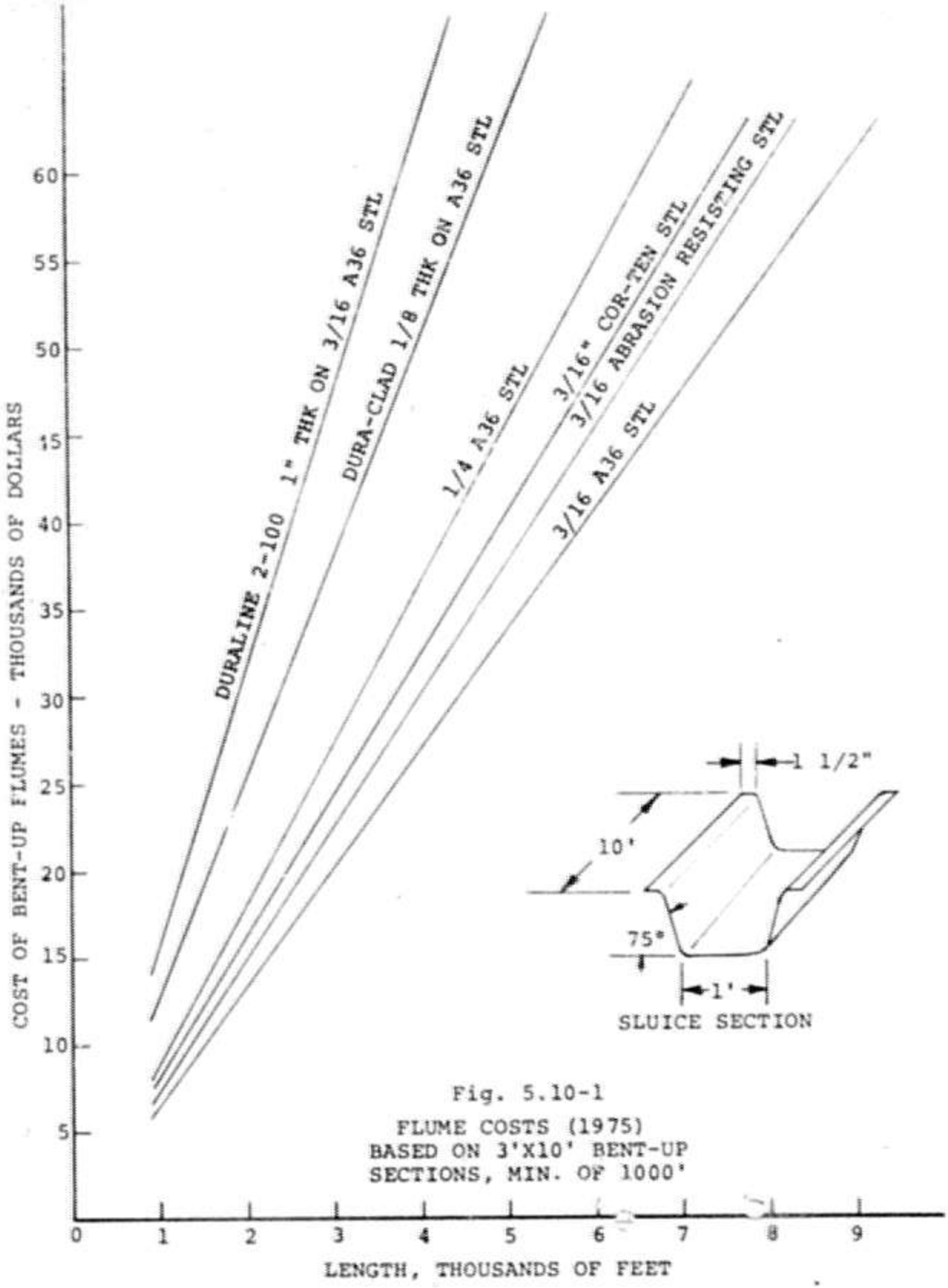


Fig. 5.10-1
FLUME COSTS (1975)
BASED ON 3'X10' BENT-UP
SECTIONS, MIN. OF 1000'

DATA SHEET 5.11-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 12U10	
B. Country of Origin	USSR	
C. Distinguishing Characteristics	Centrifugal	
2. Function	Pump coal, sludge	
3. Designation of Mining Systems for which Applicable		
4. Major Components	Impeller, shaft, housing, bearings, seals, electric motor, frame, coupling, clean out port	
5. Design Parameters		
6. Performance Parameters A. Input	Feed 600-900 m^3/hr (2642-3960 gpm); suction height 4-5 m; 1450 rpm electric motor of 320 kw power	
B. Output		
C. Performance Capacity	85-80 m head (279-262 ft)	
D. Efficiency	55% - 65%	
E. Limiting Environmental and Coal Seam Conditions	Maximum particle size: 90 mm (3.54 in.) Temperature limit 50° C.	
7. Size of Equipment A. Length	Pump Only 1.9 m	Pump & Electric Motor on Frame 3.4 m
B. Width	1.1 m	1.1 m
C. Height	1.2 m	1.4 m
8. Weight of Equipment	1600 kg	4125 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)		
10. Developing Agency		
11. Status of Development		

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

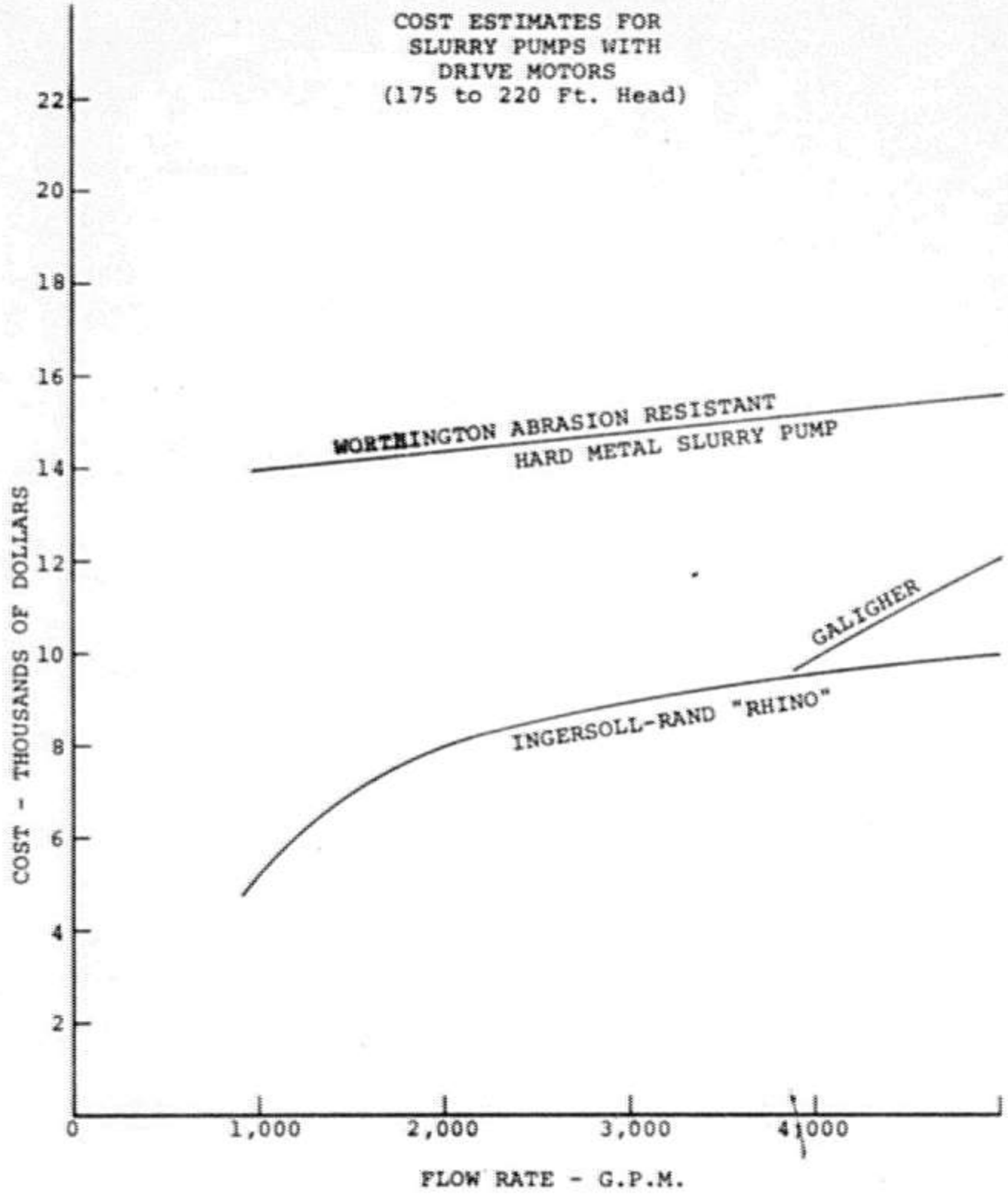
12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	739, p. 31; 874
25. Drawing(s)	
26. Photograph(s)	

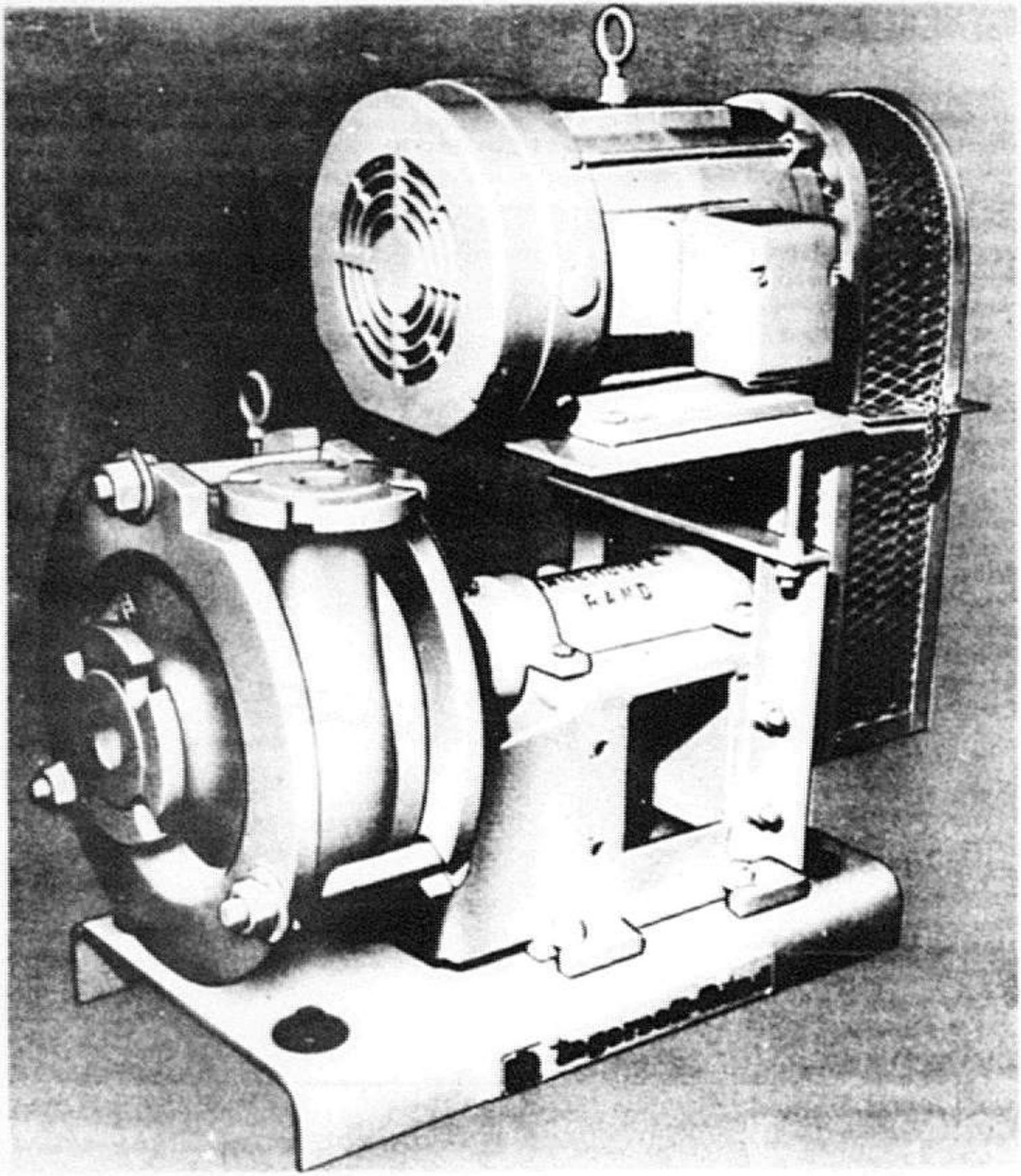
DATA SHEET 5.11-2
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number		Coal Pump, I.R. "Rhino" MIR Type					
B. Country of Origin		USA					
C. Distinguishing Characteristics		Centrifugal single stage					
2. Function		Pump abrasive slurry					
3. Designation of Mining Systems for which Applicable		With hydraulic hoisting					
4. Major Components		Casing, wear plates, seal rings, impeller, shaft & bushings, electric motor, mounting frame, sheaves, belts, etc.					
5. Design Parameters		Low head rise per stage					
6. Performance Parameters	Type	100	150	250	350	400	500
A. Input	PUMP RPM	1,700	1,350	1,100	970	900	700
B. Output	(GPM)	300	800	2,000	4,000	5,000	7,000
	(m^3/hr)	70	190	460	900	1,150	1,600
C. Performance Capacity	HEAD (ft)	220	200	180	175	200	180
	(m)	65	60	55	52	60	54
D. Efficiency							
E. Limiting Environmental and Coal Seam Conditions							
7. Size of Equipment A. Length	(in.)	37	45	56	68	68	83
B. Width	(in.)	20	25	31	36	36	40 (EST.)
C. Height	EST. (in.)	38	48	58	60	70	78 (EST.)
8. Weight of Equipment	PUMP ONLY (lbs)	840	1,640	3,100	4,590	6,030	8,700
9. Cost (and Year of Cost Evaluation and Basis for Costs)	($) With Motor (Jan. 75)	4,000	5,000	8,000	9,500	10,000	12,000
		See attached graph					
10. Developing Agency		Ingersoll-Rand					
11. Status of Development		In production					

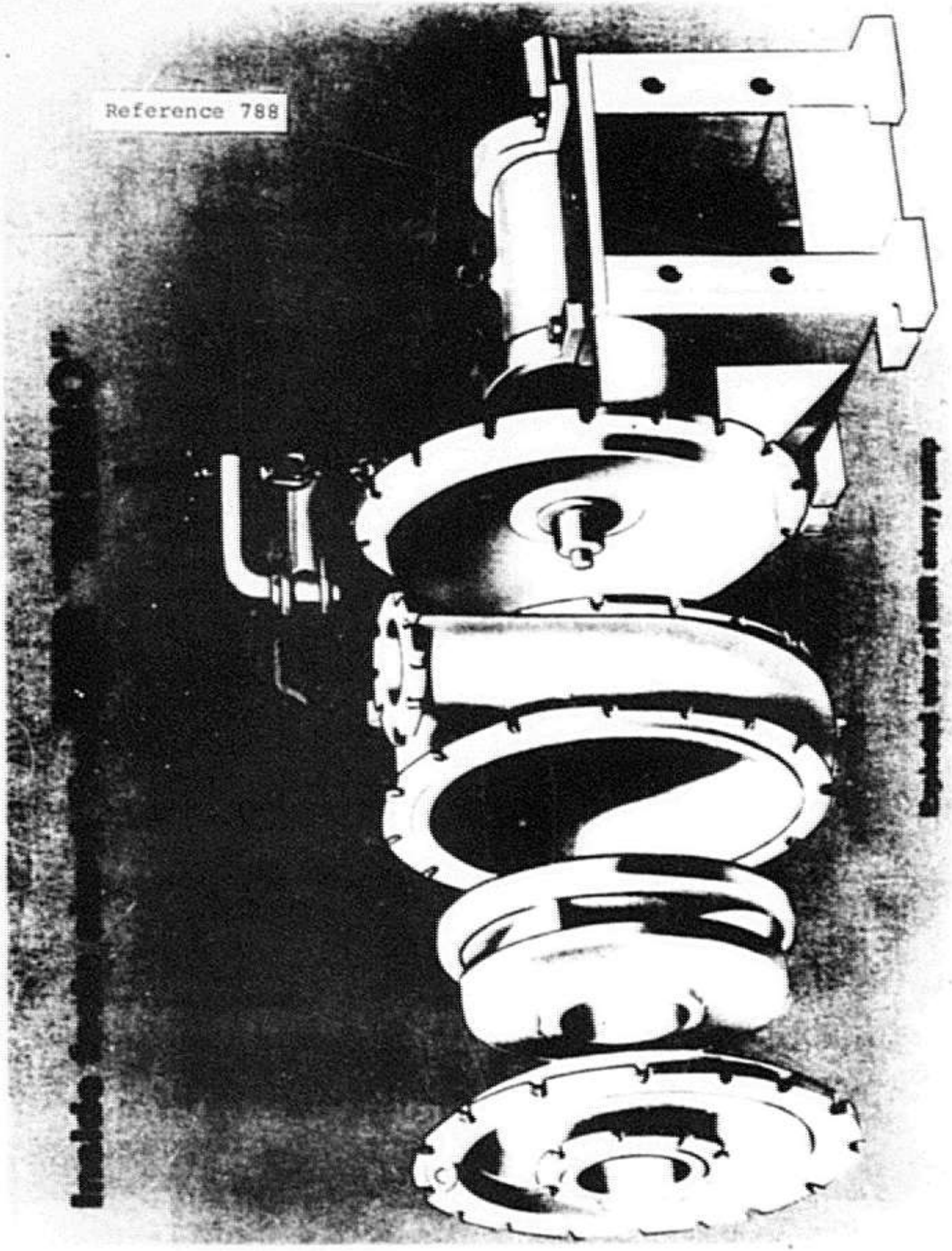
DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Ingrersoll-Rand, Cameron Pump Division, Phillipsburg, New Jersey
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
	Possibly could use higher RPM for coal without excessive wear
24. Pertinent Reference Documents	788
25. Drawing(s)	788, fig. 7, 11, 14
26. Photograph(s)	788, fig. 1, 2, 5, 6, 10


COST ESTIMATES FOR
SLURRY PUMPS WITH
DRIVE MOTORS
(175 to 220 Ft. Head)
COST - THOUSANDS OF DOLLARS
22
20
18
16
14
12
10
8
6
4
2
0
1,000
2,000
3,000
4,000
FLOW RATE - G.P.M.
WORTHINGTON ABRASION RESISTANT
HARD METAL SLURRY PUMP
GALIGHER
INGERSOLL-RAND "RHINO"

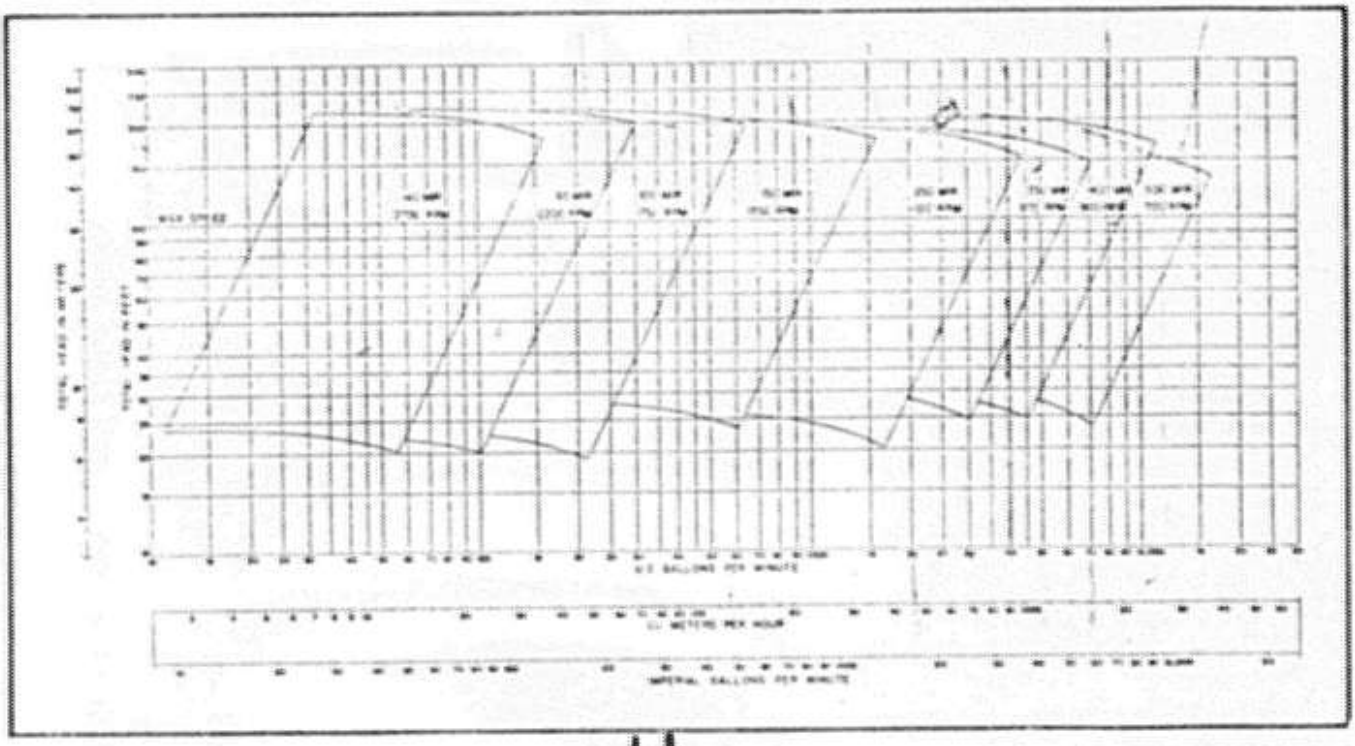


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Reference 788

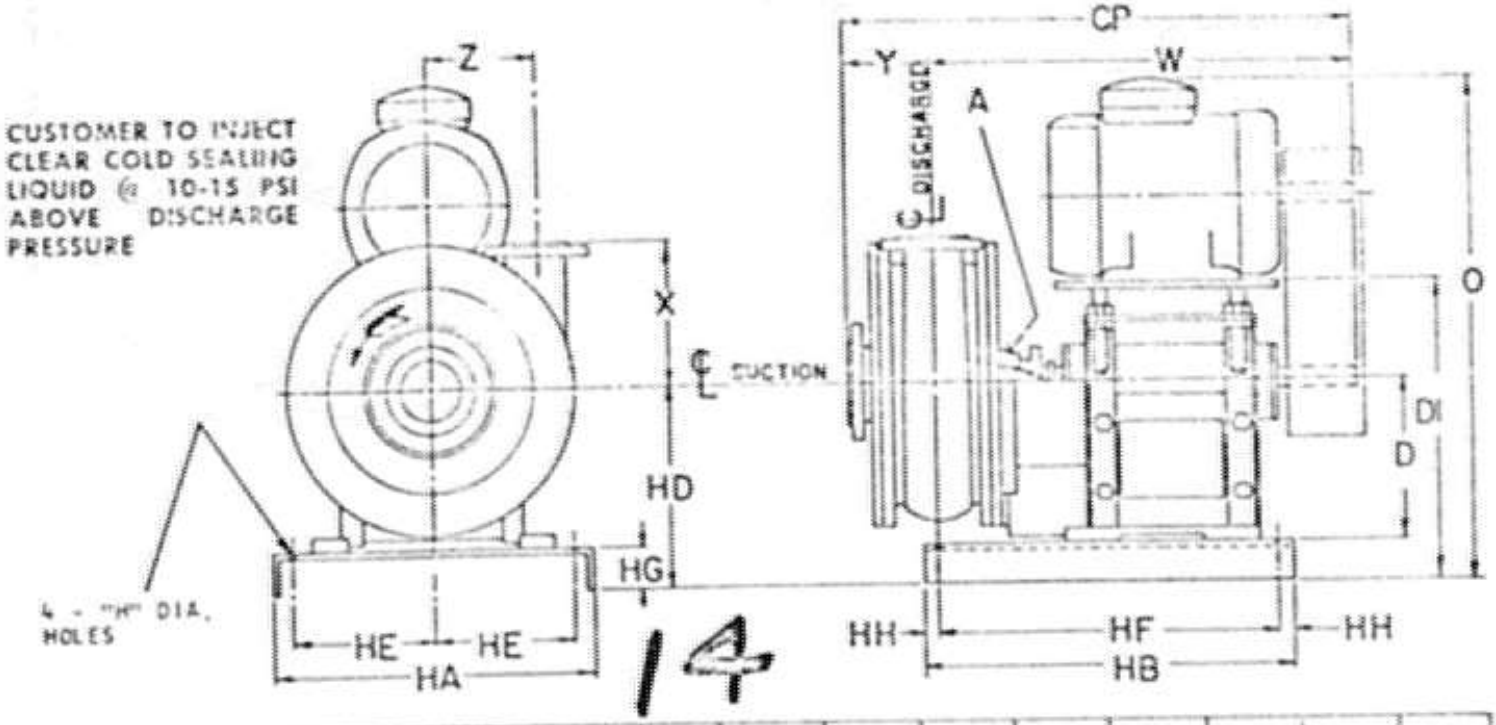
Reference 788

PUMP PERFORMANCE



Type [illegible] Hard Iron "[illegible]" Slurry Pumps

DIMENSIONS AND WEIGHTS



MODEL	*SUCT.	*DISCH.	APPROX. WEIGHTS			O	W	X	Y	Z	CP	HA	HB	HD
			PUMP	MOTOR	SHEAVES									
40	2.00	1.50	330	—	—	—	21.25	7.00	3.75	4.91	25.00	13.00	22.00	16.69
65	3.00	2.50	540	—	—	—	25.75	8.75	4.50	6.31	30.25	16.00	26.00	13.31
100	4.00	3.00	840	—	—	—	31.44	11.00	5.75	8.25	37.19	20.00	30.00	15.88
150	6.00	5.00	1640	—	—	—	38.00	14.00	7.50	10.81	45.50	25.00	36.06	15.25
250	10.00	8.00	3100	—	—	—	46.50	17.75	9.75	14.19	56.25	31.00	43.00	22.19
350	14.00	10.00	4590	—	—	—	56.75	19.75	11.00	17.75	67.75	36.00	54.00	29.75
400	16.00	12.00	6030	—	—	—	57.12	22.00	11.50	18.91	68.62	36.00	54.00	29.75
500	20.00	16.00	8700	—	—	—	68.62	27.94	14.50	23.62	83.12	—	—	—

MODEL	*SUCT.	*DISCH.	APPROX. WEIGHTS			HE	HF	HG	HH	H	D	DI
			PUMP	MOTOR	SHEAVES							
40	2.00	1.50	330	—	—	4.50	19.00	3.00	2.00	1.12	7.88	—
65	3.00	2.50	540	—	—	6.00	22.00	3.50	2.00	1.12	9.81	—
100	4.00	3.00	840	—	—	7.50	26.00	3.50	2.50	1.12	12.38	—
150	6.00	5.00	1640	—	—	10.00	32.00	3.50	2.00	1.25	15.75	—
250	10.00	8.00	3100	—	—	13.00	39.00	3.50	2.00	1.25	19.69	—
350	14.00	10.00	4590	—	—	15.00	48.00	4.00	3.00	1.62	24.75	—
400	16.00	12.00	6030	—	—	15.00	48.00	4.00	3.00	1.62	24.75	—
500	20.00	16.00	8700	—	—	—	—	—	—	—	31.50	—

*ALL FLANGES—150 LB ASA R.F.

DATA SHEET 5.11-3
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Worthington Coal Slurry Pump Type M-8-193
B. Country of Origin	Canada
C. Distinguishing Characteristics	Centrifugal
2. Function	Pump high concentrations of coarse abrasive solids in suspension
3. Designation of Mining	With hydraulic hoisting
4. Major Components	Casing, suction side wear plate, gland side wear plate, seal rings, impeller, shaft & bushings, electric motor, mounting frame, sheaves, belts
5. Design Parameters	
6. Performance Parameters A. Input	200 hp electric motor
B. Output	400 m^3/hr 1700 gpm
C. Performance Capacity	head 54 m (180 ft)
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length (with motor)	1450 mm (57.1 in.)
B. Width	721 mm (28.4 in.)
C. Height	1970 mm (77.5 ft)
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	Estimated complete cost with 200 hp electric motor, belts, sheaves, etc. 1975 = $14,000
10. Developing Agency	
11. Status of Development	In production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Worthington (Canada) Ltd.
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	786
25. Drawing(s)	786, fig. 3, 5, 6, 8
26. Photograph(s)	786, fig. 2

Reference 786

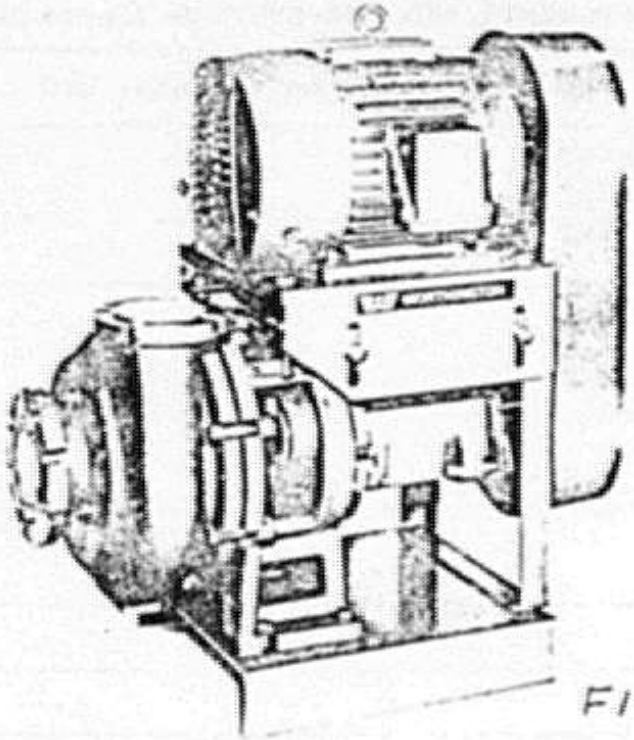


FIG 2

TYPE M abrasion resistant hard metal pump

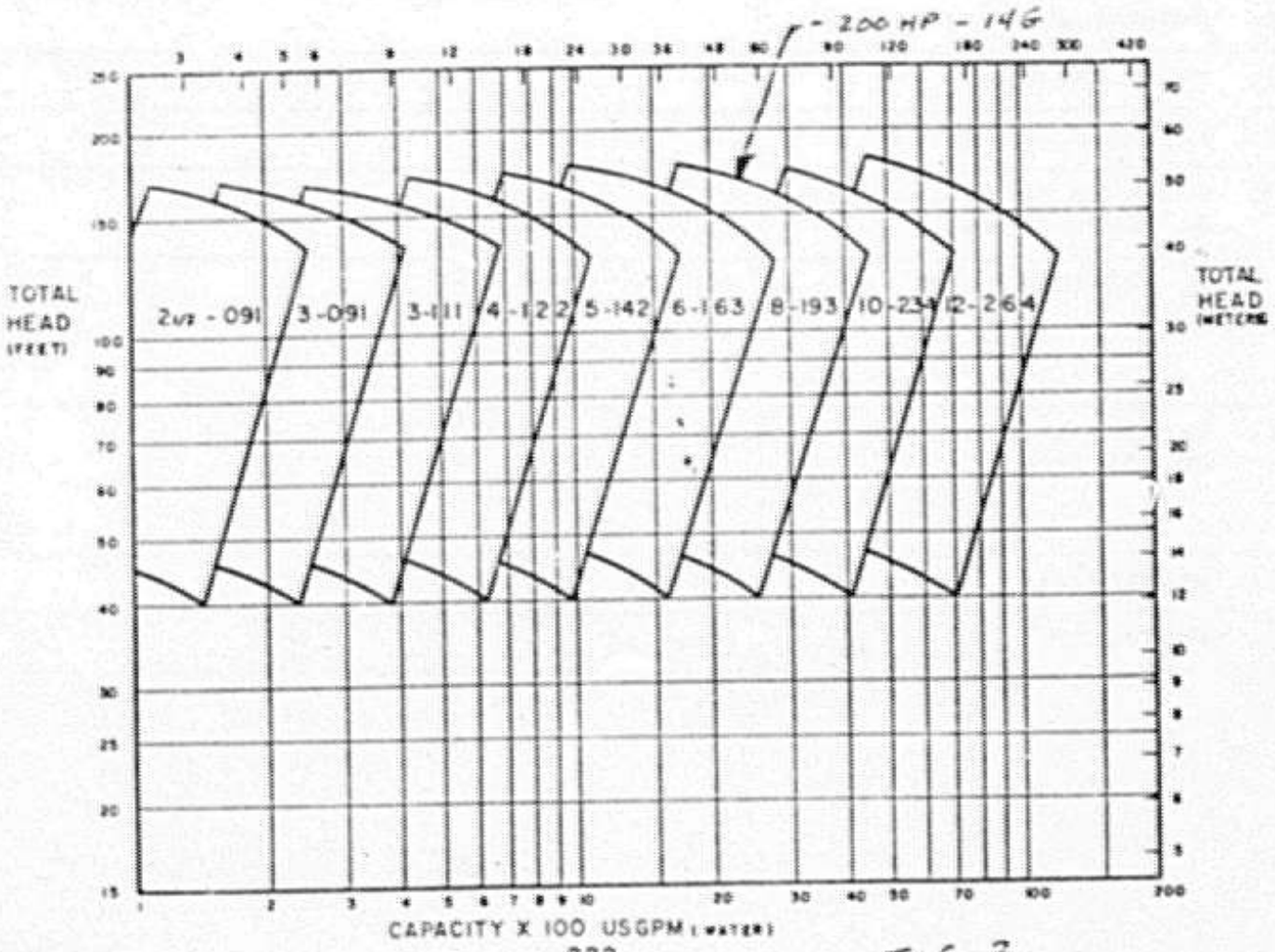
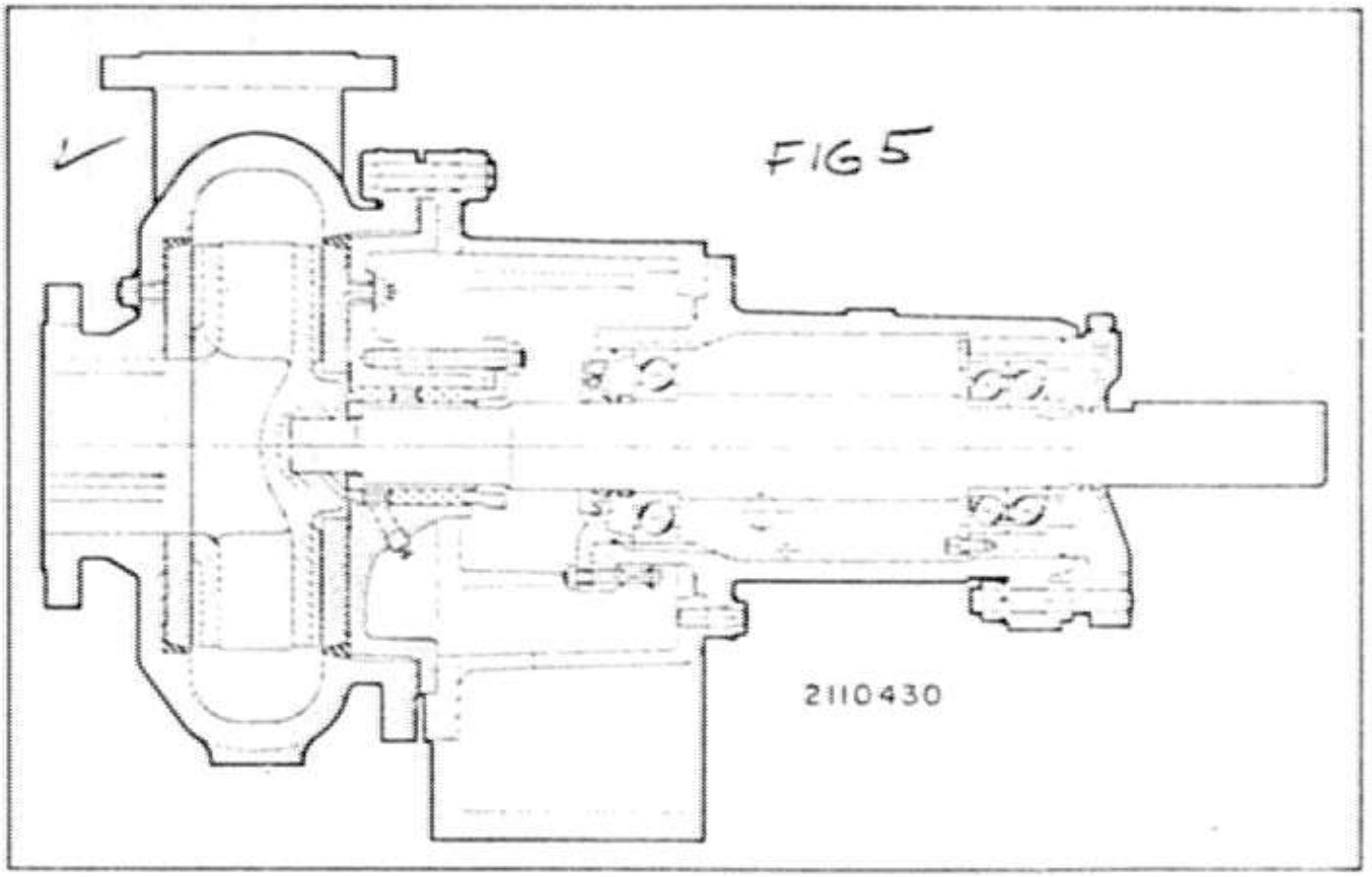


FIG 3


FIG 5
2110430

TYPE R — RUBBER LINED PUMPS			COMMON BEARING PEDESTAL AND CARTRIDGE ASSEMBLY	TYPE M — HARD METAL PUMPS		
MODEL	SUCTION	DISCHARGE		SUCTION	DISCHARGE	MODEL
2½ R-091	2½	2½	1	2½	2½	2½ M-091
3 R-091	3	3		3	3	3 M-091
3 R-111	4	3		4	3	3 M-111
4 R-122	5	4	2	5	4	4 M-122
5 R-142	6	5		6	5	5 M-142
6 R-163	8	6	3	8	6	6 M-163
8 R-193	10	8		10	8	8 M-193
10 R-234	12	10	4	12	10	10 M-234
12 R-264	14	12		14	12	12 M-264

FIG 6

TYPE M — HARD METAL PUMPS				
MATERIALS OF CONSTRUCTION	MATERIAL CLASSIFICATION			
	NI-HARD 1	NI-HARD 4	28% CHROME IRON	15/3 ALLOY IRON
CASING	NI-HARD 1	NI-HARD 4	28% CHROME IRON	15/3 ALLOY IRON
SUCTION SIDE WEAR PLATE				
GLAND SIDE WEAR PLATE				
WEAR PLATE SEAL RINGS	BUTYL RUBBER			
IMPELLER	NI-HARD 1	NI-HARD 4	28% CHROME IRON	15/3 ALLOY IRON
STUFFING BOX HEAD	CAST IRON			
SHAFT SLEEVE	55 (450 500 BHN)			
SHAFT	STEEL			
GLAND	316 SS			
THROAT BUSHING	TEFLON			
SEAL CAGE	TEFLON			

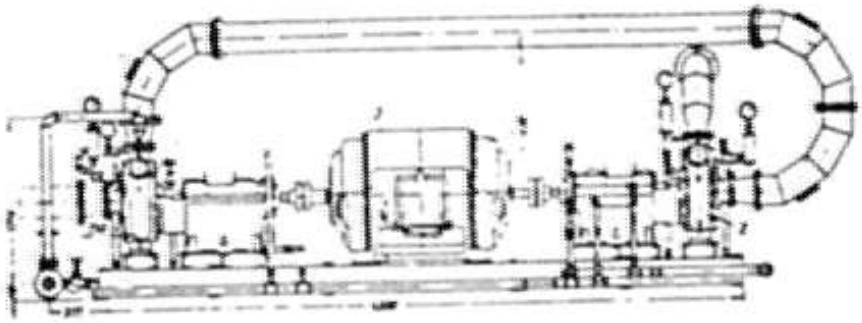
FIG 8

DATA SHEET 5.11-4
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump, High Pressure 6NUV
B. Country of Origin	USSR
C. Distinguishing Characteristics	Single stage high pressure centrifugal coal pump
2. Function	Pump coal slurry
3. Designation of Mining Systems for which Applicable	With hydraulic hoisting
4. Major Components	Impeller, pump housing, seals, pump shaft, bearings
5. Design Parameters	
6. Performance Parameters A. Input	Power = 300 kw
B. Output	Head = 120 m (394 ft)
C. Performance Capacity	1500 RPM, 400 m^3/hr slurry (1750 gpm)
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Coal size = 60 mm maximum
7. Size of Equipment A. Length	5 ft Intake pipe size 150 mm, outlet pipe 125mm
B. Width	32 in.
C. Height	30 in.
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In production prior to 1958, widely used

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Polysayevskaya Northern Colliery - Kuzbass Tyrganskiye Uklony Colliery - Kuzbass
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	678, p. 807
25. Drawing(s)	678, p. 9, fig. 8; 942, fig. 1
26. Photograph(s)	



GNUV

Рис. 1. Установка ВНУВ :

1 – первая ступень ; 2 – вторая ступень ; 3 – электродвигатель ; 4 – обсадная труба

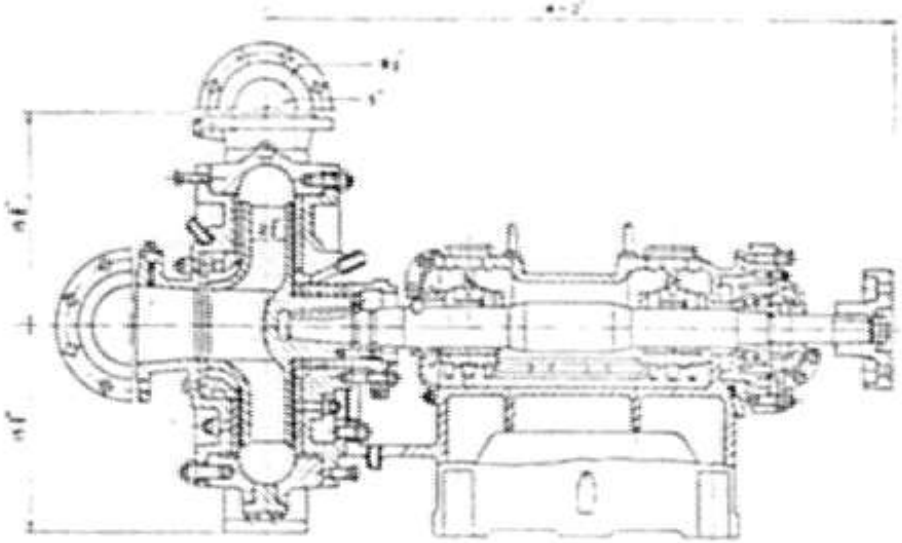


Fig. 8. 6 NUV high-pressure coal pump.

DATA SHEET 5.11-5
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 10-UVT-2S
B. Country of Origin	USSR
C. Distinguishing Characteristics	2 stage centrifugal
2. Function	Pump coal slurry
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Impellers, pump housing, seals, pump shaft, bearings
5. Design Parameters	
6. Performance Parameters A. Input	Power = 930 kw
B. Output	900 m^3 of slurry per hour (3950 gpm)
C. Performance Capacity	250 m head (820 ft) 1450 rpm
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Maximum particle size 100 mm
7. Size of Equipment A. Length	Inlet pipe size = 200 mm Outlet pipe size = 150 mm
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Widely used and in production (1965)

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	Periods between repairs increased from 250 to 2000 hours
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	658, p. 807; 746, p. 3
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.11-6
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 12U10M
B. Country of Origin	USSR
C. Distinguishing Characteristics	Horizontal single stage centrifugal pump
2. Function	Pump coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Shaft, running wheel and discs, packings, casing, suction branch pipe, drive coupling
5. Design Parameters	
6. Performance Parameters A. Input	Slurry feed 600-900 m^3/hr; 1450 rpm with 320 kw electric motor
B. Output	900-1000 m^3/hr in tests
C. Performance Capacity	Pressure head 83-89 m water; 90 m permitted; maximum suction height 4-5 m water
D. Efficiency	65-70 percent
E. Limiting Environmental and Coal Seam Conditions	Maximum particle size: 90 mm solid to liquid ratio by weight 1:5 maximum
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKrNIIGidrougol
11. Status of Development	Tests prior to 1973, recommended for mass production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Yasnogorsk Machine Works
13. Number of Units Manufactured (and Time Period)	4 pumps, 2 tested in each of the mines noted below
14. Using Agency	Krasnoarmeyskugol Combine
15. Designation of Mines where Used	Mine #105 "Kurakhovsoya" 2 units tested; 2 pumps tested in Karsnoarmeyskaya Mine
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	Average time to failure increased twofold
20. Maintenance Requirement	See 465, p. 2 table
21. Major Overhaul	Time increased 1.75 times; life of armored disc, suction cover, running wheel, packings increased 3-4 times; subpacking, bushings - 2 times; suction branch pipe 7-10 times
22. Replacement Period	
23. Comments on Suitability A. Advantages	Higher efficiency than 12U10 (by 3-7°) Better reliability & lifetime
B. Disadvantages	
24. Pertinent Reference Documents	465
25. Drawing(s)	465, p. 1, fig. 1
26. Photograph(s)	

Reference 465

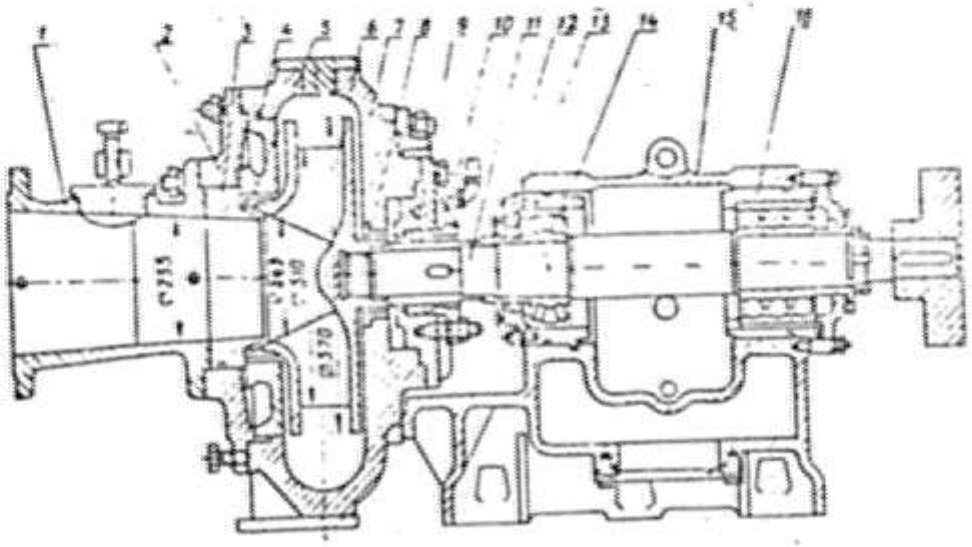


Fig.1. Construction of the Coal Pump 12U10m.

DATA SHEET 5.11-7
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 10U12
B. Country of Origin	USSR
C. Distinguishing Characteristics	Single stage centrifugal
2. Function	Pump coal
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	Feed 900 m^3/hr (3960 gpm);suction height 3 m; 1450 rpm electric motor of 320 kw power
B. Output	200 ft
C. Performance Capacity	65-80 m head (213-262 ft)
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	3.33 m
B. Width	1.18 m
C. Height	1.37 m
8. Weight of Equipment	4110 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	Comparable U.S. pump is Ingersoll-Rand MIR-400 - cost with motor about $10,500
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
	Comparable U.S. Pump, I-R "Rhino", MIR-400, head 200 ft, 5000 gpm, 900 rpm
24. Pertinent Reference Documents	739, p. 32
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.11-8
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 6NZ
B. Country of Origin	USSR
C. Distinguishing Characteristics	Centrifugal
2. Function	Pump coal slurry
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Impeller, pump housing, seals, pump shaft, bearings
5. Design Parameters	
6. Performance Parameters A. Input	Power = 75 kw
B. Output	Head = 27 m
C. Performance Capacity	400 m^3 of slurry per hour (1750 gpm) 980 rpm
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Maximum particle size = 80 mm
7. Size of Equipment A. Length	Inlet pipe diameter = 200 mm Outlet pipe diameter = 150 mm
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Widely used and in production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	658, p. 807
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.11-9
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 10U4 (12U4)
B. Country of Origin	USSR
C. Distinguishing Characteristics	Single stage centrifugal pump - electric motor, driven through flexible coupling, water cooled bearings
2. Function	Pump coal
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Frame, pedestal, shaft, impeller, bearings, labyrinth packings, bearing lubrication, oil tank & lines, bearing water cooling passages packing rings
5. Design Parameters	
6. Performance Parameters A. Input	Feed 350 m^3/hr (5.84 m^3/min = 1540 gpm); suction height 3 m; 1485 rpm electric motor of 320 kw power
B. Output	
C. Performance Capacity	120 m head maximum (394 ft)
D. Efficiency	50%
E. Limiting Environmental and Coal Seam Conditions	Coal particle size to 75 mm (2.95 in.) Maximum temperature 50°C Coal to water ratio by weight 1:5
7. Size of Equipment A. Length	3.4 m
B. Width	1.2 m
C. Height	1.4 m
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	739, p. 31
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.11-10
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump UUM-2
B. Country of Origin	USSR
C. Distinguishing Characteristics	Centrifugal
2. Function	Pump coal
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	739, p. 64
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.11-11
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 5-ShNU
B. Country of Origin	USSR
C. Distinguishing Characteristics	Single stage centrifugal
2. Function	Pump coal slurry
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Impeller, pump housing, seals, pump shaft, bearings
5. Design Parameters	
6. Performance Parameters A. Input	Power = 200 kw
B. Output	Head = 84 m (275 ft)
C. Performance Capacity	540 m^3/hr of slurry (9m^3/min = 2380 U.S. gpm) 1450 rpm
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Maximum particle size = 80 mm (3.15 in.)
7. Size of Equipment A. Length	intake pipe diameter = 200 mm (7.87 in.) outlet pipe diameter = 150 mm (5.9 in.)
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Widely used and in production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	658, p. 807
25. Drawing(s)	
26. Photograph(s)	

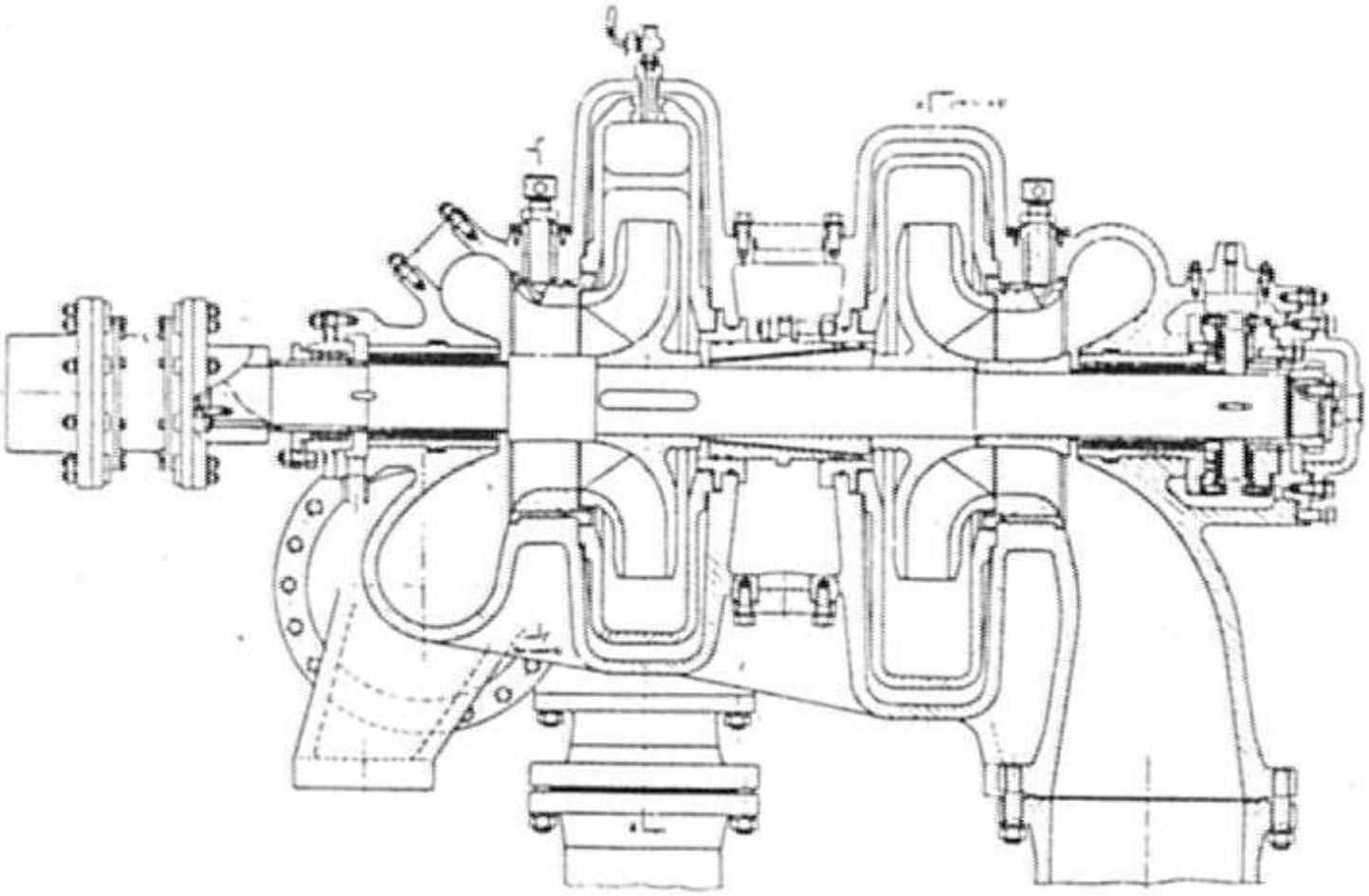
DATA SHEET 5.11-12
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 16UVTx2 (16U-7x2)
B. Country of Origin	USSR
C. Distinguishing Characteristics	Two stage centrifugal, main coal pump
2. Function	Main coal pump designed for surface pumping up to 20 km and in mine for hydraulic hoisting
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Impellers of 825 mm diameter, shaft, housing, bearings, clean out ports
5. Design Parameters	
6. Performance Parameters A. Input	5000 kw electric motor at 1480 rpm Suction pipe diameter 450 mm
B. Output	2000 m^3/hr at 450 m water head Pressure pipe diameter 300 mm
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Maximum particle passed 100 mm
7. Size of Equipment A. Length	2730 mm
B. Width	1800 mm
C. Height	
8. Weight of Equipment	6843 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	VNIIGidrougol Institute
11. Status of Development	Two experimental models built in 1960

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Bobruysk Machine Construction Works
13. Number of Units Manufactured (and Time Period)	Two experimental units built in 1960
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	Pressure water fed to packings. All wear-prone parts of pump made of hard alloy. Internal can be serviced without electric motor or pipe removal
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	1059, p. 82
25. Drawing(s)	1059, p. 83, fig. 48, 49; 942, fig. 5
26. Photograph(s)	

Reference 942



16UVTx2 (18UV-7x2).

Рис. 8. Упасос 16УВТх2 (18УВ-7х2)

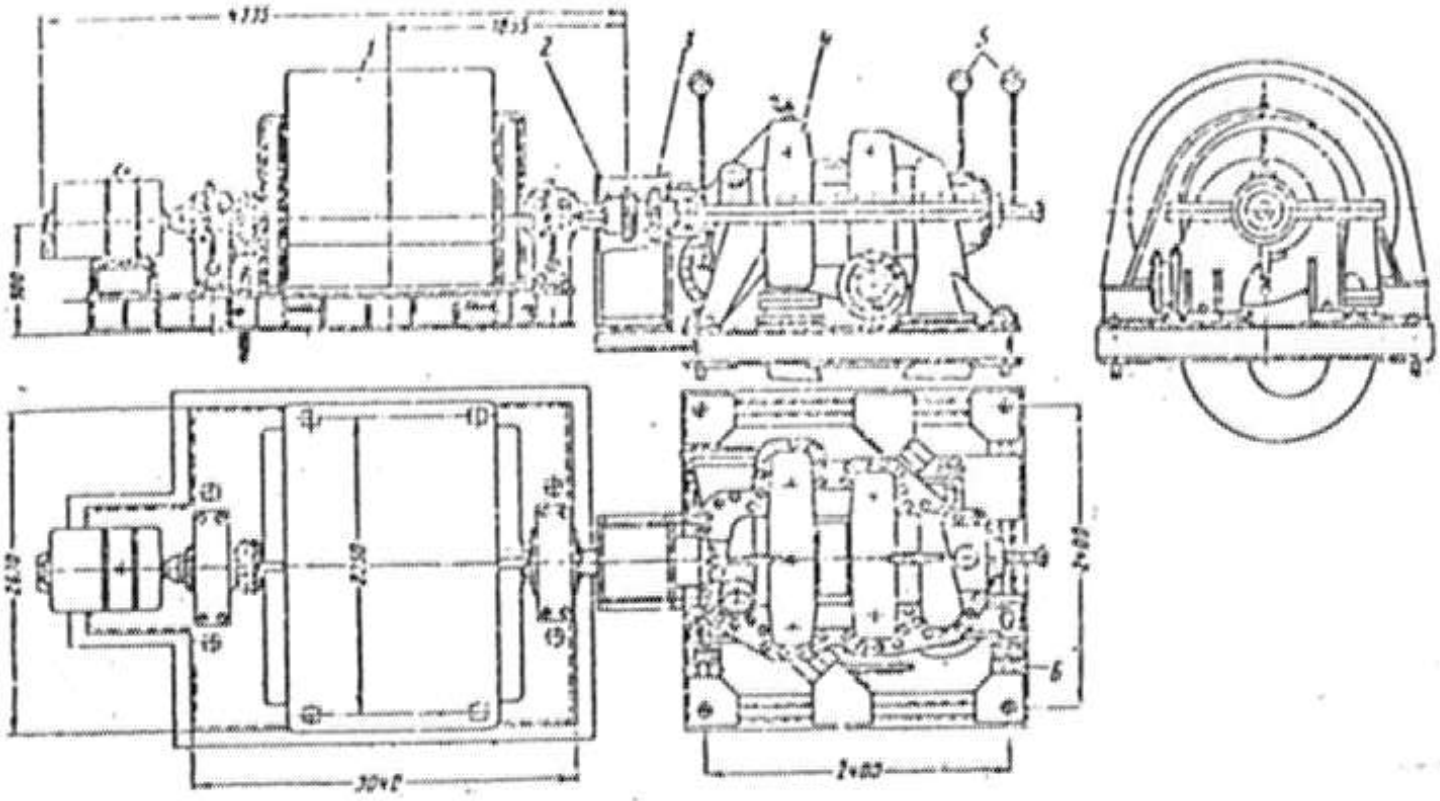


Fig. 48. General view of coal pump's 16UVTx2(16U-7x2) installation

DATA SHEET 5.11-13
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 10UVLx2T
B. Country of Origin	USSR
C. Distinguishing Characteristics	Two stage centrifugal
2. Function	Pump coal in mine and on surface up to 8 km Feed return water to monitors
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Impeller diameter of 630 mm, frame, cover, shaft, housing, bearings, clean-out parts
5. Design Parameters	
6. Performance Parameters A. Input	1000 kw electric motor at 1450 rpm, suction pipe diameter 350 mm
B. Output	900 m^3/hr at 250 m water head pressure pipe diameter 300 mm
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Maximum particle passed 100 mm
7. Size of Equipment A. Length	2250 mm
B. Width	2050 mm
C. Height	2445 mm
8. Weight of Equipment	7000 mm
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKrNIIGidrougol Institute
11. Status of Development	Two experimental models built 1962

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Antratsitovo Machine Construction Works
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	Pump internals can be serviced without disassembling electric motor or pipes, water cooled bearings
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.11-14
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 12UV-6
B. Country of Origin	USSR
C. Distinguishing Characteristics	Two stage centrifugal; split housing to facilitate disassembly
2. Function	Pump coal at 300 mm to surface; surface pumping up to 10 km and pump water; monitor feed
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Impellers of 700 mm diameter, housing, shaft, bearings
5. Design Parameters	
6. Performance Parameters A. Input	Feed 900 m^3/hr (3960 gpm) RPM 1485; electric motor of 1500 kw
B. Output	Pressure pipe diameter 250 mm Suction pipe diameter 350 mm
C. Performance Capacity	320 m Head (1050 ft)
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Maximum particle passed 100 mm
7. Size of Equipment A. Length	2.53 m
B. Width	2 m
C. Height	2.25 m
8. Weight of Equipment	6050 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Mass produced since 1965

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	Yasnogorskiy Machine Factory
13.	Number of Units Manufactured (and Time Period)	Laptev Machine Construction Works, in 1963 made two test units
14.	Using Agency	
15.	Designation of Mines where Used	Donbass & Kuznetsk
16.	Type of Control A. Input	
	B. Comments	
17.	Reliability	Flow through parts of the pump are made of long wearing and/or hard alloys; hardened steel inserts at wear points; water cooled bearings
18.	Safety	
19.	Major Causes of Failure	
20.	Maintenance Requirement	Pump internals may be serviced without disconnecting motor or pipes
21.	Major Overhaul	
22.	Replacement Period	
23.	Comments on Suitability A. Advantages	
	B. Disadvantages	
		May be used in two pump station or in series with coal pump 10U-12
24.	Pertinent Reference Documents	277, p. 33; 739, p. 2, 32, 33; 1059, p. 76
25.	Drawing(s)	1059, p. 77, fig. 44, p. 78, fig. 45, p. 79, fig. 46
26.	Photograph(s)	

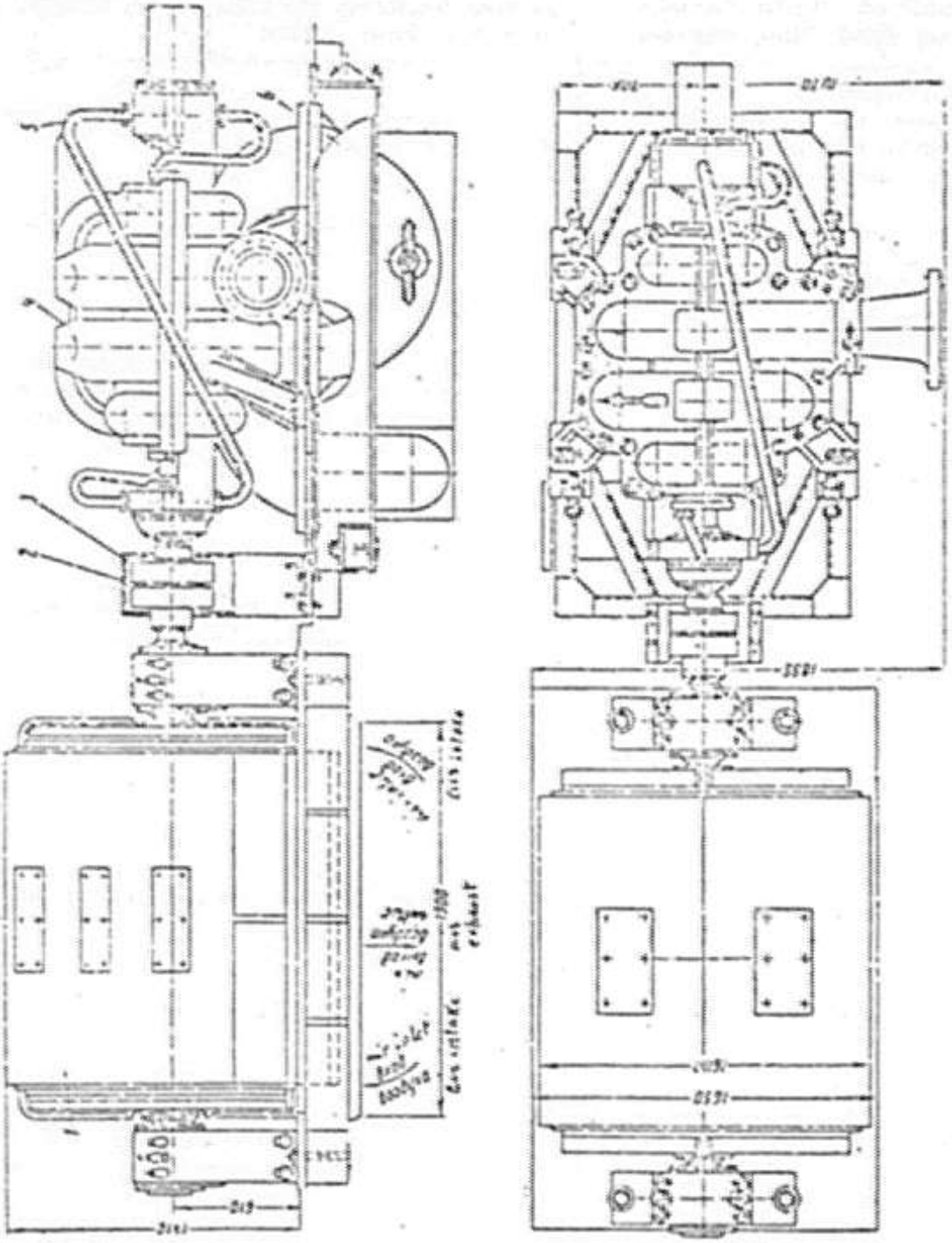


Fig.44. General view of the coal pump's 12UV-6 installation

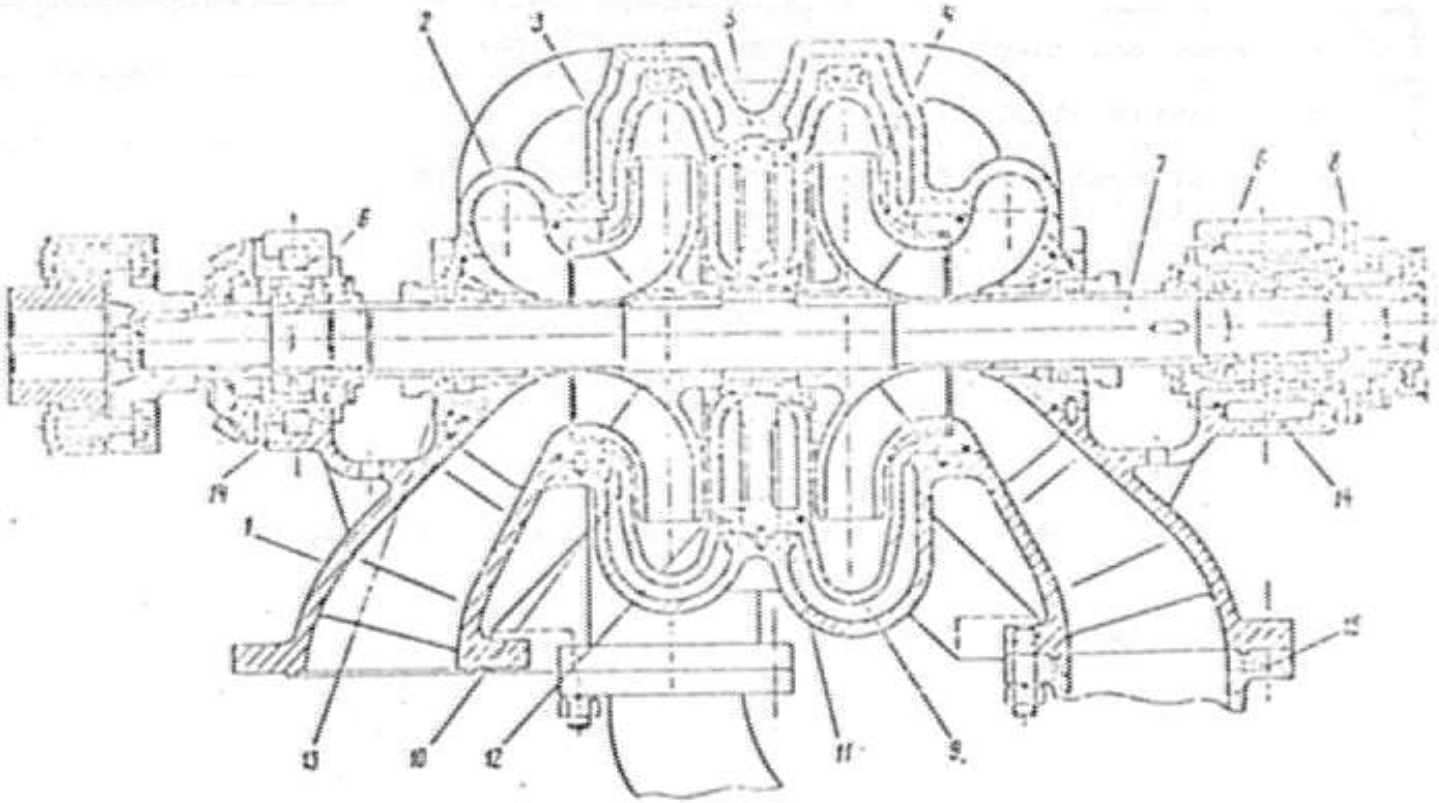


Fig.45. Coal Pump 12UV-6

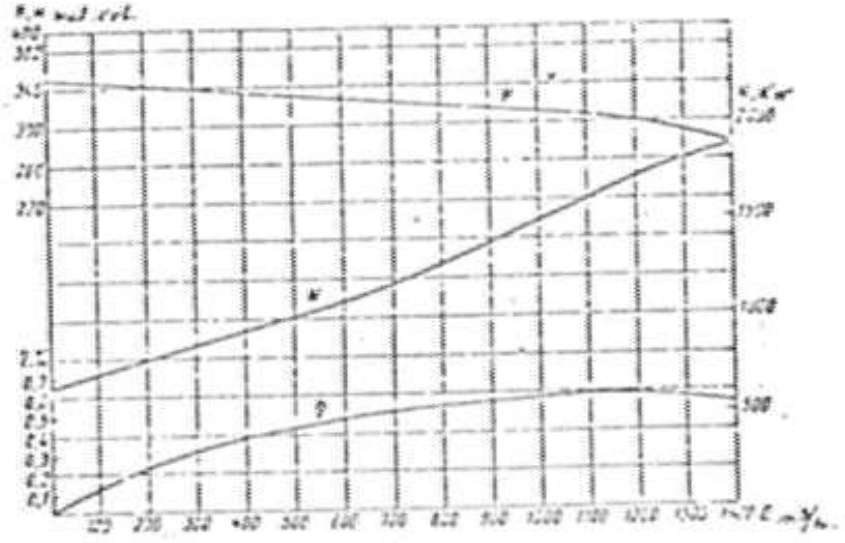


Fig.46. Performance of the pump 12UV-6

DATA SHEET 5.11-15
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 10UVRx2	
B. Country of Origin	USSR	
C. Distinguishing Characteristics	Two stage centrifugal	
2. Function	Pump coal in mine and up to 10 km on surface Feed water return to monitors	
3. Designation of Mining Systems for which Applicable	Hydraulic hoist	
4. Major Components	Impellers of 690 diameter, shaft, housing, bearings	
5. Design Parameters		
6. Performance Parameters A. Input	1500 kw electric motor at 1490 rpm Suction pipe diameter 350 mm	
B. Output	900 m^3/hr at 320 m water head Pressure pipe diameter 300 mm	
C. Performance Capacity		
D. Efficiency		
E. Limiting Environmental and Coal Seam Conditions	Maximum particle passed 100 mm	
7. Size of Equipment A. Length	Pump 2230 mm	Pump with Electric Motor on Base 5756 mm
B. Width	2045 mm	2045 mm
C. Height	1705 mm	2222 mm
8. Weight of Equipment	6380 kg	
9. Cost (and Year of Cost Evaluation and Basis for Costs)		
10. Developing Agency	VNIIGidrougol Institute	
11. Status of Development	4 units built in 1963	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Laptev Machine Construction Works
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	Bearings cooled & purged by pumps NS-301
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
	This coal pump (10UVRx2) is a modification of the coal pump 10UVLx2M differs by bearing support
24. Pertinent Reference Documents	1059, p. 74
25. Drawing(s)	1059, p. 75, fig. 42, p. 76, fig. 43
26. Photograph(s)	

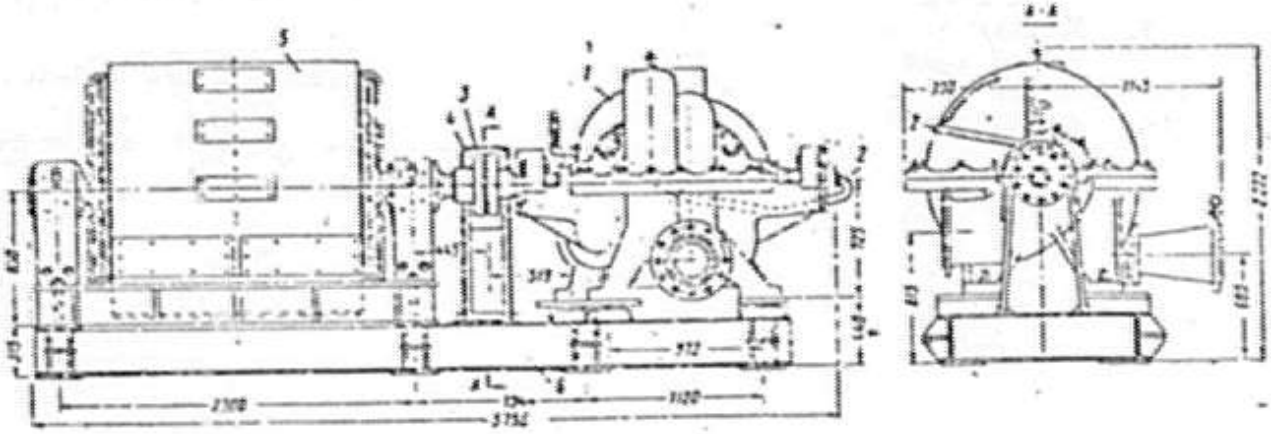


Fig.42. General view of the installation of the coal pump 10UVR x 2

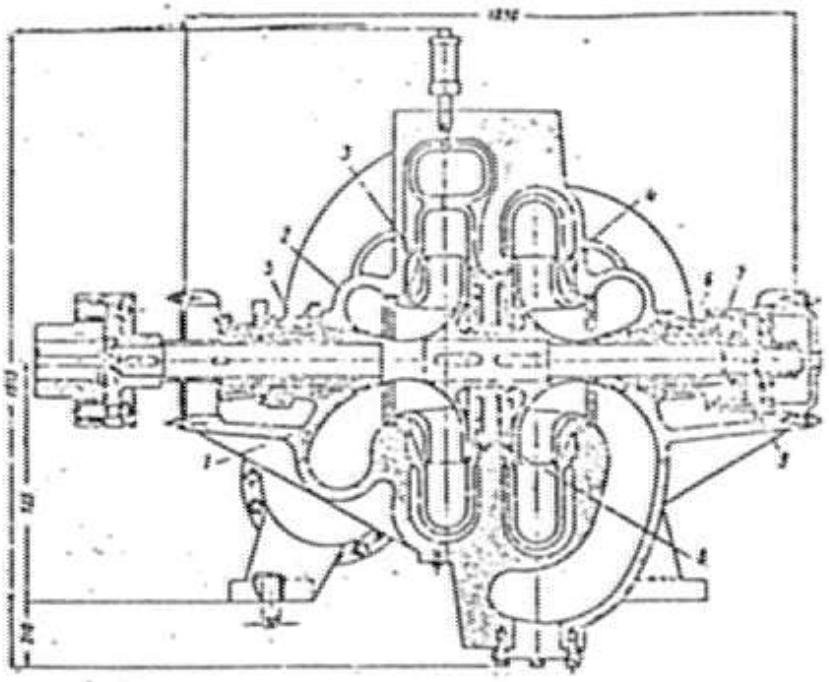


Fig.43. Coal pump 10UVRx2

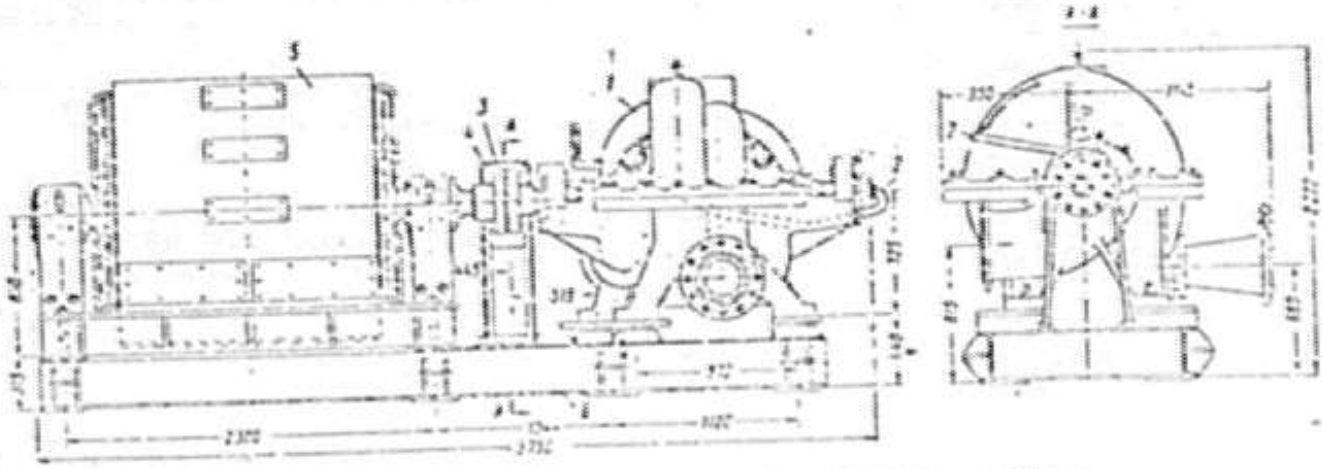


Fig.42. General view of the installation of the coal pump 10UVR x 2

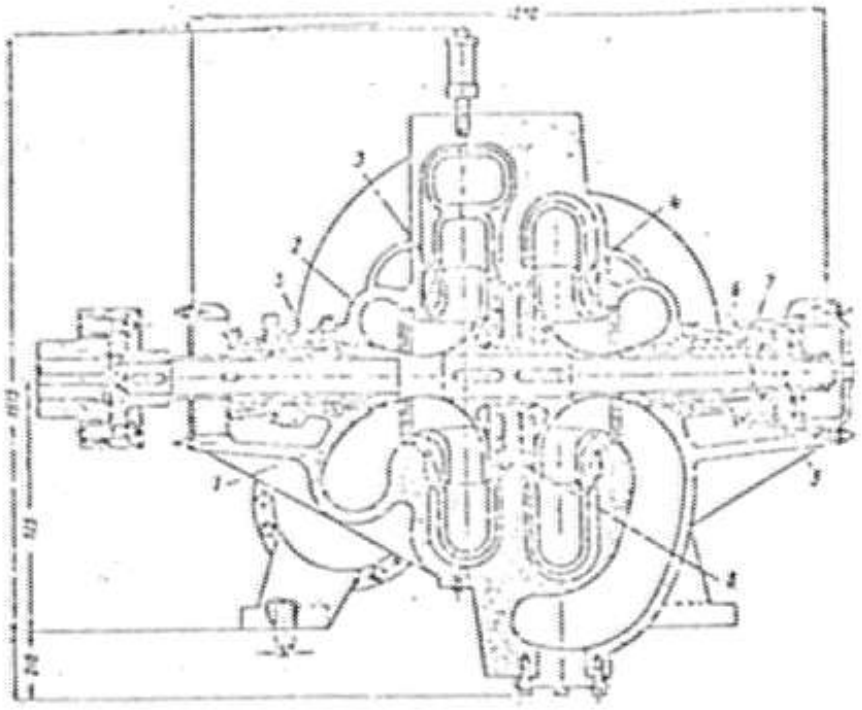


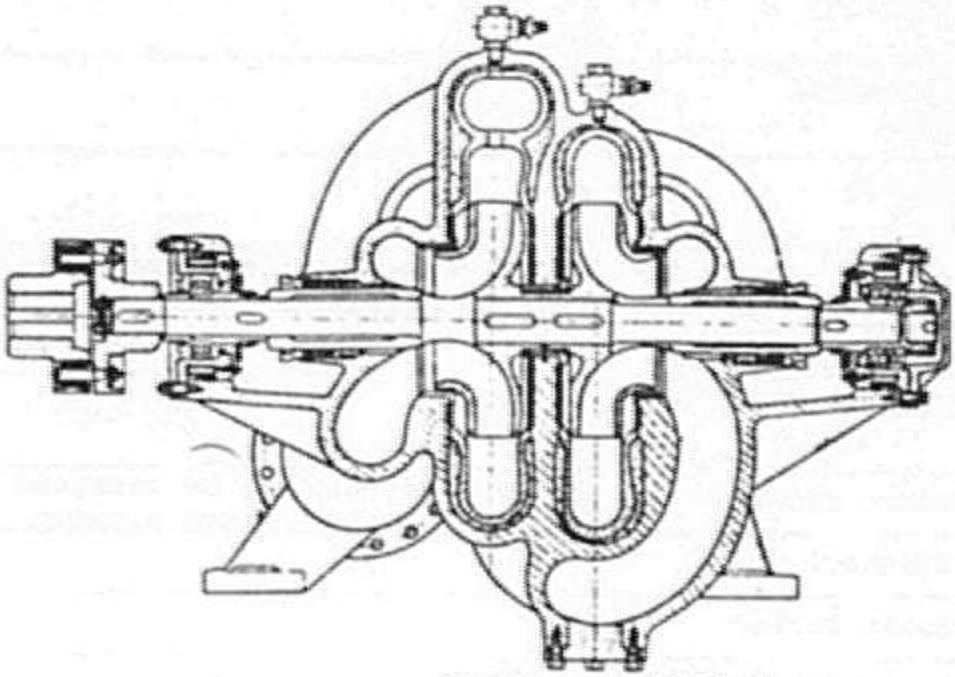
Fig.43. Coal pump 10UVRx2

DATA SHEET 5.11-16
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 10UVLx2M (10UVTx2M)	
B. Country of Origin	USSR	
C. Distinguishing Characteristics	2 stage centrifugal	
2. Function	Pump coal in mine and on the surface up to 8 km. Feed return water to monitors	
3. Designation of Mining Systems for which Applicable	Hydraulic hoist	
4. Major Components	Impeller diameter of 630 mm, housing, bearings, ports, shaft, clean-out ports	
5. Design Parameters		
6. Performance Parameters A. Input	1000 kw electric motor at 1450 rpm Suction pipe diameter 350 mm	
B. Output	800 m^3/hr at 250 m water head Pressure pipe diameter 300 mm	
C. Performance Capacity		
D. Efficiency		
E. Limiting Environmental and Coal Seam Conditions	Maximum particle passed 100 mm	
7. Size of Equipment A. Length	Coal Pump 2230 mm	Pump with Electric Motor on Base 4672 mm
B. Width	2045 mm	
C. Height	1705 mm	1895 mm
8. Weight of Equipment	6430 kg	
9. Cost (and Year of Cost Evaluation and Basis for Costs)		
10. Developing Agency		
11. Status of Development		

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Laptev and Bobrusk Machine Construction Works
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	Hard metal inserts at wear points, water cooled bearings, alloy impellers
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	Pump intervals may be serviced without removing electric motor & pipes
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
	May be used in series in 2 pump station. May also be used in series with coal pump 10U-12
24. Pertinent Reference Documents	1059, p. 7
25. Drawing(s)	1059, p. 72, fig. 39, p. 73, fig. 40, p. 74, fig. 41 ; 942, fig. 3
26. Photograph(s)	



10 UVT<2m (10UVL<2m)

Рис. 5. Углесос 10УВТх2м (10УВЛх2 м)

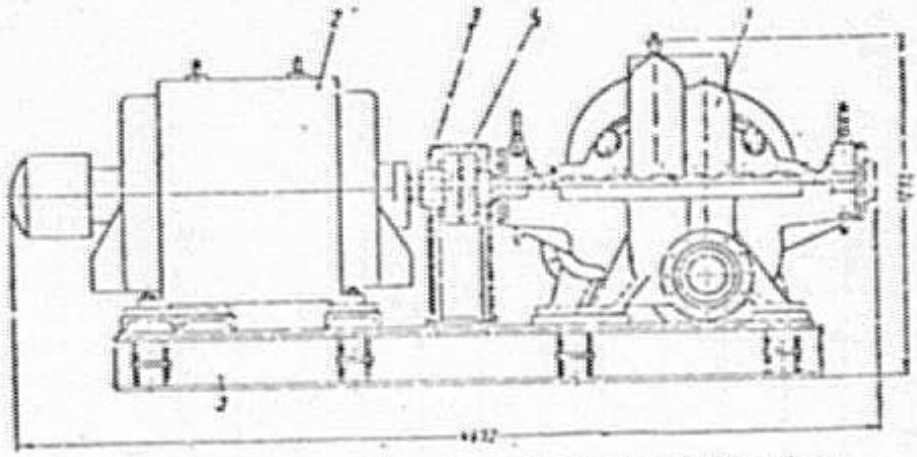


Fig.39. General view of the installation of the coal pump 10UVLx2M (10UVTx2M)

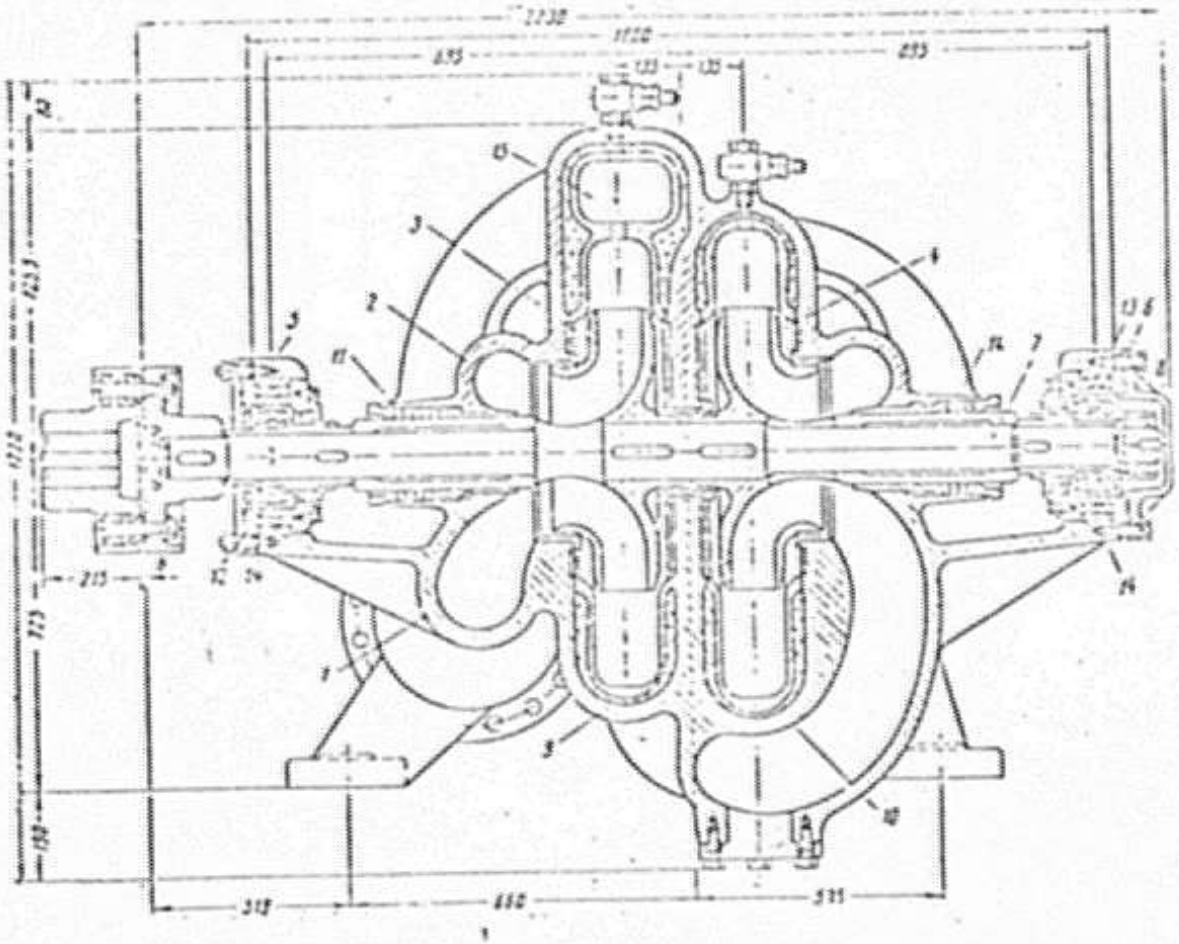


Fig.40. Coal pump 10UVLx2M

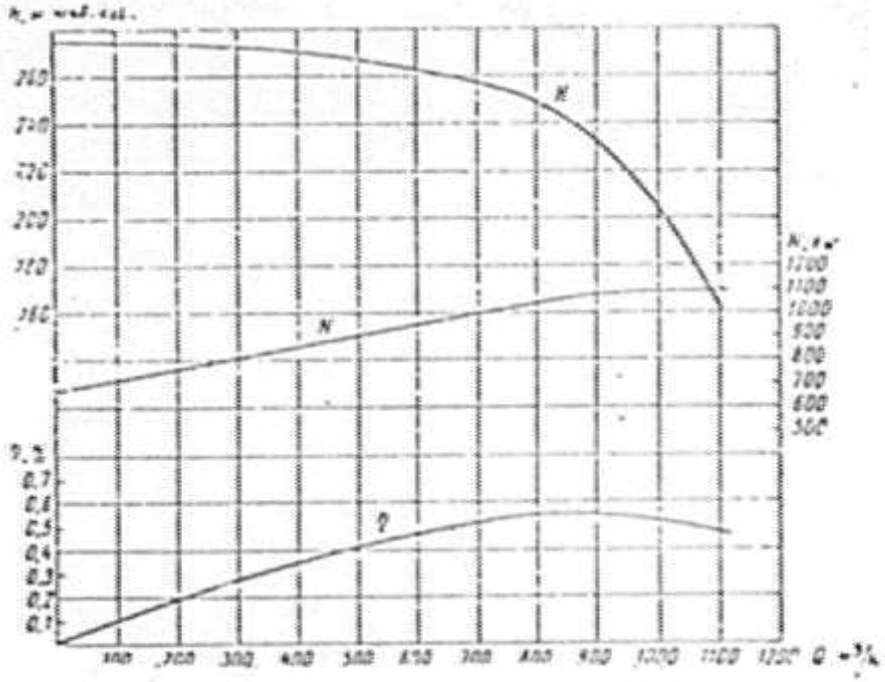


Fig.41. Performance of the coal pump 10UVLx2M

DATA SHEET 5.11-17
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 8USP-2
B. Country of Origin	USSR
C. Distinguishing Characteristics	Combination integrated unit consisting of vacuum pump, crusher, coal pump & electric motor
2. Function	Evacuate coal from face, crush & pump it. Also can be used during up-raise workings over thin seams driven in diagonal; and cleaning water headings
3. Designation of Mining Systems for which Applicable	Hydraulic haulage
4. Major Components	Impeller of 430 mm, housing, electric motor, stamp mill type crusher with 2 hammers, skid frame, shaft, quick split joints
5. Design Parameters	
6. Performance Parameters A. Input	50 kw electric motor of 990 RPM Suction diameter 200 mm
B. Output	150 m^3/hr at 30 m water head
C. Performance Capacity	Maximum particle size suction = 200 mm Maximum particle size out = 70 mm
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	2530 mm
B. Width	1000 mm
C. Height	1060 mm
8. Weight of Equipment	1640 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	VNIIGidrougol Institute
11. Status of Development	10 experimental units manufactured in 1962

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Laptev Machine Construction Works
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	Armored discs installed at wear points Crusher hammers of hard alloy
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	1059, p. 69
25. Drawing(s)	1059, p. 70, fig. 37; p..71, fig. 38
26. Photograph(s)	

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Reference 1059

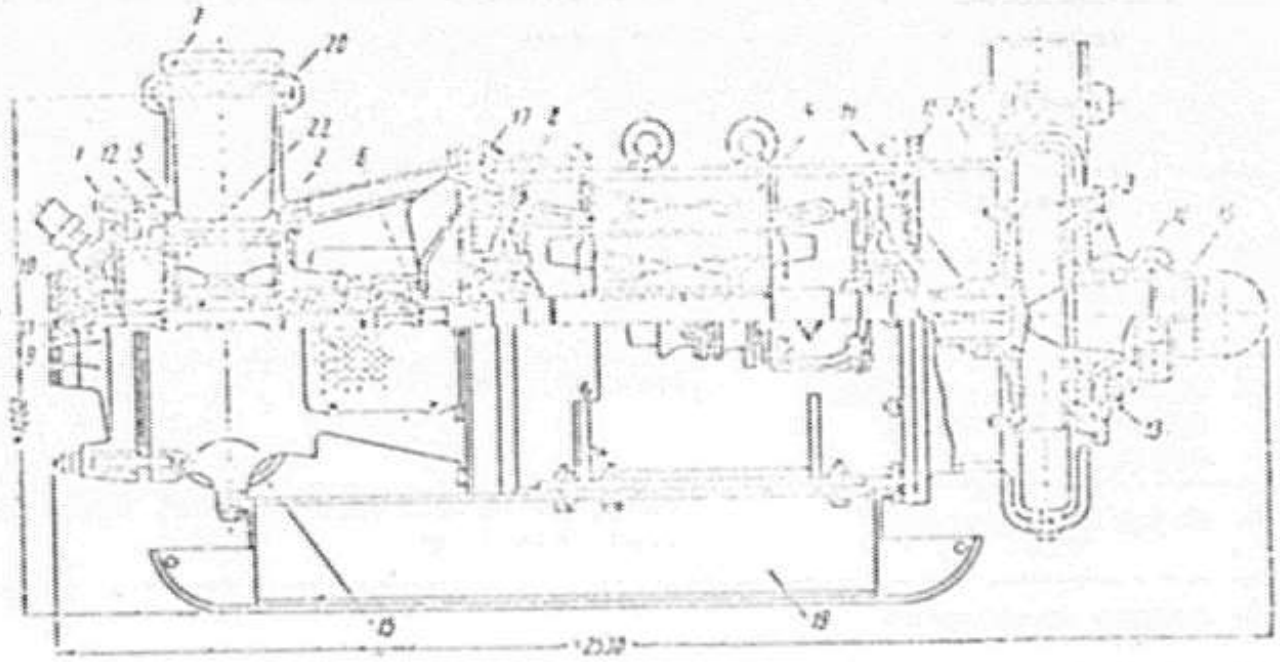


Fig. 37. Coal Pump 8USP-2

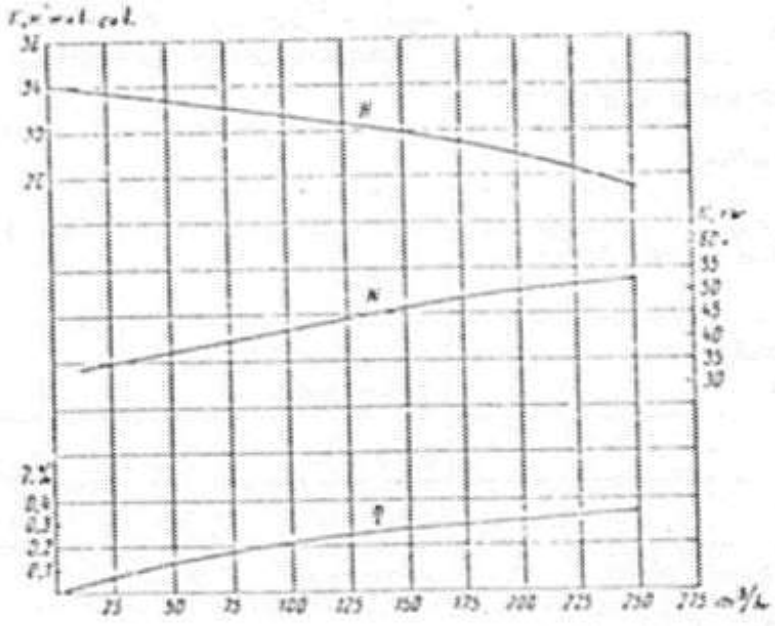


Fig. 38. Performance of the coal pump 8USP-2

DATA SHEET 5.11-18
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 6UVS
B. Country of Origin	USSR
C. Distinguishing Characteristics	Ring vortex type, centrifugal impeller
2. Function	Pump coal and rock
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Impeller of 600 mm diameter, frame, housing, shaft bearings
5. Design Parameters	
6. Performance Parameters A. Input	320 kw electric motor at 1480 rpm Suction pipe diameter 200 mm
B. Output	600 m^3/hr at 85 m water head Pressure pipe diameter 150 mm
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Maximum particle size passed 150 mm
7. Size of Equipment A. Length	1860 mm
B. Width	900 mm
C. Height	885 mm
8. Weight of Equipment	1172 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKrNIIGidrougol Institute
11. Status of Development	Experimental Industrial specimens built

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Antratsitov Machine Construction Works of Donetsk Sovnarkhoz
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	Gap between running wheel and rear tover adjustable
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	1059, p. 67
25. Drawing(s)	1059, p. 68, fig. 36
26. Photograph(s)	

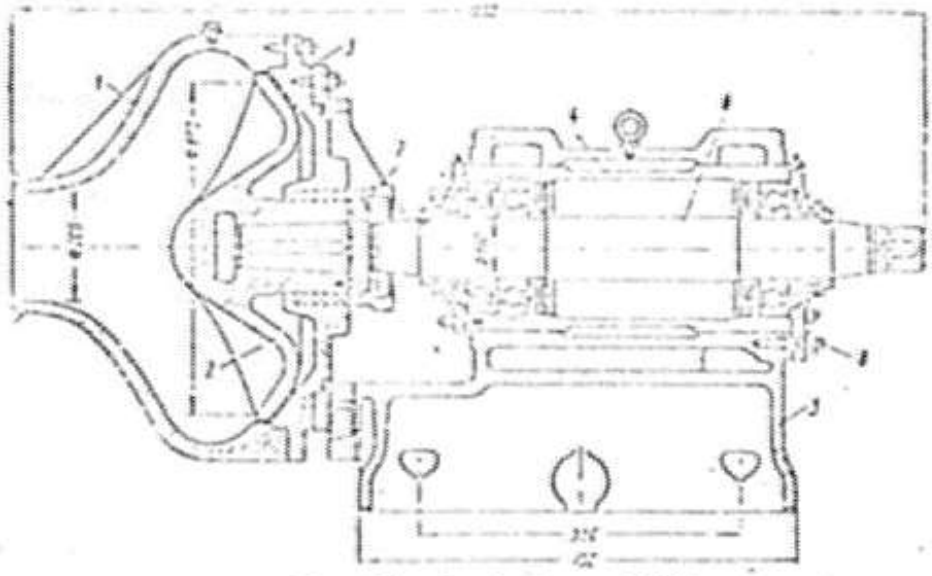


Fig.36. Coal Pump 6UVS

DATA SHEET 5.11-19
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump UVK-150	
B. Country of Origin	USSR	
C. Distinguishing Characteristics	Centrifugal	
2. Function	Pump coal in mine and on the surface to distance of 5.0-5.5 km without booster stations. Also to feed return water to monitors and for opening works in strip mines	
3. Designation of Mining Systems for which Applicable		
4. Major Components	Impeller of 700 mm diameter	
5. Design Parameters		
6. Performance Parameters A. Input	1000 kw electric motor at 1480 rpm Suction pipe diameter 300 mm	
B. Output	1400 mm^3/hr at 175 m waterhead Pressure pipe diameter 250 mm	
C. Performance Capacity		
D. Efficiency		
E. Limiting Environmental and Coal Seam Conditions	Maximum particle passed 100 mm	
7. Size of Equipment A. Length	Pump Only 1540 mm	Pump and electric Motor 3986 mm
B. Width	1250 mm	1510 mm
C. Height	1400 mm	1795 mm
8. Weight of Equipment	3000 kg	
9. Cost (and Year of Cost Evaluation and Basis for Costs)		
10. Developing Agency	VNIIGidrougol	
11. Status of Development	Two experimental units manufactured	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	Bobruysk Machine Construction Works
13.	Number of Units Manufactured (and Time Period)	Experimental series will be manufactured by the Lapter Machine Construction Works
14.	Using Agency	
15.	Designation of Mines where Used	
16.	Type of Control A. Input	
	B. Comments	
17.	Reliability	
18.	Safety	
19.	Major Causes of Failure	
20.	Maintenance Requirement	Pump internals can be removed without having to disconnect suction pipelines
21.	Major Overhaul	
22.	Replacement Period	All wearing parts are made from wear resistant material
23.	Comments on Suitability A. Advantages	
	B. Disadvantages	
		Pump is used also in 2 pump series on one level
24.	Pertinent Reference Documents	1059, p. 64
25.	Drawing(s)	1059, p. 65, fig. 33, 34, 35
26.	Photograph(s)	

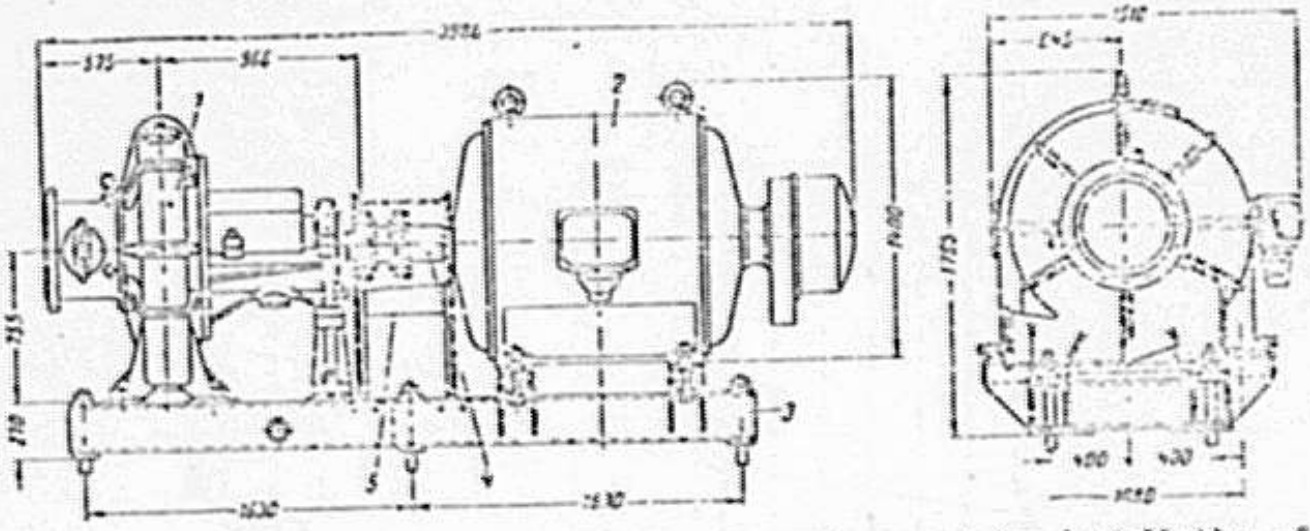


Fig. 33. General view of the installation of the coal pump UVK-150

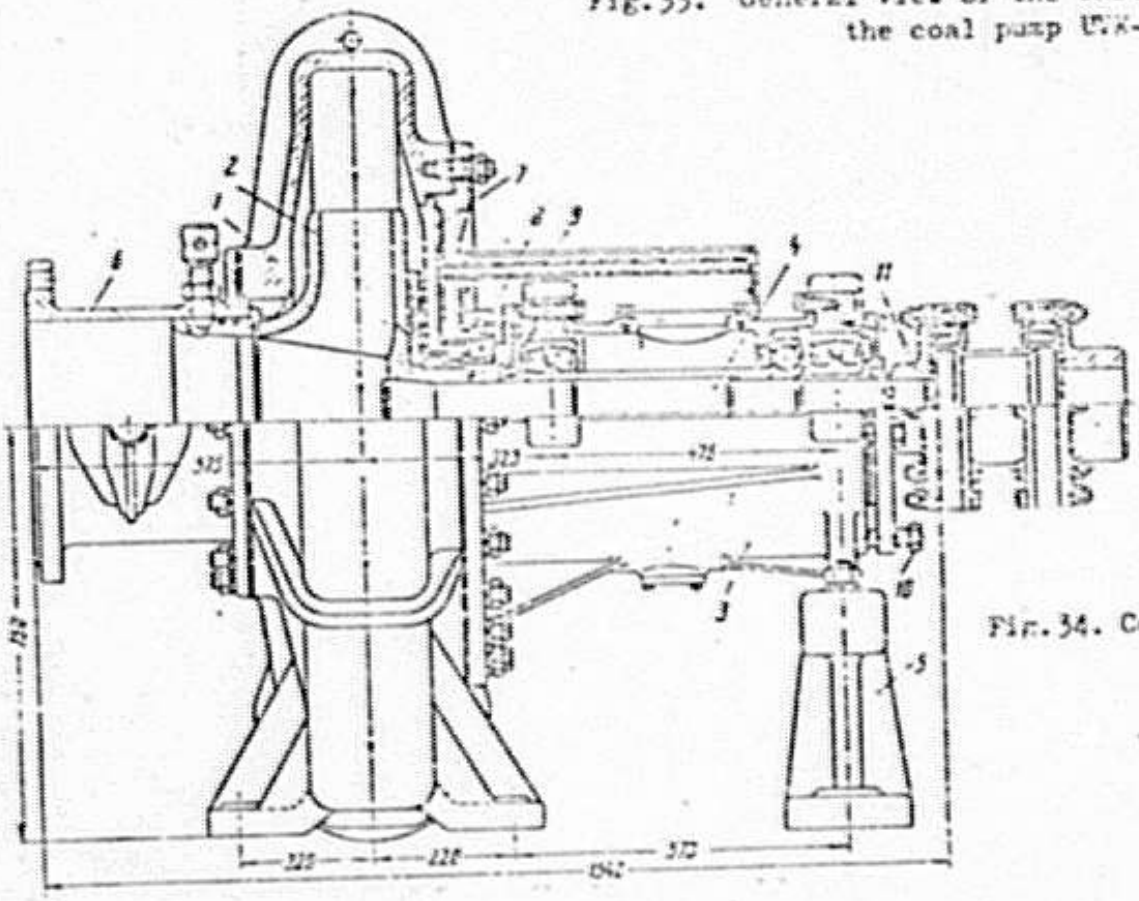


Fig. 34. Coal Pump UVK-150

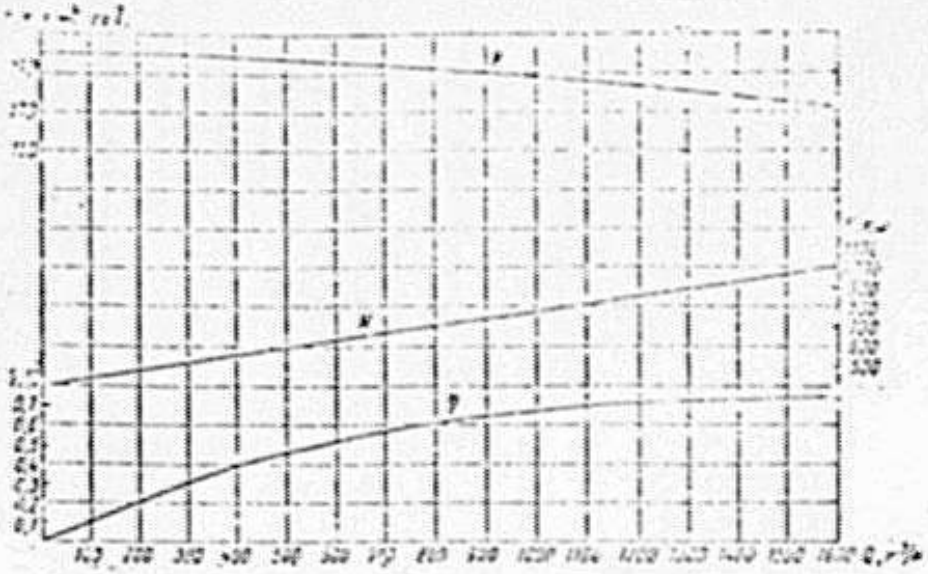


Fig. 35. Performance of the Coal Pump UVK-150

DATA SHEET 5.11-20
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 10U5	
B. Country of Origin	USSR	
C. Distinguishing Characteristics	Single stage centrifugal. Split housing to facilitate disassembly. Independently housed bearings	
2. Function	Pump coal and rock	
3. Designation of Mining Systems for which Applicable	Hydraulic hoist	
4. Major Components	Impeller of 690 mm diameter, frame, housing, shaft, bearings	
5. Design Parameters		
6. Performance Parameters A. Input	Feed 600 m^3/hr (2642 gpm); intake pipe size 250 mm; 1485 rpm electric motor of 630 kw power	
B. Output	Pressure pipe size 200 mm	
C. Performance Capacity	175 m head (575 ft)	
D. Efficiency	0.55	
E. Limiting Environmental and Coal Seam Conditions	Maximum particle size passed 100 mm	
7. Size of Equipment A. Length	Installation Pump & Motor 3.8 m	Pump Only 1.91 m
B. Width	1.65 m	1.1 m
C. Height	1.7 m	1.1 m
8. Weight of Equipment	3030 kg	1.8 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)		
10. Developing Agency	DonUGI	
11. Status of Development	1963 two experimental models built	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Laptev Machine Construction Works
13. Number of Units Manufactured (and Time Period)	Two prototypes
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	Adjustable end packing
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
	Comparable US pump - None
24. Pertinent Reference Documents	739, p. 32; 1059, p. 63
25. Drawing(s)	1059, p. 64, fig. 32
26. Photograph(s)	

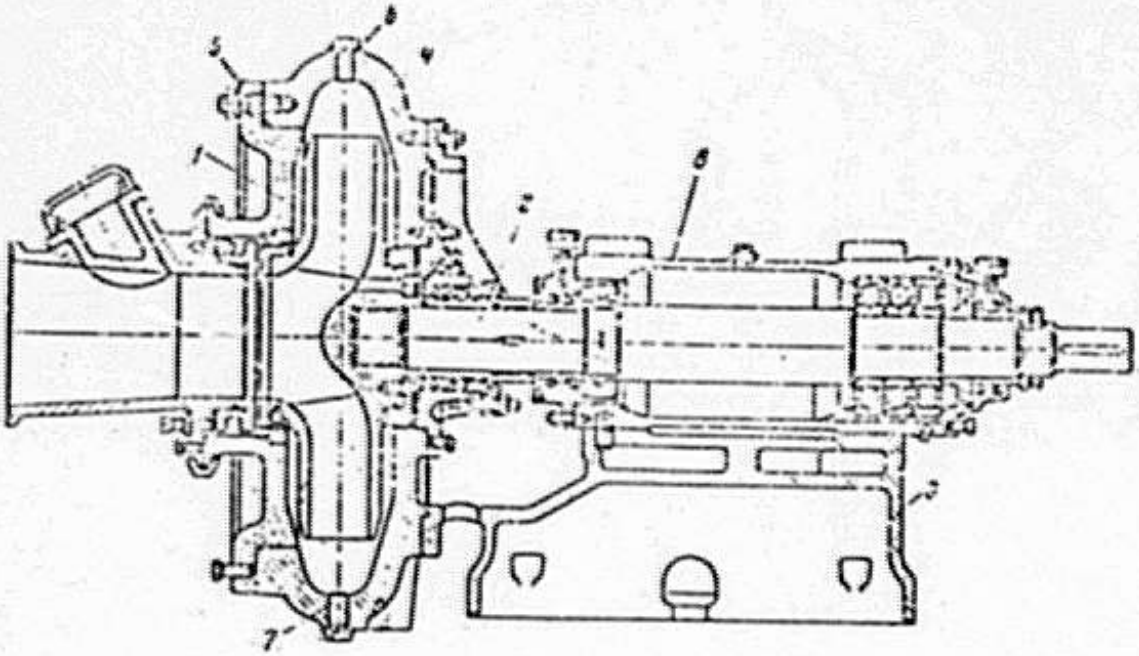


Fig. 32. Coal pump 10U-5

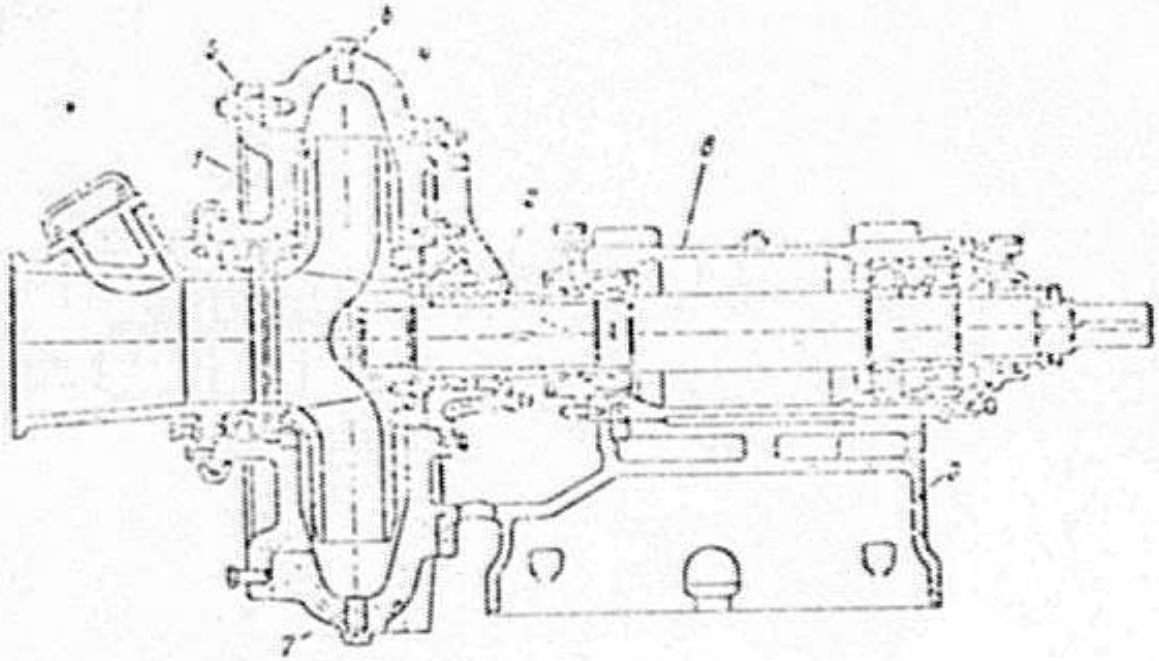


Fig.32. Coal pump 10U-5

DATA SHEET 5.11-21
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 10U-12
B. Country of Origin	USSR
C. Distinguishing Characteristics	Centrifugal
2. Function	Pump coal and rock
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Impeller of 480 mm diameter, housing, frame, shaft, bearings, clean out port
5. Design Parameters	
6. Performance Parameters A. Input	320 kw electric motor at 1450 rpm Intake pipe diameter 300 mm
B. Output	900 m^3/hr at 60 m water head Pressure pipe diameter 200 mm
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Maximum particle passed 100 mm
7. Size of Equipment A. Length	1868 mm
B. Width	850 mm
C. Height	880 mm
8. Weight of Equipment	1600 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Recommended for mass production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	Laptev Factory
13.	Number of Units Manufactured (and Time Period)	5 Experimental units built
14.	Using Agency	
15.	Designation of Mines where Used	
16.	Type of Control A. Input	
	B. Comments	
17.	Reliability	Parts subject to most abrasion made of wear resistant alloys
18.	Safety	
19.	Major Causes of Failure	
20.	Maintenance Requirement	
21.	Major Overhaul	
22.	Replacement Period	
23.	Comments on Suitability A. Advantages	
	B. Disadvantages	
		This coal Pump (10U-12) may be operated in series on the same level and also as the 1st stage in series with a 10UVLx2 coal pump
24.	Pertinent Reference Documents	1059, p. 61
25.	Drawing(s)	1059, p. 61a, fig. 29, 30, p. 62, fig. 31
26.	Photograph(s)	

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View A. Reference 1059

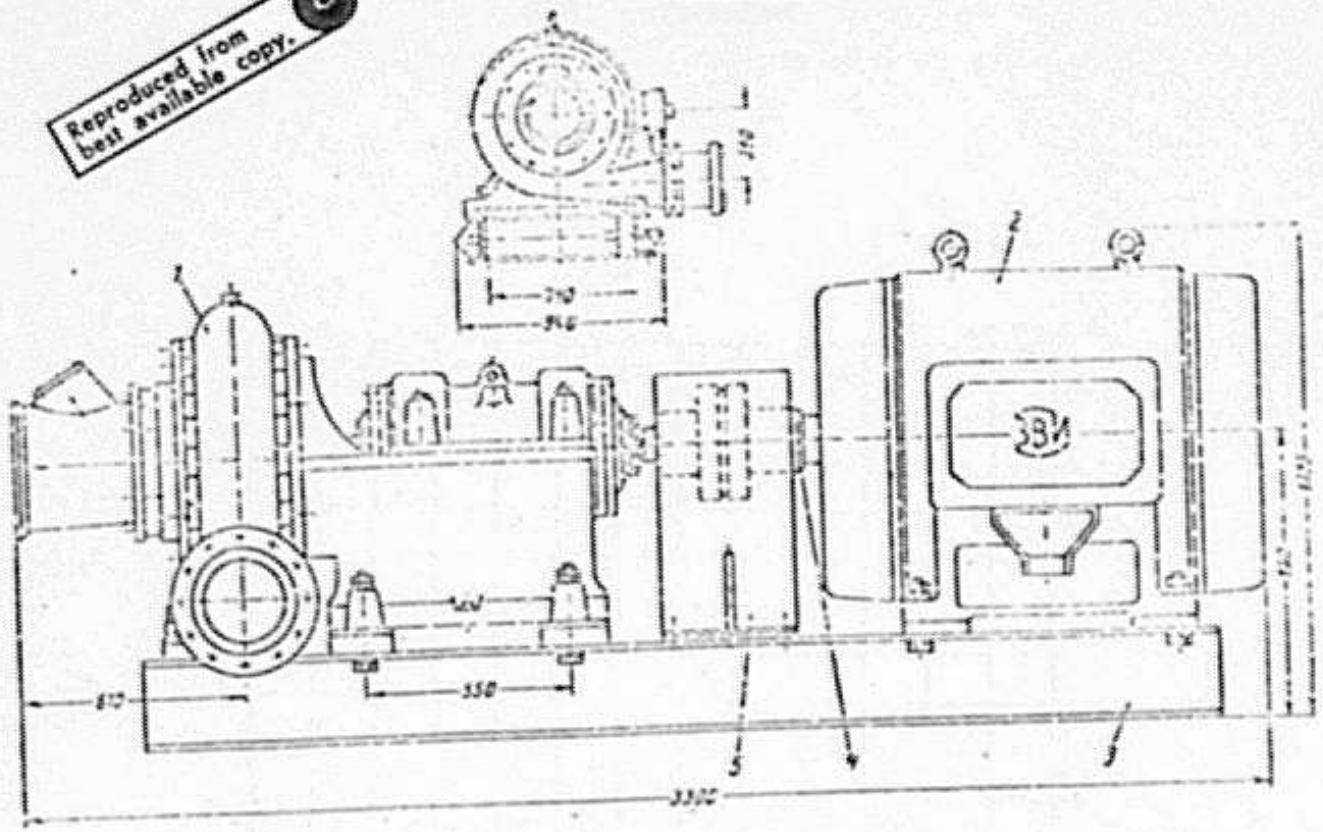


Fig.29. General view of the installation of the coal pump 10U-12

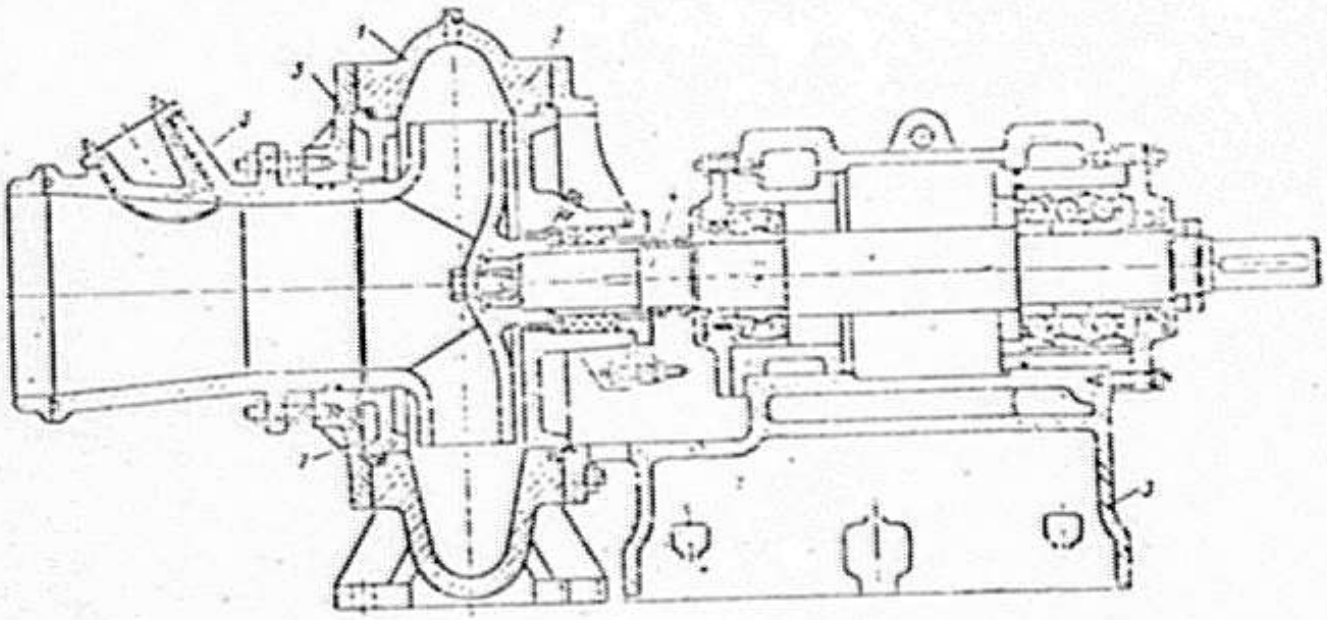


Fig.30. Coal pump 10U-12

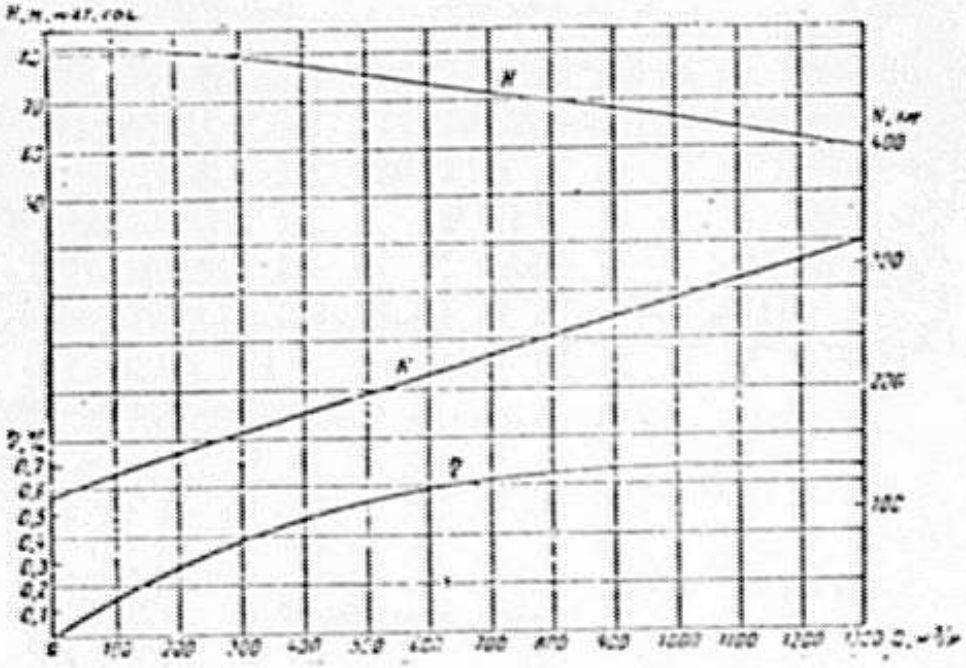


Fig.31. Operational Characteristics of the coal pump 10D-12

DATA SHEET 5.11-22
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 8UVD2
B. Country of Origin	USSR
C. Distinguishing Characteristics	Centrifugal
2. Function	Pump coal and rocks
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Frame, housing, impeller (620 mm dia), shaft, bearings, clean-out port, quick split joints, pressure and suction ports
5. Design Parameters	
6. Performance Parameters A. Input	320 kw electric motor, 1450 rpm Suction pipe diameter 250 mm
B. Output	350 m^3/hr at 120 m water head Pressure pipe diameter 200 mm
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Maximum particle size passed, 90 mm
7. Size of Equipment A. Length	1831 mm
B. Width	935 mm
C. Height	935 mm
8. Weight of Equipment	1495 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Manufactured since 1962

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Laptev Machine Construction Works
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20 Maintenance Requirement	Packing ring is manually squeazed every 20 to 25 hours by tightening bolts. Packing ring wear may be up to 20 mm
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.11-23
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 8SHNV
B. Country of Origin	USSR
C. Distinguishing Characteristics	Armor discs forward and rear, direction of rotation can be reversed with new impeller and rotating housing 180° around vertical
2. Function	Pump coal and rock
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Frame, impeller, housing, bearings, shaft, manometers
5. Design Parameters	Coal:Rock ratio 1:3 to 1:12
6. Performance Parameters A. Input	Maximum particle size passed 80 mm, electric motor drive of 250 kw, suction pipe diameter 200 mm
B. Output	540 m^3/hr, 84 m water head at 1450 rpm Pressure pipe diameter 150 mm
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	1625 mm
B. Width	1058 mm
C. Height	946 mm
8. Weight of Equipment	1430 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	OKsk District Sovrnarkhoz
11. Status of Development	Mass produced

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Laptev Machine Works
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	Hydro-abrasive wear resulting in great increase of electrical power and great decrease in slurry flow rate
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	270 hrs with standard material - 40xL;NV-188, 2000 hrs with experimental material - 300x 12m (no traces of wear)
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	739, p. 65, Table 17; 1059, p. 55
25. Drawing(s)	1059, p. 57, fig. 24, 25, 26
26. Photograph(s)	

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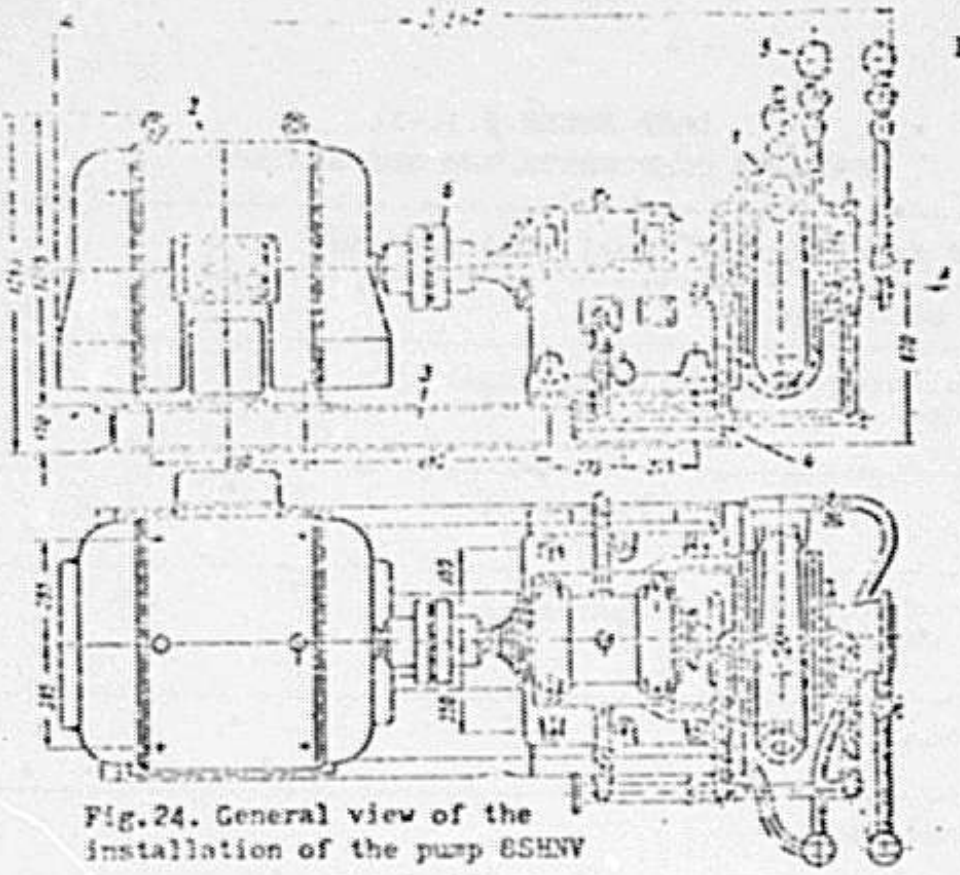


Fig.24. General view of the installation of the pump 8SHNV

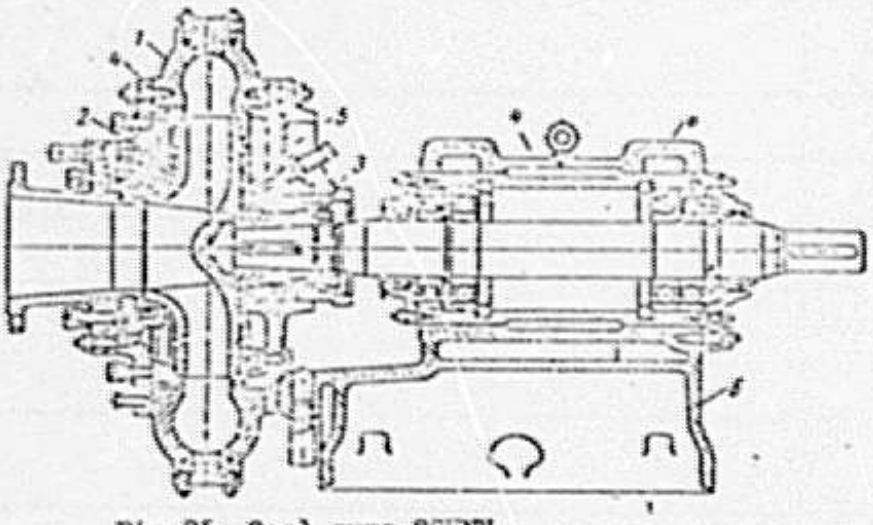


Fig.25. Coal pump 8SHNV

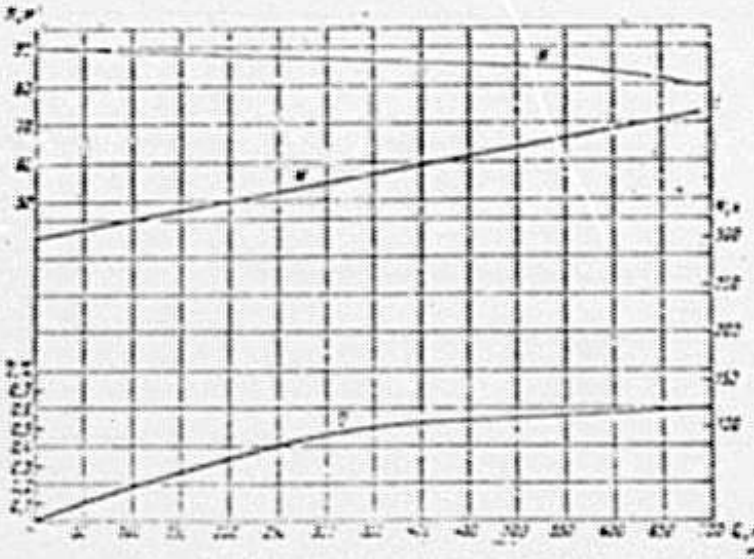


Fig. 26. Performance of the coal pump 8SHNV

DATA SHEET 5.11-24

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump SHN-150
B. Country of Origin	
C. Distinguishing Characteristics	Centrifugal
2. Function	Pump coal
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	
13.	Number of Units Manufactured (and Time Period)	
14.	Using Agency	
15.	Designation of Mines where Used	
16.	Type of Control A. Input	
	B. Comments	
17.	Reliability	
18.	Safety	
19.	Major Causes of Failure	Hydro-abrasive wear resulting in great increase of electric power and great decrease in slurry flow rate
20.	Maintenance Requirement	
21.	Major Overhaul	
22.	Replacement Period	Impeller - 124 hrs with "41xL" materials, 256 hrs with "300x12M" experimental material, Armor plates - forward & rear - 400 hrs with 40xL; NS-50 material (loss of 45% of mass) 408 hrs with 300-12M material (15% loss of mass) 582 hrs 300-12M material (with 7-25 mm wear)
23.	Comments on Suitability A. Advantages	
	B. Disadvantages	
24.	Pertinent Reference Documents	739, p. 65, table 17
25.	Drawing(s)	
26.	Photograph(s)	

TABLE 17

Machine	Parts	Material of the Parts		Lifetime of Parts, h	
		Serial	Experimental	Serial	Experimental
Coal Pump 10UVL x 2M	Parts of the rotor	ICH x98N2 with 2.2 - - 2.5 % C	300 x 12M	216	372 - 517
Coal Pump 8SIENV	Armor discs forward and rear	40 x L; NV-188	300 x 12M	270	Worked 2,000 hours and are still able to work 400 h, no traces of wear
Slime Pump SHN-150	Body (Frame)	—	300 x 12M	-	
	Running Wheel	41 x L	300 x 12M	124 Totally worn out	256 partially worn out
	Armor discs forward and rear	40 x L; NS-50	300 x 12M	400 with loss of 45% of the mass	408 with loss of 15% of the mass, and 502 wear: 7 - 25 mm
Centrifuge UTSM-2a	Conveyor spiral (?) (*)	Steel 40 x NC 50	300 x 12M	240 - 300 wear 45 - 60 mm	502 wear: 7 - 25 mm

(*) Precise translation of "vitki shneka" could not be found due to numerous senses of both words

DATA SHEET 5.11-25
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 14U7
B. Country of Origin	USSR
C. Distinguishing Characteristics	Single stage centrifugal with horizontal detachable frame from the pedestal
2. Function	Pump coal and mine water
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	Feed 1400 m^3/hr (6150 gpm), 1485 rpm electric motor of 1200 kw power
B. Output	
C. Performance Capacity	175 m head (574 ft)
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Coal to water ratio not over 1 to 5
7. Size of Equipment A. Length	5.02 m
B. Width	1.93 m
C. Height	1.9 m
8. Weight of Equipment	11,930 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Easy disassembly without removing pipeline or motor
B. Disadvantages	
24. Pertinent Reference Documents	739, p. 32, 1008R (not translated)
25. Drawing(s)	1008R, fig. 2
26. Photograph(s)	

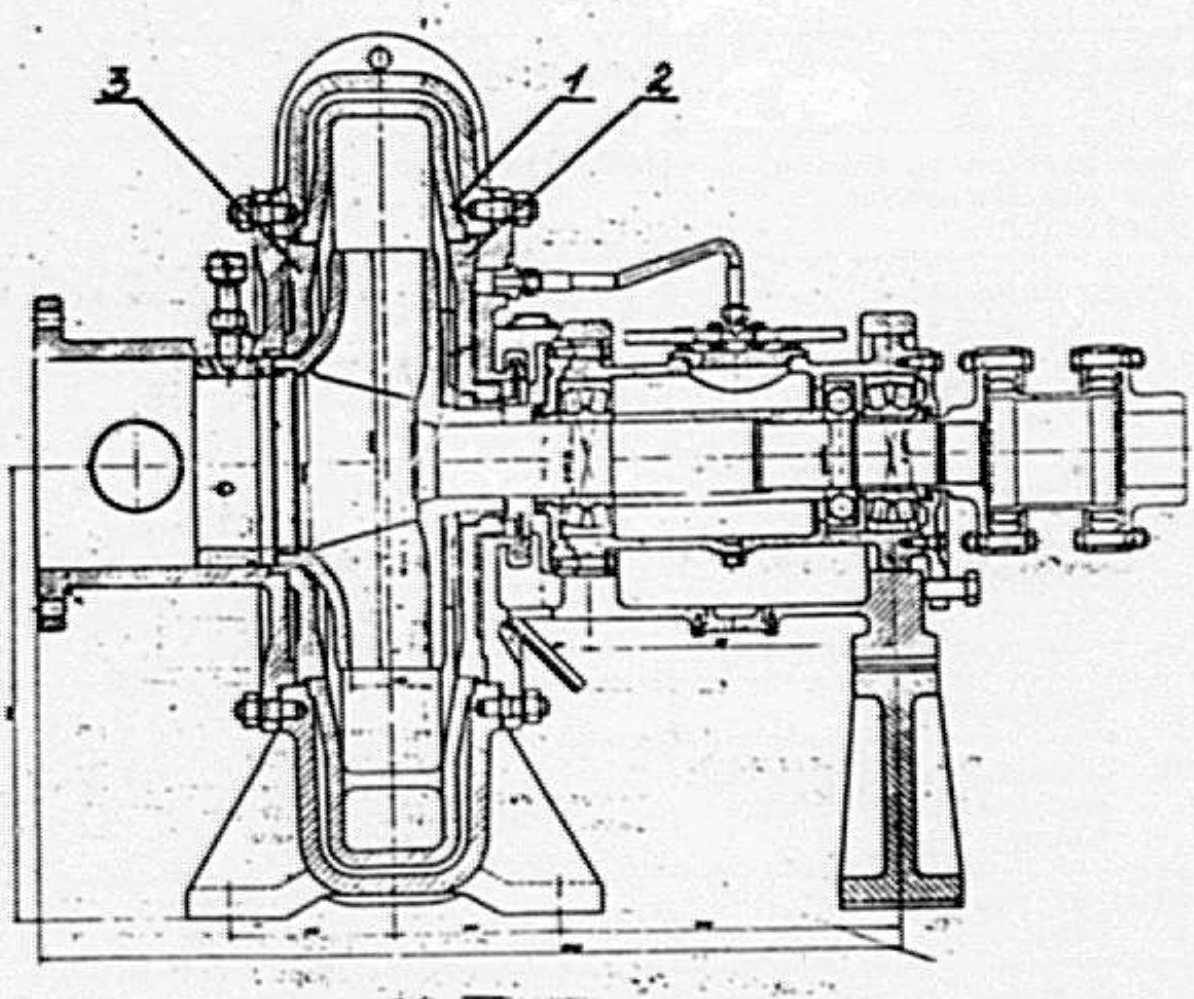


Рис. 2. Упасос типа 14У-7

PUMP 14U-7

DATA SHEET 5.11-26a

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump 10UVLX2M
B. Country of Origin	USSR
C. Distinguishing Characteristics	2 Stage Centrifugal
2. Function	Pump coal
3. Designation of Mining Systems for which Applicable	Hydraulic Hoist
4. Major Components	Frame, lining, impellers, packing rings, bushings, shaft
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKRNIIGidrougol and DonUGI Institutes
11. Status of Development	Mass produced

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Bokovskiy Mine Repair Plant
13. Number of Units Manufactured (and Time Period)	Mass produced
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	Parts of the rotor (impeller)
20. Maintenance Requirement	
21. Major Overhaul	Standard rotor material ICHx98N2; experimental rotor material 300x12m
22. Replacement Period	Standard material 216 hrs; experimental material 372-517 hrs
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	739, p. 65, table 17, p. 68, p. 33
25. Drawing(s)	739, p. 68, fig. 105
26. Photograph(s)	

Reference 739

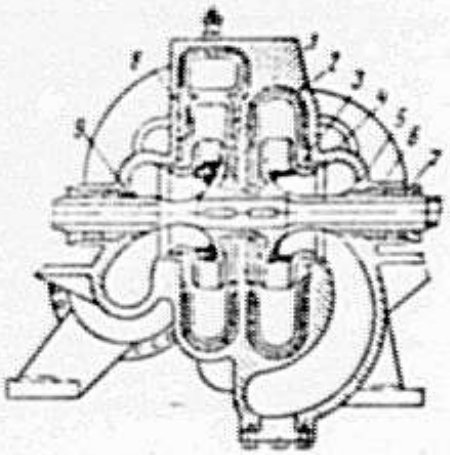


Fig. 105. Chart of Coal Pump 10UVLx 2m Wear

1) frame; 2) protector; 3) running wheel; 4) packing ring; 5) internal bushing; 6) external bushing; 7) packing; 8) intermediate bushing; 9) shaft

DATA SHEET 5.11-26b
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Slurry Pump 10YVLx2 (10YVTx2)
B. Country of Origin	USSR
C. Distinguishing Characteristics	
2. Function	Pump coal slurry
3. Designation of Mining Systems for which Applicable	Hard anthracite, hydraulic hoisting
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKrGIIGidrougol Institute and Don UGI
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Bokovskiy Ore-Servicing Plant
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Donbass
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	277, p. 34
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.11-27
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump, WP-200
B. Country of Origin	Poland
C. Distinguishing Characteristics	Centrifugal pump lined with metal inserts which are resistant to abrasive wear
2. Function	Slurry transportation
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Have two-channel rotors with large inside diameters
5. Design Parameters	Pump 0-3 mm particles of coal with water Pump 60 mm maximum particle size
6. Performance Parameters A. Input	170 kw
B. Output	6-8 m^3/min at 60-80 m head
C. Performance Capacity	tons/hr: 80 with 1:7 coal water ratio, 140 with 1:3 coal water ratio
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Operational

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	Parts subject to wear and tear can easily be replaced
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	646
25. Drawing(s)	646, p. 5, table 4, p. 7, table 8
26. Photograph(s)	

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Table 4

Type of pump	Working parameters		Power kw	Amount of slime transported (tons per hour) with ratio of solids to H_2O		Application
	Q cu m/min	H m H_2O		1:7	1:3	
PLP-150	3.5	40	38	40	70	slime transportation over short distances and to small heights
WP-200	6—8	80—60	170	80	140	slime transportation
WWB-200	6—8	230—150	525—1100	80	140	slime transportation over longer distances and to greater heights
OWB-200	4.5	300—730	370—920	50	90	slime transportation over long distances and to great heights

Table 5

Type of pump	Working parameters		Power kw	Maximum particle mm	Maximum amount of run-of-mine coal transported, (tons per hour) with a ratio 1:7
	Q cu m min	H m H_2O			
PLP-150	3.5	40	40	40	40
WP-200	6—8	80—60	170	60	80
WWB-200	6—8	230—150	525—1100	20	80
OWB-200	4.5	300—730	370—920	6	50

DATA SHEET 5.11-28
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump, WWB-200
B. Country of Origin	Poland
C. Distinguishing Characteristics	Pump lined with metal inserts which are resistant to abrasive wear
2. Function	Slurry transportation over longer distances and to greater heights than WP-200
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Multiple stage pump with symmetrical location of left and right hand rotors; pumps do not have rotor decks
5. Design Parameters	Pump 0-3 mm particles of coal with water Pump Maximum 20 mm particle size
6. Performance Parameters A. Input	525-1100 kw
B. Output	6-8 m^3/min with 230-450 m head
C. Performance Capacity	Tons/hr: 80 with 1:7 coal water ratio, 140 with 1:3 coal water ratio
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Operational

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	
13.	Number of Units Manufactured (and Time Period)	
14.	Using Agency	
15.	Designation of Mines where Used	
16.	Type of Control A. Input	
	B. Comments	
17.	Reliability	
18.	Safety	
19.	Major Causes of Failure	
20.	Maintenance Requirement	
21.	Major Overhaul	
22.	Replacement Period	Parts subject to wear and tear; can easily be replaced
23.	Comments on Suitability A. Advantages	
	B. Disadvantages	
24.	Pertinent Reference Documents	646
25.	Drawing(s)	646, p. 5, table 4, p. 7, table 8
26.	Photograph(s)	

Table 1

Type of pump	Working parameters		Power kw	Amount of slime transported (tons per hour) with ratio of solids to H_2O		Application
	Q cu m/min	H m H_2O		1 : 7	1 : 3	
PLP-150	3.5	40	38	40	70	slime transportation over short distances and to small heights
WP-200	6—8	80—60	170	80	140	slime transportation
WWB-200	6—8	230—450	525—1100	80	140	slime transportation over longer distances and to greater heights
OWB-200	4.5	300—780	370—920	50	90	slime transportation over long distances and to great heights

Table 2

Type of pump	Working parameters		Power kw	Maximum particle mm	Maximum amount of run-of-mine coal transported (tons per hour) with a ratio 1 : 7
	Q cu m/min	H m H_2O			
PLP-150	3.5	40	40	40	40
WP-200	6—8	80—60	170	60	80
WWB-200	6—8	230—450	525—1100	20	80
OWP-200	4.5	300—780	370—920	6	50

DATA SHEET 5.11-29
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump, PLP-150
B. Country of Origin	Poland
C. Distinguishing Characteristics	Pump lined with metal inserts which are resistant to abrasive wear
2. Function	Pump slurry (slime) or larger particles over short distances and to small heights
3. Designation of Mining Systems for which Applicable	
4. Major Components	Have two channel rotors with large inside diameters
5. Design Parameters	Pump 0-3 mm particles of coal with water Pump to 40 mm maximum particle size
6. Performance Parameters A. Input	38 kw as slurry pump; 40 kw for 40 mm size particles
B. Output	3.5 m^3/min at 40 ft head
C. Performance Capacity	Tons/hr transported: 40 with 1:1 coal to water ratio; 70 with 1:3 coal to water ratio
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Operational

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	Parts subject to wear and tear can easily be replaced
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	646
25. Drawing(s)	646, p. 5, table 4, p. 7, table 8
26. Photograph(s)	

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Reference 646

Table 4

Type of pump	Working parameters		Power kw	Amount of slime transported (tons per hour) with ratio of solids to H_2O		Application
	Q cu m min	N m H_2O		1:7	1:3	
PLP-150	3.5	40	38	40	70	slime transportation over short distances and to small heights
WP-200	6—8	80—60	170	80	140	slime transportation
WWB-200	6—8	230—450	525—1100	80	140	slime transportation over longer distances and to greater heights
OWB-200	4.5	300—780	370—920	50	90	slime transportation over long distances and to great heights

Table 5

Type of pump	Working parameters		Power kw	Maximum particle mm	Maximum amount of run-of-mine coal transported, tons per hour with a ratio 1:7
	Q cu m min	N m H_2O			
PLP-150	3.5	40	40	40	40
WP-200	6—8	80—60	170	60	80
WWB-200	6—8	230—450	525—1100	50	80
OWB-200	4.5	300—780	370—920	6	50

DATA SHEET 5.11-30
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump Slurry, OWB-200
B. Country of Origin	Poland
C. Distinguishing Characteristics	
2. Function	Slurry transportation over long distances and to great heights
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Symmetrical location of left and right hand rotors; pumps do not have rotor disks
5. Design Parameters	Pump 0-3 mm coal particles in water Pump maximum 6 mm particle size
6. Performance Parameters A. Input	370-920 kw
B. Output	4.5 m^3/min at 300-780 m head water
C. Performance Capacity	Tons/hr: 50 with 1:7 coal to water ratio; 190 with 1:3 coal to water ratio
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In operation prior to 1960

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	Parts subject to wear and tear can easily be replaced
23. Comments on Suitability A. Advantages	
B. Disadvantages	Pump lined with metal inserts which are resistant to abrasive wear
24. Pertinent Reference Documents	646
25. Drawing(s)	646, p. 5, table 4, p. 7, table 8
26. Photograph(s)	

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Reference 646

Table 4

Type of pump	Working parameters		Power kw	Amount of slime transported (tons per hour) with ratio of solids to H_2O		Application
	Q cu m/min	H m H_2O		1:7	1:3	
PtP-150	3.5	40	38	40	70	slime transportation over short distances and to small heights
WP-200	6—8	80—60	170	80	140	slime transportation
WWB-200	6—8	230—430	525—1100	80	140	slime transportation over longer distances and to greater heights
OWB-200	4.5	300—780	370—920	50	90	slime transportation over long distances and to great heights

Table 5

Type of pump	Working parameters		Power kw	Maximum particle mm	Maximum amount of run-of-mine coal transported (tons per hour) with a ratio 1:7
	Q cu m/min	H m H_2O			
PtP-150	3.5	40	40	40	70
WP-200	6—8	80—60	170	40	80
WWB-200	6—8	230—430	525—1100	30	60
OWB-200	4.5	300—780	370—920	6	50

DATA SHEET 5.11-31a
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump, Sigma NBB
B. Country of Origin	Czechoslovakia
C. Distinguishing Characteristics	
2. Function	Pump coal over long distance
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Maximum particle size 50 mm
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Ministry of Fuels
11. Status of Development	1958

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

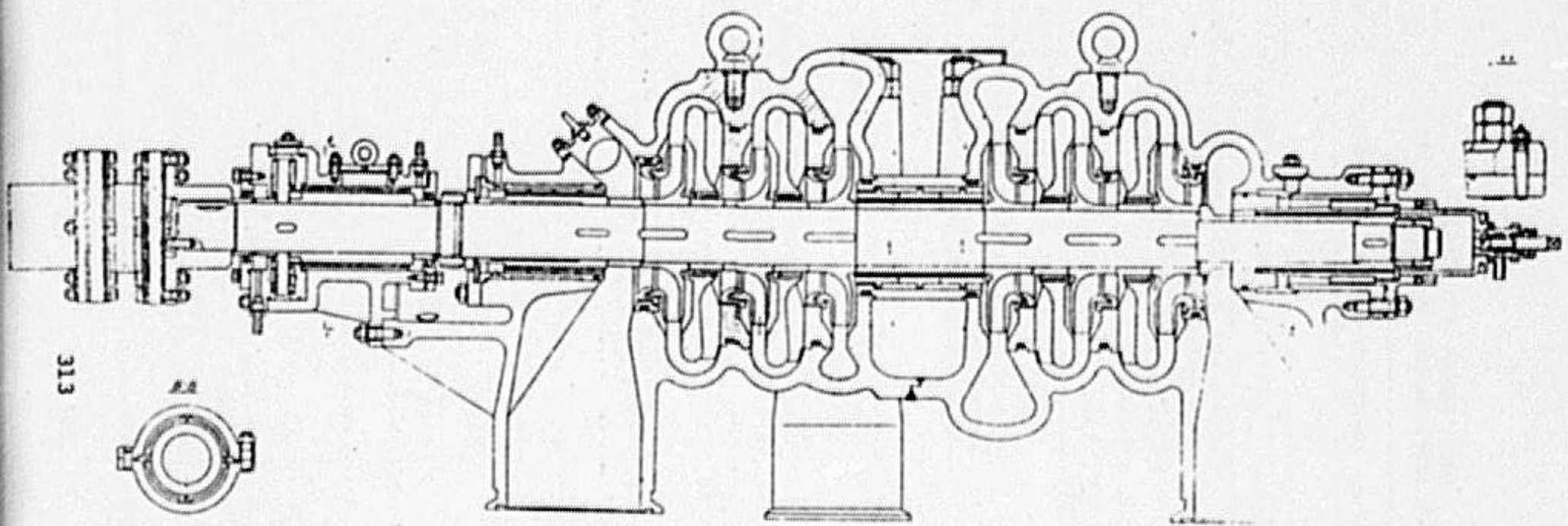
12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Institute for Pit Mechanisation (UDM) Prague
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	543, p. 10
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.11-31b
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Pump, 12NVG-2x6
B. Country of Origin	USSR
C. Distinguishing Characteristics	Double suction - 2 stage centrifugal
2. Function	Pump coal
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Rotor, impellers, casing
5. Design Parameters	Pressure: 12 MN/m^2 (120 kg/cm^2 or 1700 psi)
6. Performance Parameters A. Input	800 m^3/hr (2712 gpm) at 1200 m of water head
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	VNIIGidrougol
11. Status of Development	Developed prior to 1968

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	1008R (Not Translated)
25. Drawing(s)	1008R, fig. 1
26. Photograph(s)	



Par. 1, Hasse 12HBF-3x8

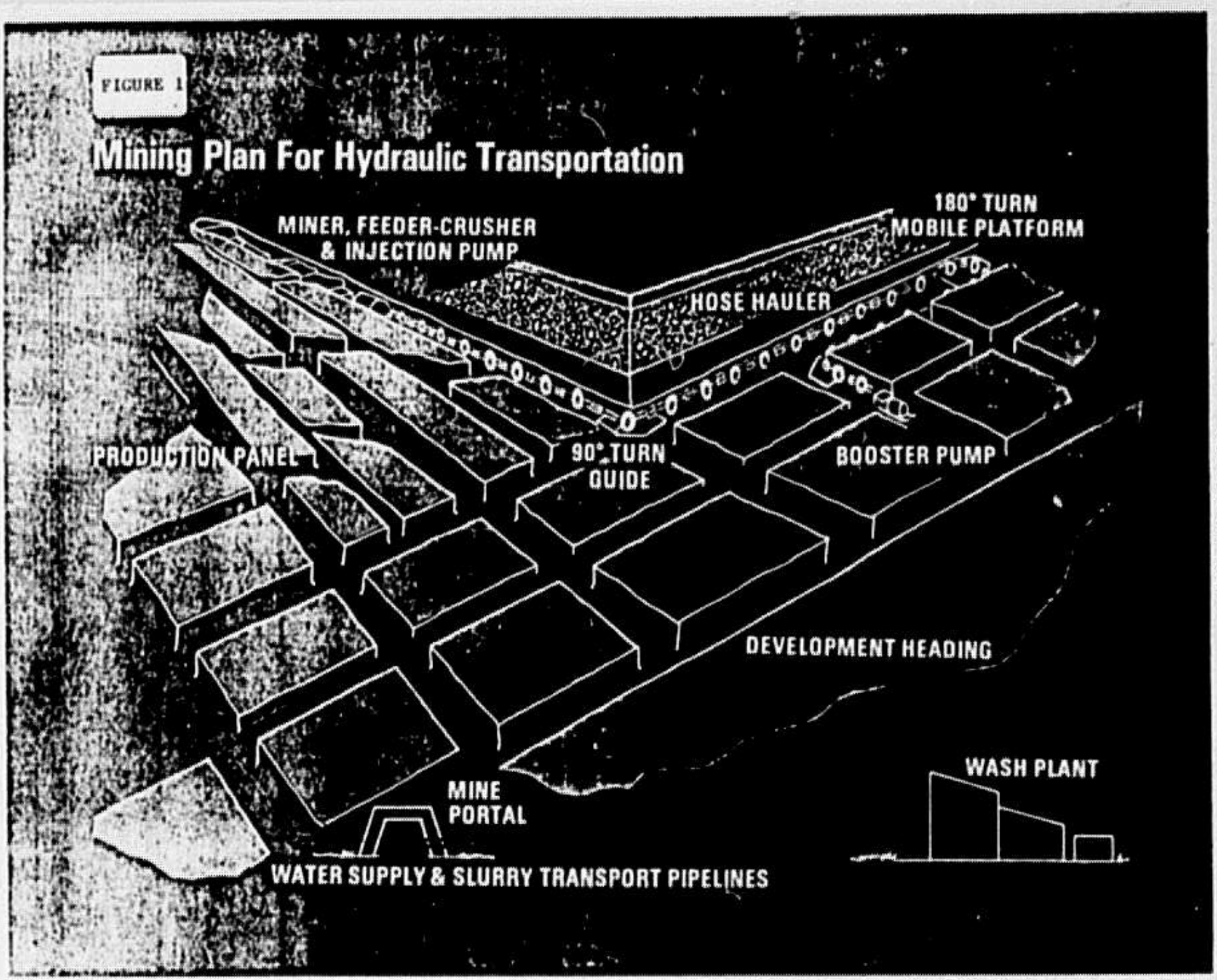
PUMP 12NVG - 2X6

DATA SHEET 5.12.1-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hydraulic Haulage System - Consol
B. Country of Origin	USA
C. Distinguishing Characteristics	Injection pump slurrifier unit
2. Function	Unitized crawler mounted slurrifier pump to mix coal from continuous miner (larger lumps crushed on miner) with water & pump through 10" flex line to underground collection point
3. Designation of Mining Systems for which Applicable	Hydraulic haulage
4. Major Components	Frame, crawler tracks, controls & stationary electric motor, vertical shaft, top intake centrifugal coal pump, receiving hopper, bevel gears, 10" slurry hose, water & electricity connections, hose handling dollies
5. Design Parameters	
6. Performance Parameters A. Input	Electric motor 260 kw (350 hp); coal at 5.3 tons/min.
B. Output	Coal slurry flow 3000 gpm - 38% coal by wt., discharge pressure at pump for above = 60 psi
C. Performance Capacity	5000 gpm at 100 ft head with 1:1 mixture
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Machine height for use in 60 in. high seam
7. Size of Equipment A. Length	30 ft
B. Width	12 ft
C. Height	4 ft
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Consol
11. Status of Development	Development 1965, units in use 1973

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Consol with pump manufactured by Lawrence Pumps, Inc.
13. Number of Units Manufactured (and Time Period)	Experimental Units
14. Using Agency	Consol
15. Designation of Mines where Used	Robinson Run Mine of Mountaineer Coal Company
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	Much better than shuttle cars; reduces fire and explosion hazards, haulage accidents, roof fall hazards, and airborne dust concentrations
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Single mode transportation of coal from face to preparation plant
B. Disadvantages	
24. Pertinent Reference Documents	550; 521; 1027
25. Drawing(s)	521, fig. 1 to 5; 1027, fig. 1-5
26. Photograph(s)	


FIGURE 1
Mining Plan For Hydraulic Transportation
MINER, FEEDER-CRUSHER & INJECTION PUMP
180° TURN MOBILE PLATFORM
HOSE HAULER
PRODUCTION PANEL
90° TURN GUIDE
BOOSTER PUMP
DEVELOPMENT HEADING
WASH PLANT
MINE PORTAL
WATER SUPPLY & SLURRY TRANSPORT PIPELINES

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Figure 2. Hose Hauler Vehicle Prototype Used in Development Test

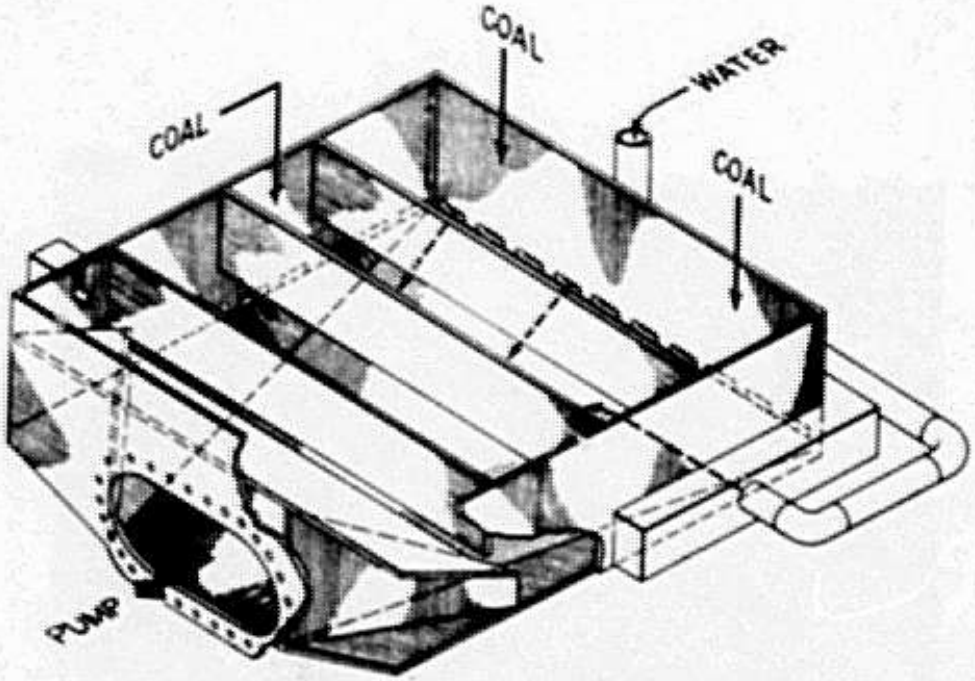


Figure 3. Mixing Hopper to Receive Coal and Move the Resulting Slurry into the Pump

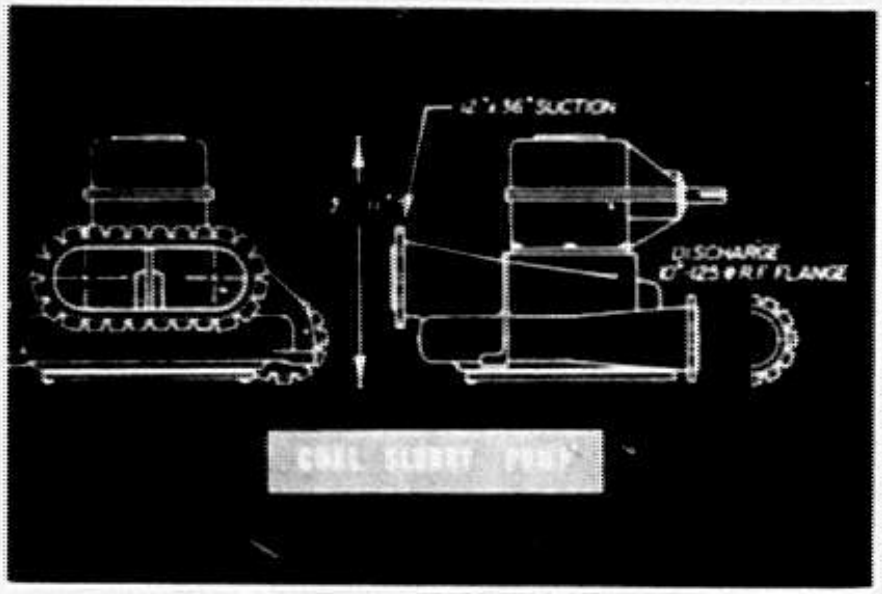


Figure 4. Coal Slurry Pump



Figure 5. First Generation Pump Vehicle

DATA SHEET 5.12.2-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Air'ift Hydraulic Hoist
B. Country of Origin	USSR
C. Distinguishing Characteristics	Injects compressed air into slurry pipe to lower density and permit gravity flow from deep sump
2. Function	Hoist coal slurry or water from mine
3. Designation of Mining Systems for which Applicable	
4. Major Components	Deep sump, slurry pipe, air mixer
5. Design Parameters	Sump depth = 20-50% of lift height (see 739, p. 44)
6. Performance Parameters A. Input	Air pressure at 12 kg/cm^2
B. Output	Flow rate to 300 m^3/hr
C. Performance Capacity	380 m lift to 725 m lift (3 stages
D. Efficiency	Consumes 1.5 to 1.8 times more power than coal pump hoisting
E. Limiting Environmental and Coal Seam Conditions	Shaft must be deepened for slurry sump; lift height up to 300 m in one stage; when combined with coal pump can lift to 600-700 m
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	All components mass produced, except slurry valve

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	3 custom systems
14. Using Agency	Donbass and Lugansk District
15. Designation of Mines where Used	# 7 Belyanka, Yuzhnaya, # 2 Krasnoarmeyskaya
16. Type of Control A. Input	
B. Comments	Flow rate easily regulated
17. Reliability	High
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Simple and reliable, easy to control
B. Disadvantages	Low efficiency and requires shaft to be deepened by 20-50% of the lift height per stage
24. Pertinent Reference Documents	735, p. 2; 739, p. 44; 277, p. 34; 502; 158
25. Drawing(s)	739, p. 43
26. Photograph(s)	

Reference 739

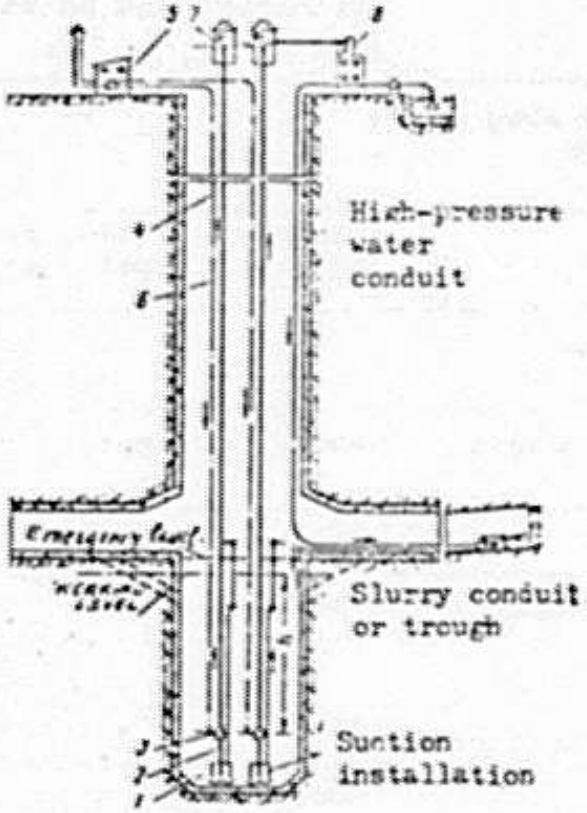


Fig. 13
Scheme of the Air-lift Hydraulic
Hoisting (Ch.II)

DATA SHEET 5.12.3-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Jet pump Coal Feeder (Hydraulic-Elevator)
B. Country of Origin	USSR
C. Distinguishing Characteristics	Jet pump hoist with integral crusher
2. Function	Transport and hoist rock (small height)
3. Designation of Mining Systems for which Applicable	
4. Major Components	Crusher, grates, bunker, mixing chamber, slurry circuit, jet pump
5. Design Parameters	
6. Performance Parameters A. Input	Water consumption 80 m^3/hr
B. Output	Pressure head of water = 4 m
C. Performance Capacity	Rock transport = 15 m^3/hr
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Pressure of working liquid must be 2 to 2 1/2 times greater than height of slurry hoisting, or of use of muddy water
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In use

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Mine # 1 and 2, "Novo-Glubokaya" in the Donbass
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Light weight, reliable, no moving parts due to usage of jet pump
B. Disadvantages	Low efficiency (0.2); high consumption of pressure water, settling and circulatory basins required, filters required
24. Pertinent Reference Documents	739, p. 37
25. Drawing(s)	739, p. 38, fig. 96
26. Photograph(s)	

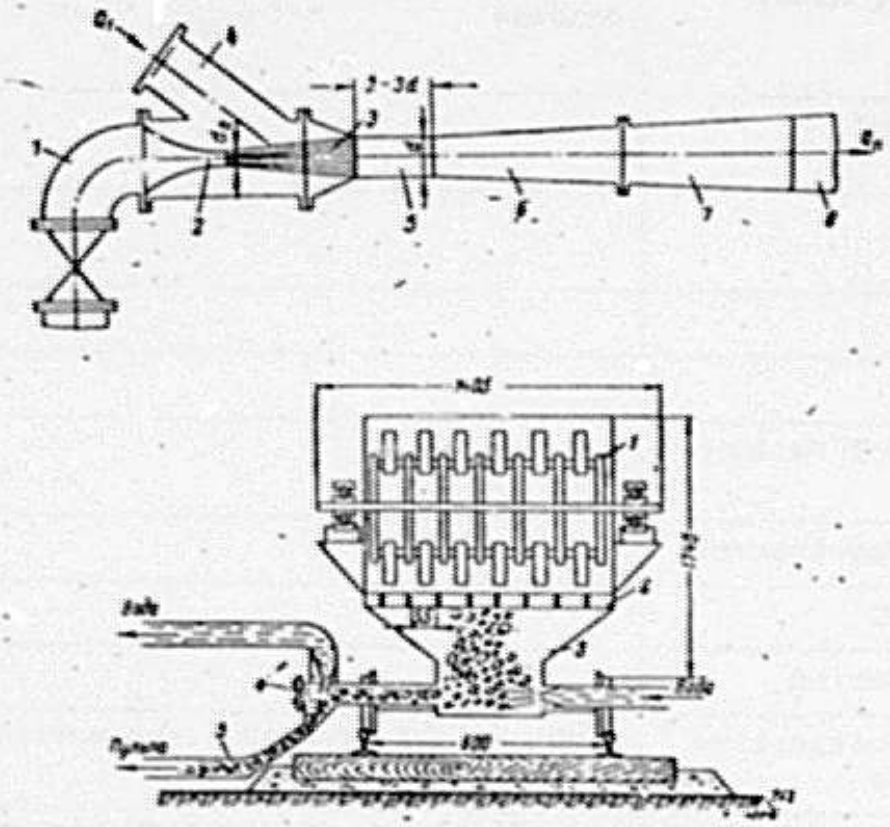


Figure 96. Jet Pump

From Reference 739, page 38

DATA SHEET 5.12.4-1
DATA ON COMPONENTS AND SUB-SYSTEMS

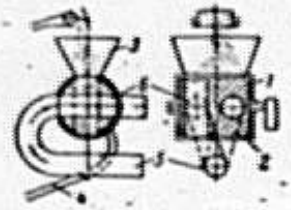
1. A. Name and Model Number	Coal Feeders, Rotary and Screw Types
B. Country of Origin	USSR
C. Distinguishing Characteristics	Rotary pocket drum, rotary plug valve and screw feeders (UPSh-1)
2. Function	Feed dry coal into slurry pipeline
3. Designation of Mining Systems for which Applicable	Hydraulic haulage
4. Major Components	Rotary drum, plug valve or screw
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	Wear of moving parts
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Screw feeder is simple, compact and continuous
B. Disadvantages	High power required, water losses of rotary types, blow out of coal plug with screw type
24. Pertinent Reference Documents	739, p. 38-41; 1059, p. 45-46 (for UPSh-1)
25. Drawing(s)	739, p. 40; 1059, p. 46
26. Photograph(s)	



B. Rotary Pocket Drum Feeder



A. Rotary Plug Valve Feeder

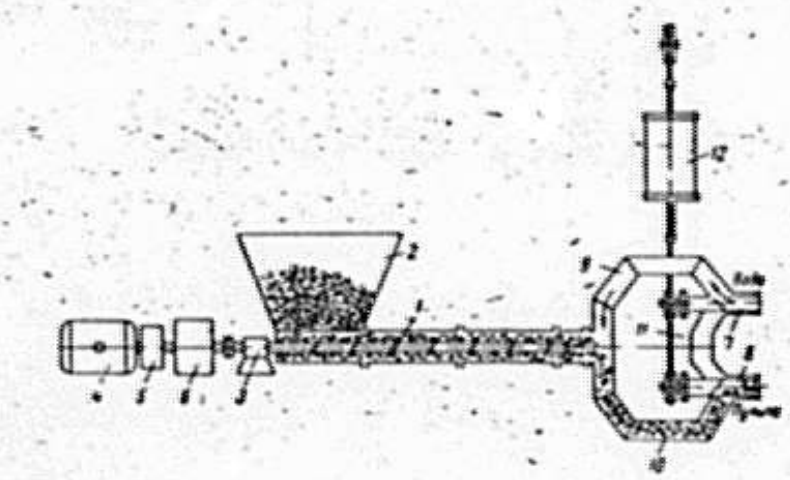


Figure 98. Screw Feeder

All of Above From Reference 739, page 40

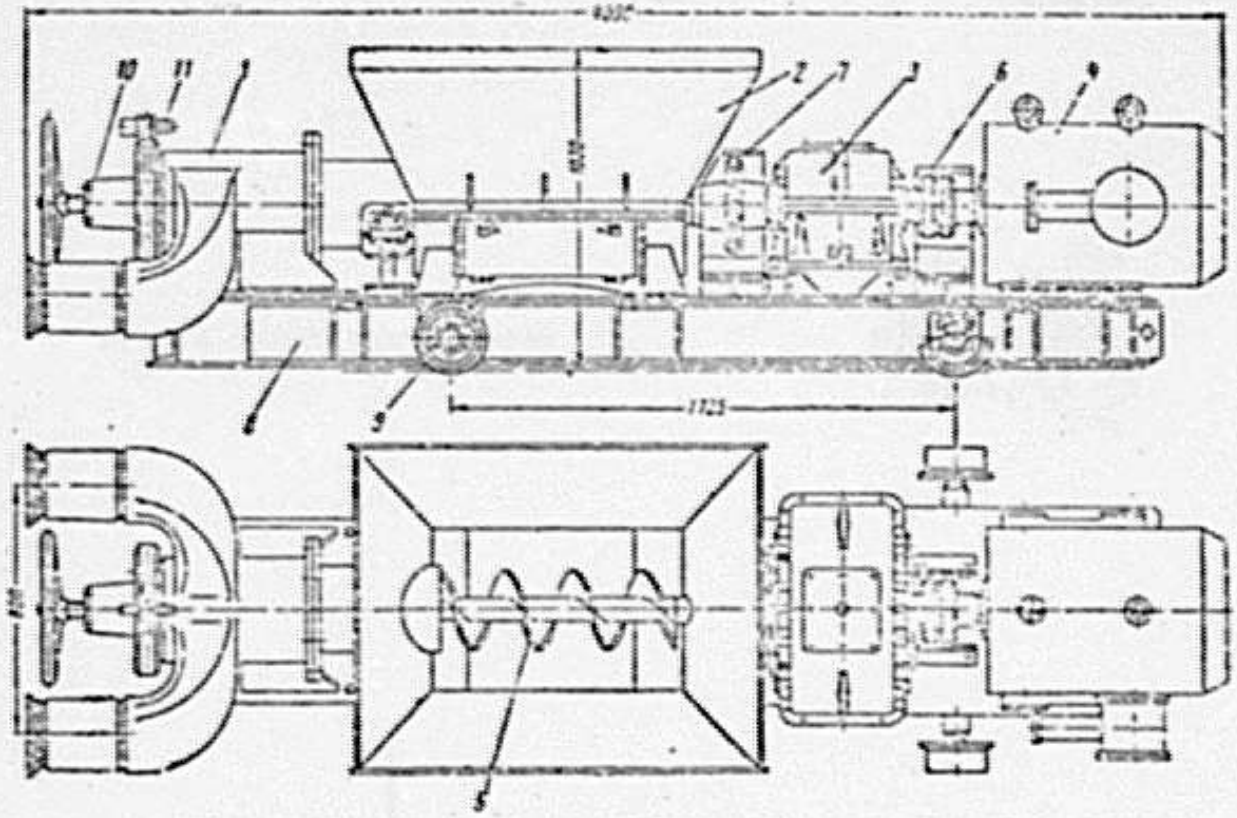


Fig.18. Section screw feeder UPSH-1

DATA SHEET 5.12.5-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Universal Bin Feeder - UBP
B. Country of Origin	USSR
C. Distinguishing Characteristics	Large bin feeder
2. Function	Feed coal and/or rock to pressure pipeline
3. Designation of Mining Systems for which Applicable	
4. Major Components	12 chambers, capacity 125 m^3 each
5. Design Parameters	
6. Performance Parameters A. Input	Operating pressure 64, m head water, hydraulic drive
B. Output	Production rate, slurry, 4000 m^3/hr
C. Performance Capacity	400 tons/day coal; 5100 tons/day mine cuttings
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	DonUGI with Dongiproshakht
11. Status of Development	In use

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Hydromine # 1 "Krasnoarmeyskaya" in Donbass
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Large amount of material can be loaded at one time
B. Disadvantages	Chambers cannot be used at high pressures
24. Pertinent Reference Documents	739, p. 42, 43
25. Drawing(s)	739, table 10
26. Photograph(s)	

Reference 739

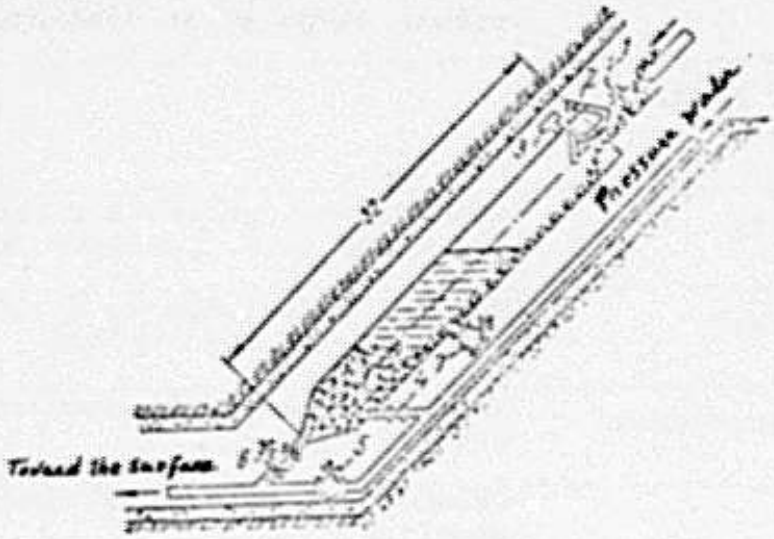


Fig.99. Bin-Feeder

1) gate valve; 2) valve; 3) air escape valve or vent; 4), 5), 6) gates regulating the chamber washout during loading; 7) drain pipe gate valve

DATA SHEET 5.12.5-2
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Feeder, Rock BP-1
B. Country of Origin	USSR
C. Distinguishing Characteristics	Large volume bin feeder (2 chambers)
2. Function	Feed rock to pressure pipeline to surface refuse disposal at distance of 1.5 km
3. Designation of Mining Systems for which Applicable	
4. Major Components	Gate valves, valve, air bleed valve, pressure water line, pressure chambers (bins)
5. Design Parameters	Handles rock lumps up to 100 mm Pumps are on the surface
6. Performance Parameters A. Input	Maximum pressure in chambers used for blow-out 100 kg/cm^2
B. Output	Chamber capacity 52 m^3 each feed a 200 mm pipeline
C. Performance Capacity	Presently over 140,000 tons delivered from 320 m depth to surface at chamber pressure of 45 ATM - total distance 1.5 km
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	Chamber length: 32 m
B. Width	Chamber diameter 3 m with 10 mm wall, grouted with concrete into rock
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	DonUGI
11. Status of Development	In use

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Mine # 6, Kapital'naya in Donbass
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Large volume loaded in each cycle (53 m^3)
B. Disadvantages	Chambers cannot be used at high pressures
24. Pertinent Reference Documents	739, p. 41
25. Drawing(s)	739, p. 42, fig. 99
26. Photograph(s)	

TABLE 10

	FEEDER							
	chamber DonUGI	TP-4	AZT	AZV-4	AZV-2M	PSG	coal pump tubular	VZV-2
Production rate, slurry, m^3/h	4,000	78-106	320	coal 250 rock 500	coal 180	75	150 - 200	coal 90 rock 180
Operating pressure, m.wat.c.	64	300-400	1000	1200	to 1000	to 1000	800	to 700
Number of chambers	12	-	-	4	2	2	-	2
Capacity of one chamber, m^3	125	-	-	1.8	2.0	30	-	0.6
Type of drive	hydraul	electr.	-	-	-	-	-	-
Coarseness of load. mater.	-	to 100	-	-	-	-	-	-
Power, kw	-	170	-	-	-	-	-	-
Dimensions, mm:								
length	-	6,250	-	6,600	3,970	-	-	2,500
width	-	6,720	-	4,100	2,410	-	-	2,200
height	-	1,900	-	-	6,220	120,000	-	4,750
Mass, kg	-	17,600	-	-	-	-	-	15,630

DATA SHEET 5.12.6-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Lock Hopper Feeder
B. Country of Origin	USSR
C. Distinguishing Characteristics	Historically important - first hydraulic hoist in mining
2. Function	Hoist crushed ore from mine
3. Designation of Mining Systems for which Applicable	
4. Major Components	Settling tank, high pressure water pump and line, charging device, pulp (crushed rock) pipeline, metering device, ore crusher, vibrating feeder, rock receiving hopper, control system and pump
5. Design Parameters	Hoist to 396 m
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	60 ton/hr
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	60 mm maximum rock size
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Leninogorsk Administration for Construction of Mines, USSR
11. Status of Development	Trial run - November 1958 1st operation - January 15, 1959

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	USSR
13.	Number of Units Manufactured (and Time Period)	1 Unit
14.	Using Agency	VNIITsuetmet Institute of Ust - 'Kamenogorsk
15.	Designation of Mines where Used	Belkina - Ventilyatsionnaya Mine (Leninogorsk, Kuzbass, USSR)
16.	Type of Control A. Input	Automatic - Remote control from panel located in mine
	B. Comments	
17.	Reliability	
18.	Safety	Excellent
19.	Major Causes of Failure	Rubber gaskets of valves
20.	Maintenance Requirement	
21.	Major Overhaul	
22.	Replacement Period	Must change rubber gaskets of valves every two or three days
23.	Comments on Suitability A. Advantages	
	B. Disadvantages	Extensive friction losses and wear
24.	Pertinent Reference Documents	650
25.	Drawing(s)	650, p. 12, fig. 1, p.13, fig. 2, p14, figs. 3 & 4
26.	Photograph(s)	

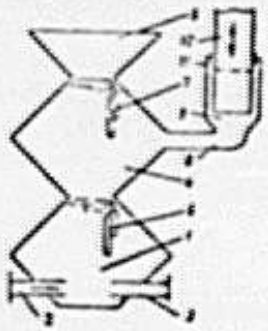


FIGURE 1. Schematic diagram of the charging devices

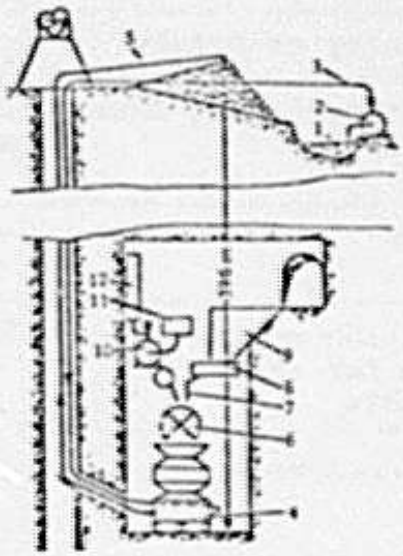


FIGURE 2. Schematic diagram of the hydraulic hauling unit at the Belkina-Vasilyevskaya mine

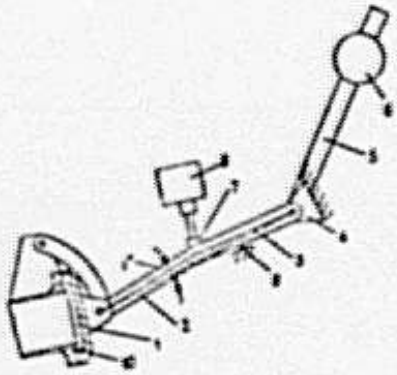


FIGURE 3. Schematic diagram of the drawing device

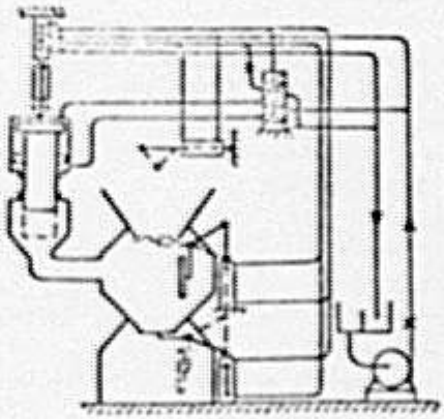


FIGURE 4. Schematic diagram of the hydraulic remote-control system of the charging device

DATA SHEET 5.12.6-2
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Screw Feeder Hydraulic Hoist, Lock Hopper Type with GIG-3
B. Country of Origin	Poland
C. Distinguishing Characteristics	Closed hoppers with screw feed thru water and coal valve to transport line
2. Function	Transport coal from pit bottom to coal washer (vertical height 700 m)
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	2 pressure containers with screw feeders, coal-water low pressure pumps, high pressure pumps valve, servo & control valves, air-fan and feeders
5. Design Parameters	120 atm maximum pressure
6. Performance Parameters A. Input	Closed circuit
B. Output	120 tons of coal per hour
C. Performance Capacity	Closed cycle, 5.1 kwhr/ton-km for vertical transport (horiz. = 0.9 kwhr/ton-km)
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Main Institute fo Mining, Poland
11. Status of Development	In operation after 1962

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	
13.	Number of Units Manufactured (and Time Period)	Prototype - Debiensko Mine Production unit - Andaluzja Mine
14.	Using Agency	Ministry of Mining
15.	Designation of Mines where Used	Debiensko Mine Andaluzja Mine
16.	Type of Control A. Input	Hydraulic Servo-Cylinder from Program Cam
	B. Comments	
17.	Reliability	Good
18.	Safety	Exeellent
19.	Major Causes of Failure	Excessively dirty water in control circuit (Servo-Cylinder water operated) Electric control circuits
20.	Maintenance Requirement	
21.	Major Overhaul	
22.	Replacement Period	
23.	Comments on Suitability A. Advantages	Increased reliability, reduced operating personnel, less energy to operate, elimination of electric shocks from trolley lines and other accidents in transportation and hoisting
	B. Disadvantages	Excessively dirty water causes seizing of hydraulic control cylinders
24.	Pertinent Reference Documents	655; 656
25.	Drawing(s)	655, p. 15, fig. 10; 656, p. 49, fig. 23, p. 67, fig. 38, p. 109, fig. 57, p. 62, f.36
26.	Photograph(s)	

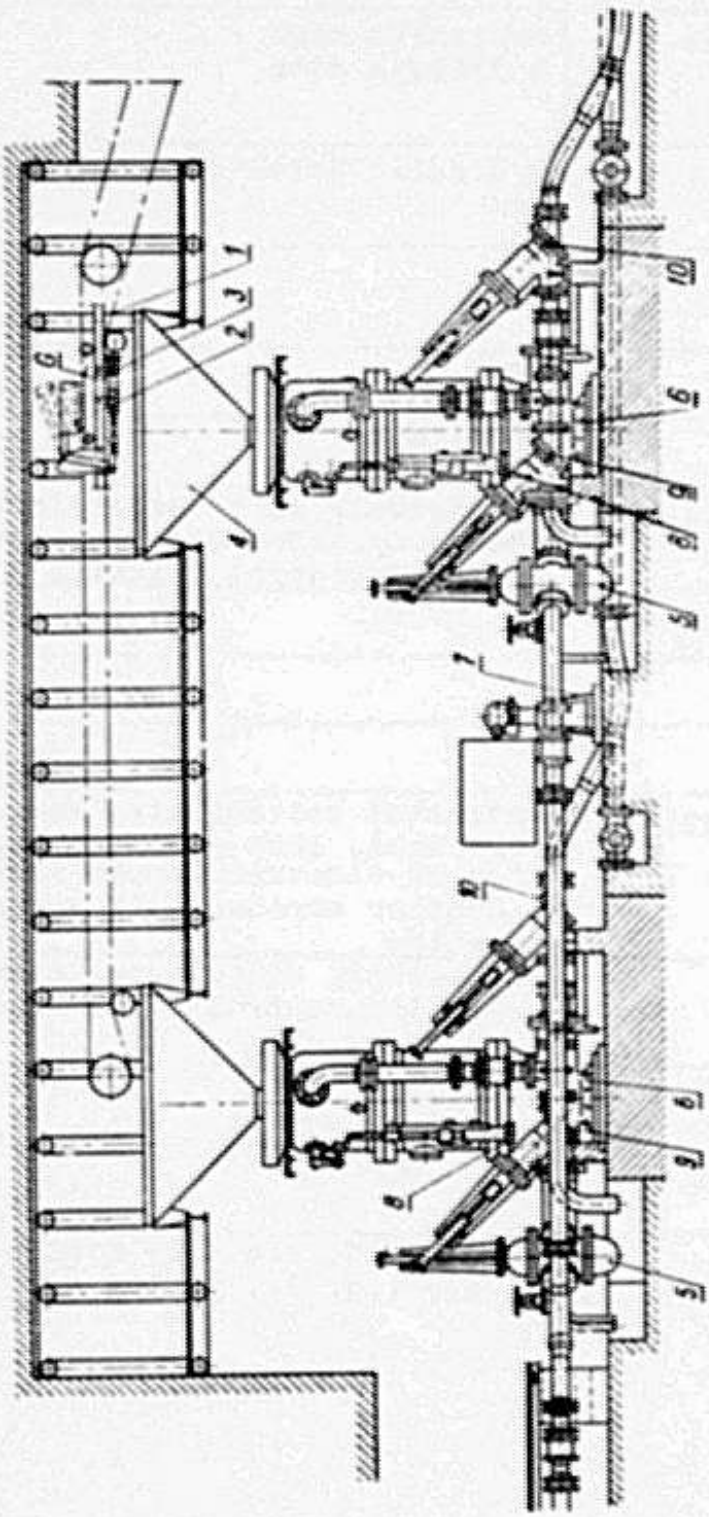


Fig. 23. Layout of the installation with feeders: *1* — belt conveyor, *2* — scrapper, *3* — hydraulic cylinder of the scrapper, *4* — bunker for one portion, *5* — coal and water mixture gate valve, *6* — pressure container, *7* — automatic control device, *8* — hydraulic cylinder of the flap valve, *9* — draining valve, *10* — water valve.

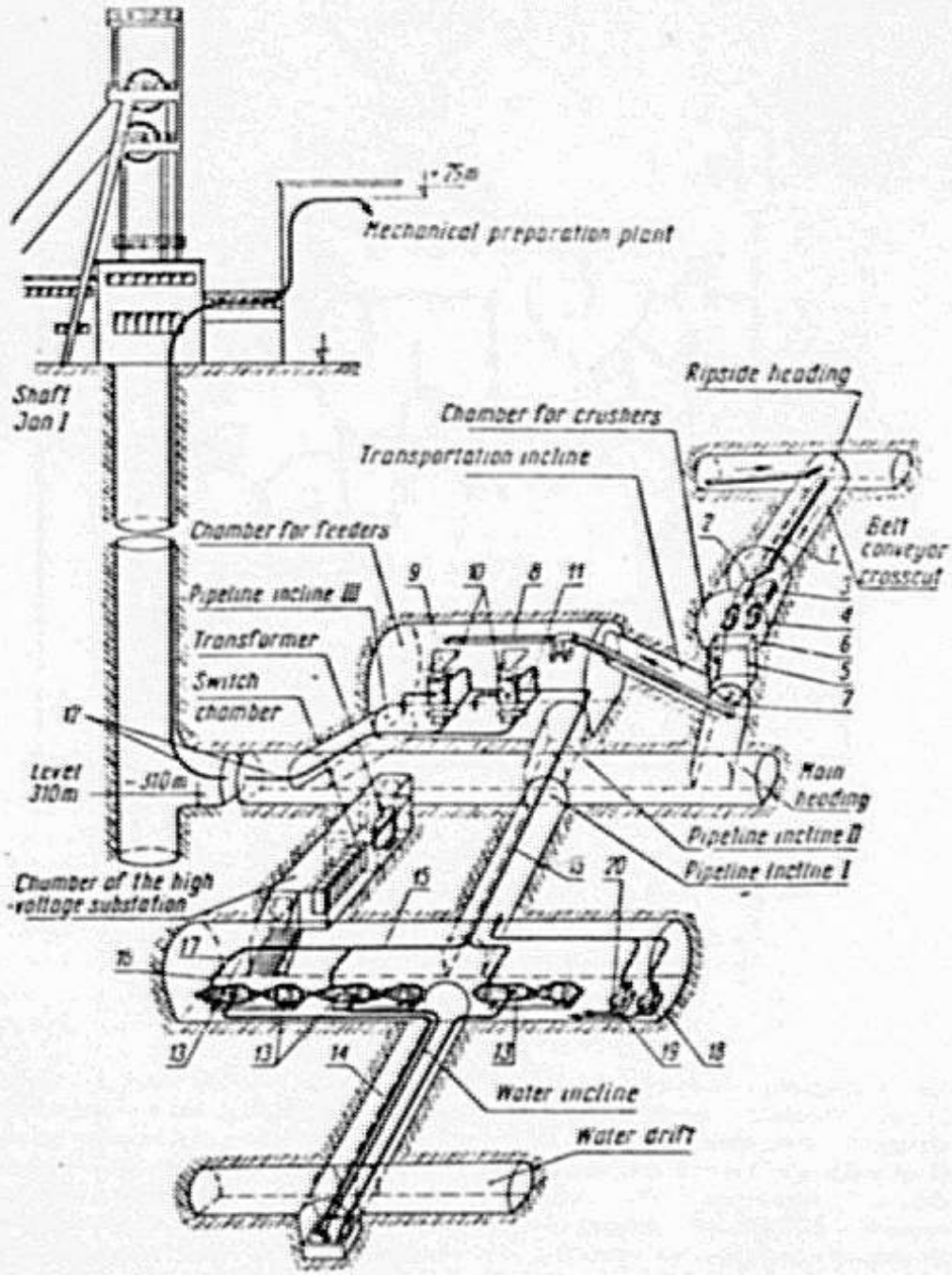


Fig. 38. Spatial arrangement of the installation.

67

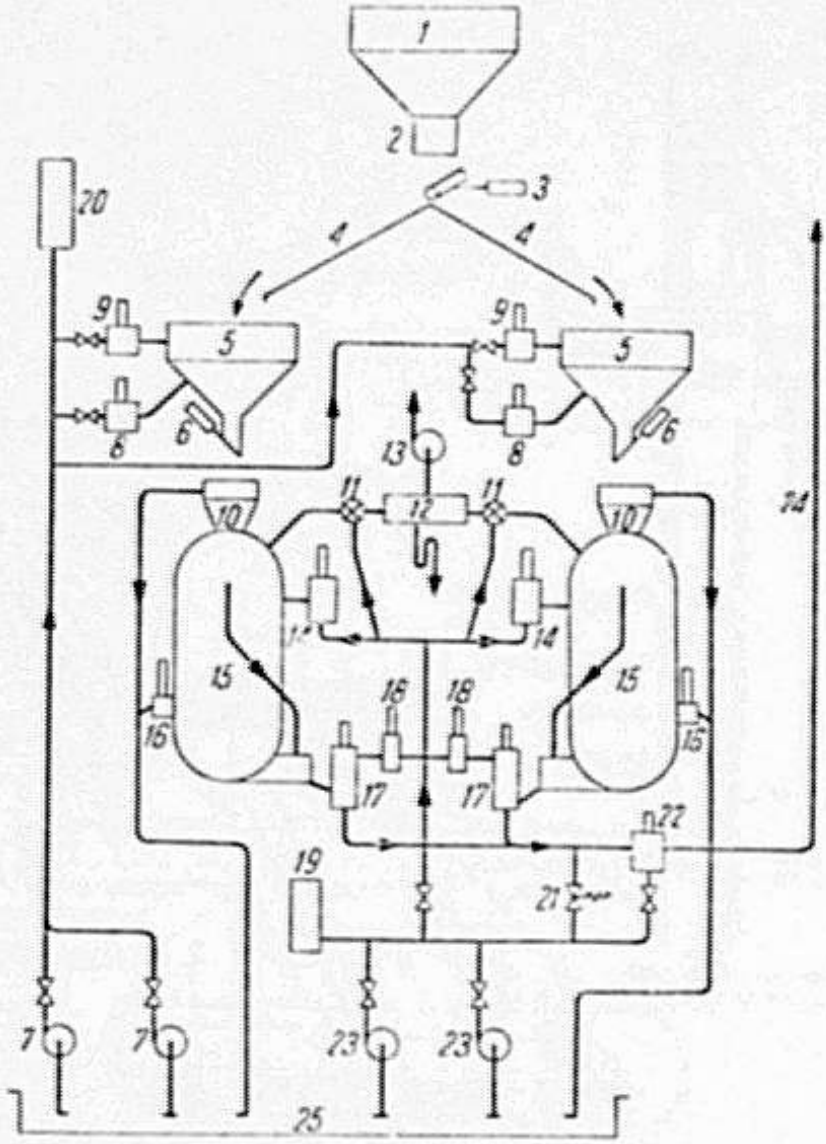


Fig. 57. Diagram of the feeder installation. *1* – coal bunker, *2* – feeding device, *3* – directing flap with hydraul cylinder, *4* – trough (eventually), *5* – bunker for one portion of coal, *6* – gate valve with hydraulic cylinder, *7* – low-pressure pump, *8* – valve of the flushing down water with hydraulic cylinder, *9* – valve of the additional water with hydraulic cylinder, *10* – loading hopper with tray, *11* – three-way equalizing cock, *12* – water separator, *13* – suction nozzle, *14* – water valve with hydraulic cylinder, *15* – pressure container of the feeder, *16* – draining valve with hydraulic cylinder, *17* – coal and water valve with hydraulic cylinder, *18* – flushing down water valve with hydraulic cylinder, *19* – high-pressure air vessel, *20* – low-pressure air vessel, *21* – safety valve, *22* – three-way isolating valve, *23* – high-pressure pump, *24* – transportation pipeline, *25* – main water reservoir, X – hand valve.

DATA SHEET 5.12.6-3
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Lock Hopper with Screw Feeder - GIG-3
B. Country of Origin	Poland
C. Distinguishing Characteristics	For use in GIG-3 Hydraulic Hoist System
2. Function	Feed coal to hydraulic hoist pipeline
3. Designation of Mining Systems for which Applicable	
4. Major Components	Pressure chamber, loading flap valve, screw conveyor, screw conveyor drive motor
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	Delivery head of 320 m
C. Performance Capacity	120 tons of coal/hr, size 0-80 mm
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Coal size 0-80 mm
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Main Institute of Mining, Poland
11. Status of Development	Produced first in 1962

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	
13.	Number of Units Manufactured (and Time Period)	
14.	Using Agency	Ministry of Mining, Poland
15.	Designation of Mines where Used	Debiensko Mine, Poland
16.	Type of Control A. Input	Hydraulic cylinder flap valve
	B. Comments	
17.	Reliability	Good
18.	Safety	Excellent
19.	Major Causes of Failure	Excessively dirty water caused seizing of valves
20.	Maintenance Requirement	Feed screw wears out
21.	Major Overhaul	
22.	Replacement Period	
23.	Comments on Suitability A. Advantages	See GIG-3 System Data
	B. Disadvantages	
24.	Pertinent Reference Documents	655
25.	Drawing(s)	655, p. 14, fig. 9, p. 47, fig. 21; 656, p. 48, fig.22, p.72, fig.41, p.75, fig. 44-45
26.	Photograph(s)	

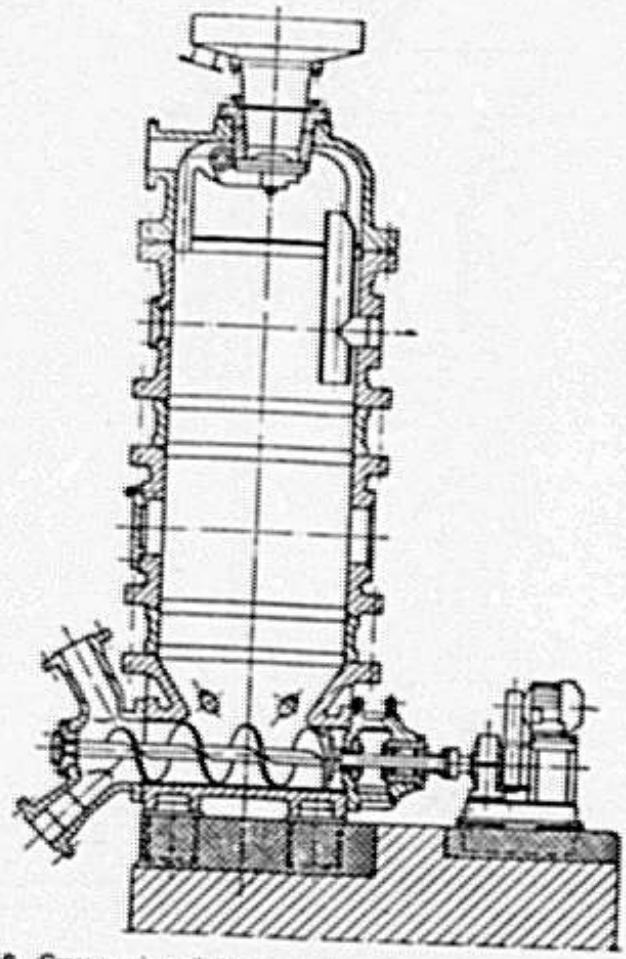


Fig. 9. Cross section of the pressure container of the GIG-3 feeder.

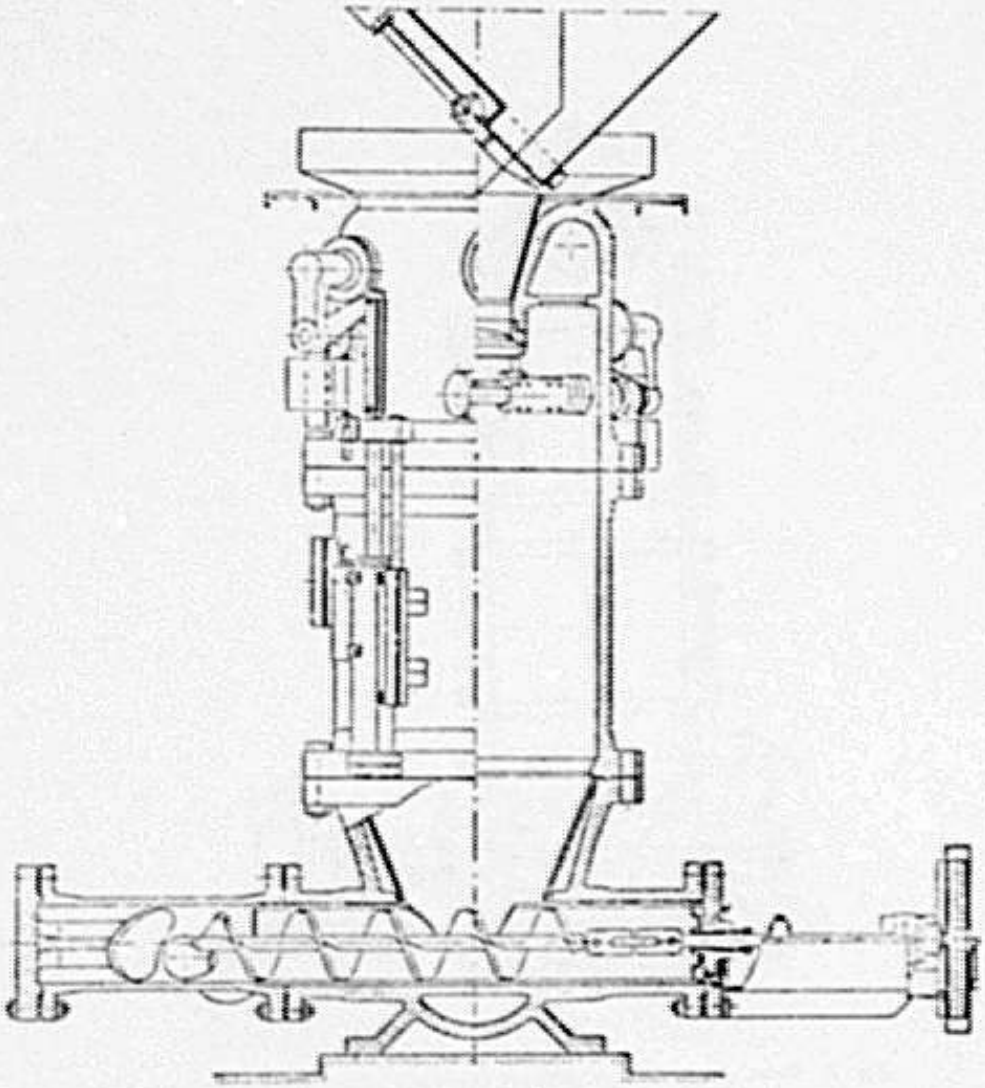


Fig. 21. Cross section of the feeder container.

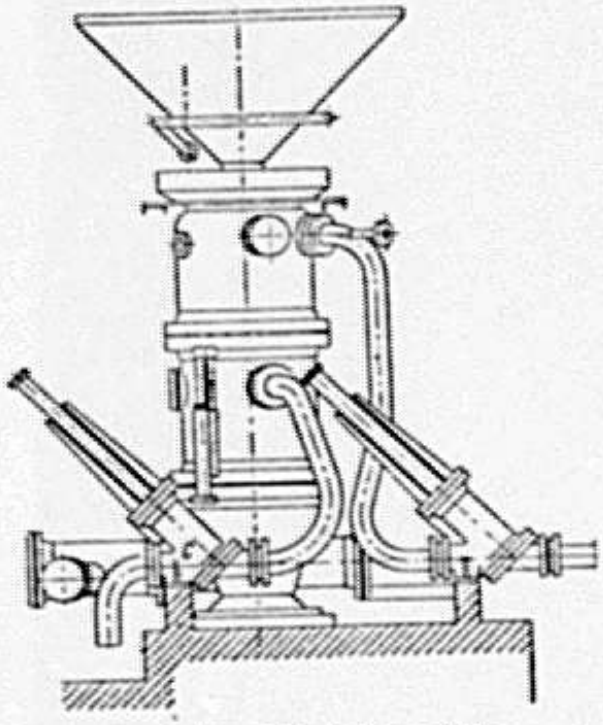


Fig. 22. View of the feeder container.

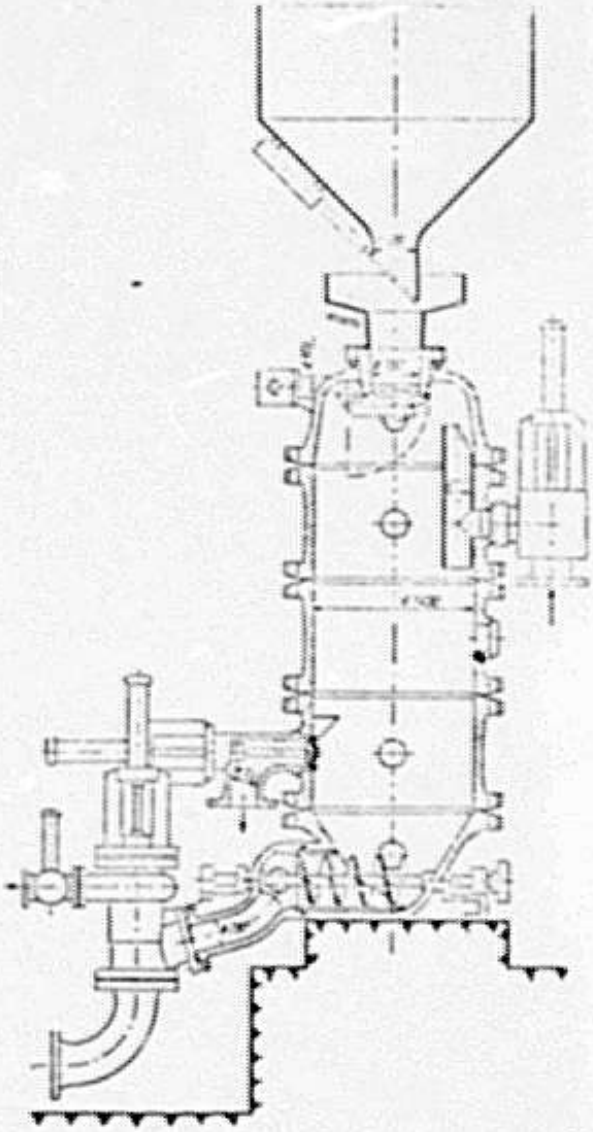


Fig. 41. GIG-3 feeder.

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Fig. 41. Factory assembling of the pressure container.

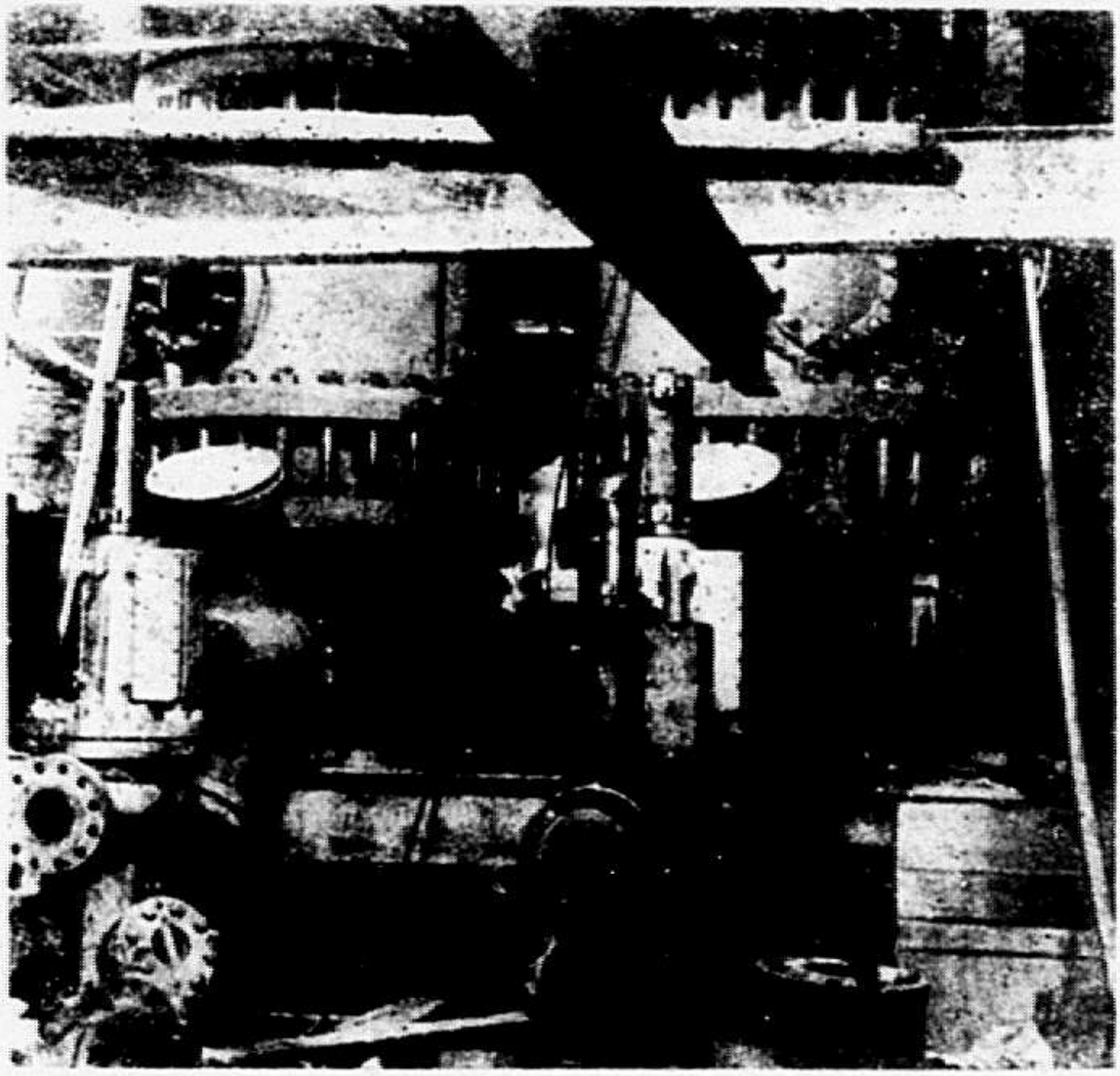


Fig. 45. Underground installation of two pressure containers.

DATA SHEET 5.12.6-4
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Feeder, Lock Hopper
B. Country of Origin	USSR
C. Distinguishing Characteristics	Cyclic Feeding
2. Function	Feed coal slurry to high pressure transport line
3. Designation of Mining Systems for which Applicable	
4. Major Components	Hoppers, pressure chambers, unloading chambers, ring-shaped injector pump, gates, tipple, valves, cyclic control
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	Seal problems, valves
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	Complex and unreliable gates and valves, cumbersome control systems
24. Pertinent Reference Documents	739, p. 39
25. Drawing(s)	739, p. 40, fig. 97
26. Photograph(s)	

Reference 739

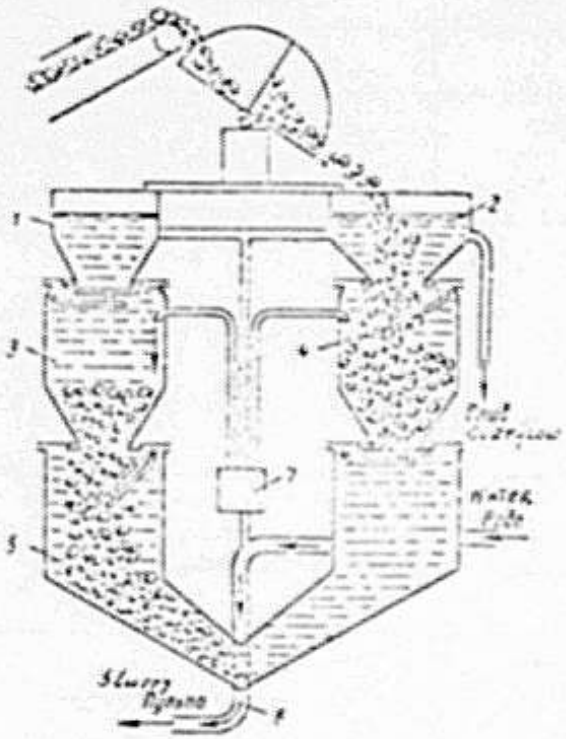


Fig.97. Flowsheet of a Cyclic or Foodgate (?) Feeder

1 & 2) hoppers; 3 & 4) pressure chambers; 5) unloading chamber; 6)ring-shaped injector; 7) pump

DATA SHEET 5.12.6-5
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Feeder, Lock-Hopper
B. Country of Origin	USA
C. Distinguishing Characteristics	
2. Function	Feed coal to pipeline under pressure for vertical hoisting
3. Designation of Mining Systems for which Applicable	
4. Major Components	Coal hopper, upper lock gate, vessel (upper pressure chamber, lower lock gates, lower pressure
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	36 tons/hr of anthracite with 2 pressure vessels
D. Efficiency	25-30% solids concentration
E. Limiting Environmental and Coal Seam Conditions	Test unit designed for 2 in. maximum coal size, although 3 in. maximum coal particle size passed through satisfactorily
7. Size of Equipment A. Length	6 in. diameter pipeline
B. Width	
C. Height	30 ft.
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Bureau of Mines
11. Status of Development	Test rig operated and tests completed 1963

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	Automatic with electrical timer
B. Comments	
17. Reliability	Good
18. Safety	Must have safety devices to prevent escape of large quantity of water under pressure
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	730
25. Drawing(s)	730, p. 13, fig. 3, p. 16, fig. 4, p. 19, fig. 6, p. 24, fig. 8
26. Photograph(s)	730, p. 12, fig. 2, p. 17, fig. 5

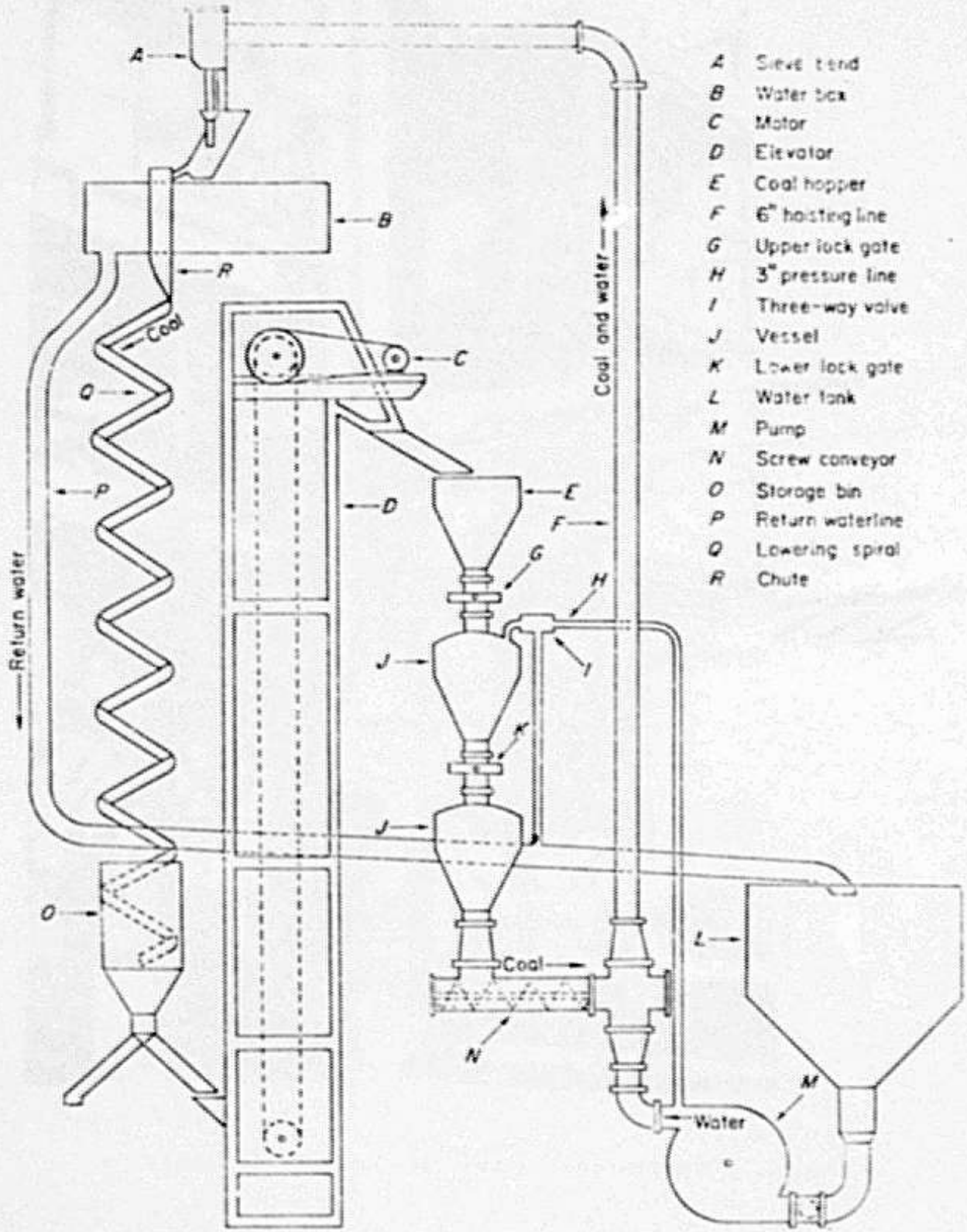


FIGURE 3. - Experimental Feeder Assembly, Feeder Units Arranged Vertically.

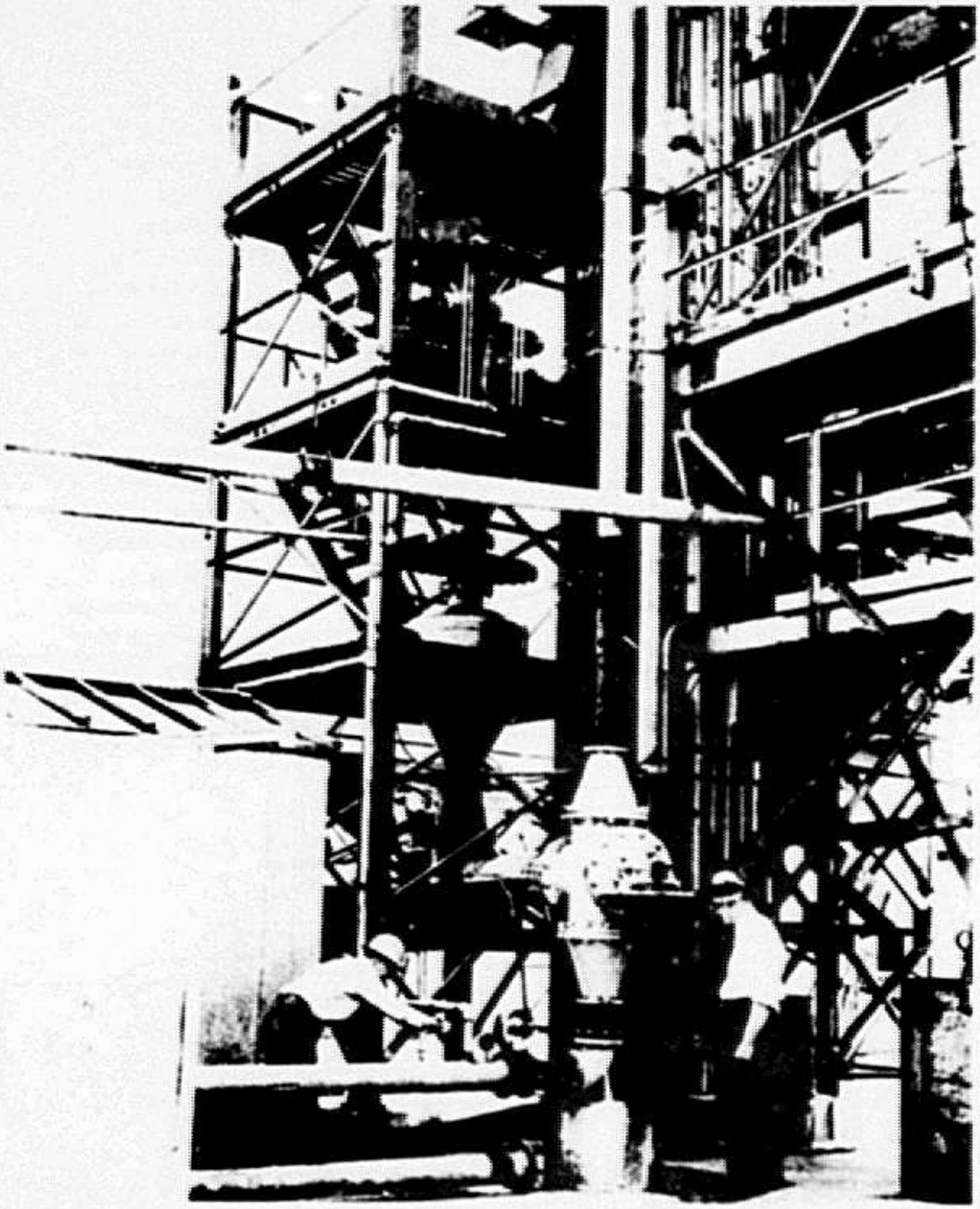


Fig. 2. Experimental Hydraulic-Hoisting Assembly

DATA SHEET 5.12.6-6
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Feeder System AŁV-1
B. Country of Origin	USSR
C. Distinguishing Characteristics	Dual chamber hopper feeder
2. Function	Hydraulic hoisting of coal, also hoisting of debris from mine
3. Designation of Mining Systems for which Applicable	
4. Major Components	Tunnel feeder, hopper, upper chamber, high pressure valves, pressure equation valves, lower chamber, spherical valves, slurry, discharge lines
5. Design Parameters	
6. Performance Parameters A. Input	Water consumption = 430 m^3/hr
B. Output	Slurry flow velocity 3.2 m/sec.
C. Performance Capacity	87 tons/hr
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Maximum pressure in chambers: 50 atm Maximum particle size: 100 mm
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In operation

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	
13.	Number of Units Manufactured (and Time Period)	
14.	Using Agency	
15.	Designation of Mines where Used	
16.	Type of Control A. Input	Automatic operation
	B. Comments	
17.	Reliability	
18.	Safety	
19.	Major Causes of Failure	
20.	Maintenance Requirement	
21.	Major Overhaul	
22.	Replacement Period	
23.	Comments on Suitability A. Advantages	Continuous feeding because of 2 feeders
	B. Disadvantages	
24.	Pertinent Reference Documents	658, p. 807
25.	Drawing(s)	658, p. 808, fig. 31
26.	Photograph(s)	

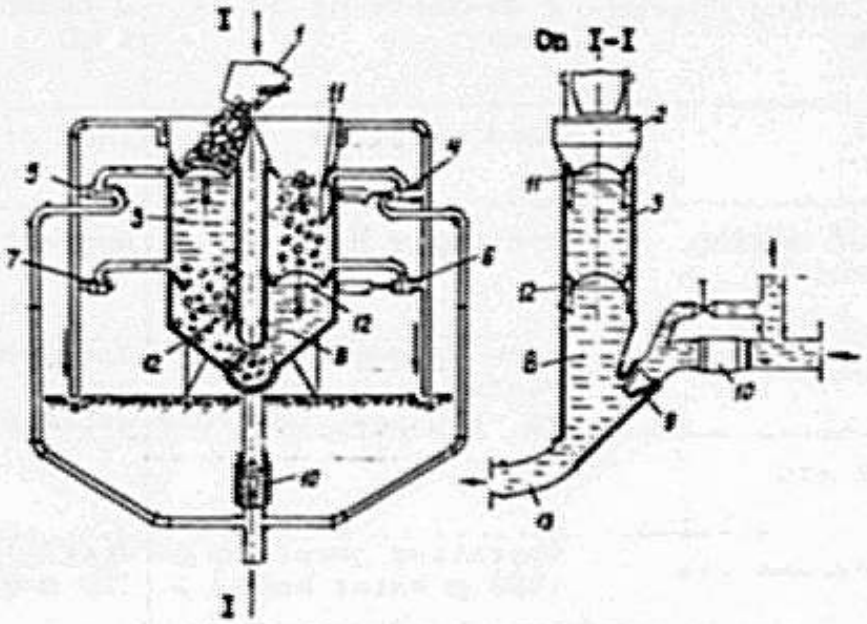


Fig. 31. Feeder system of hydro-hoisting.

1—Tunnel feeder. 2—Hopper. 3—Upper chamber for building up pressure. 4, 5—High pressure valves. 6, 7—Pressure-equaliser valves. 8—Bottom mixing discharge chamber. 9—Water inlet nozzle. 10—High pressure water valve. 11—Half-moon (spherical) valves of the upper chamber. 12—Half-moon (spherical) valves of the bottom mixing chamber. 13—Pulp discharge line.

DATA SHEET 5.12.6-7
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Feeder PSG	Feeder VZV-2
B. Country of Origin	USSR	USSR
C. Distinguishing Characteristics	2 chambers of 30 m^3 each	2 chambers of 0.6 m^3 each
2. Function	Feed pipeline	Feed pipeline
3. Designation of Mining Systems for which Applicable	Hydraulic hoist	Hydraulic hoist
4. Major Components	Gate valves, bleed vents, high press. water pipes, controls	Gate valves, bleed vents, high press. water pipes, controls
5. Design Parameters		
6. Performance Parameters A. Input	Operating pressure to 1000 m water head	Operating pressure to 700 m water head
B. Output		
C. Performance Capacity	75 m^3/hr	90 m^3/hr coal 180 m^3/hr rock
D. Efficiency		
E. Limiting Environmental and Coal Seam Conditions		
7. Size of Equipment A. Length		2500 mm
B. Width		2200 mm
C. Height	120 m	4750 mm
8. Weight of Equipment		15,630 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)		
10. Developing Agency		
11. Status of Development	In use	In use

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	PSG	VZV-2
13.	Number of Units Manufactured (and Time Period)		
14.	Using Agency		
15.	Designation of Mines where Used		
16.	Type of Control A. Input		
	B. Comments		
17.	Reliability		
18.	Safety		
19.	Major Causes of Failure		
20.	Maintenance Requirement		
21.	Major Overhaul		
22.	Replacement Period		
23.	Comments on Suitability A. Advantages	Large volume/cycle	
	B. Disadvantages	Chambers cannot be used at high pressures	
24.	Pertinent Reference Documents	739, p. 43, table 10, p. 42, fig. 99	
25.	Drawing(s)		
26.	Photograph(s)		

TABLE 10

	F E E D E R							
	chamber DonUGI	TP-4	AZT	AZV-4	AZV-2M	PSG	coal pump tubular	VZV-2
Production rate, slurry, m^3/h	4,000	78-106	320	coal 250 rock 500	coal 160	75	150 - 200	coal 90 rock 180
Operating pressure, m.wat.c.	64	300-400	1000	1200	to 1000	to 1000	800	to 700
Number of chambers.	12	-	-	4	2	2	-	2
Capacity of one chamber, m^3	125	-	-	1.8	2.0	50	-	0.6
Type of drive	hydraul	electr.	-	-	-	-	-	-
Coarseness of load. mater. .	-	to 100	-	-	-	-	-	-
Power, kw	-	170	-	-	-	-	-	-
Dimensions, mm:								
length	-	6,250	-	6,600	3,970	-	-	2,500
width	-	6,720	-	4,100	2,410	-	-	2,200
height	-	1,900	-	-	6,220	120,000	-	4,710
Mass, kg	-	17,600	-	-	-	-	-	15,650

Reference 739

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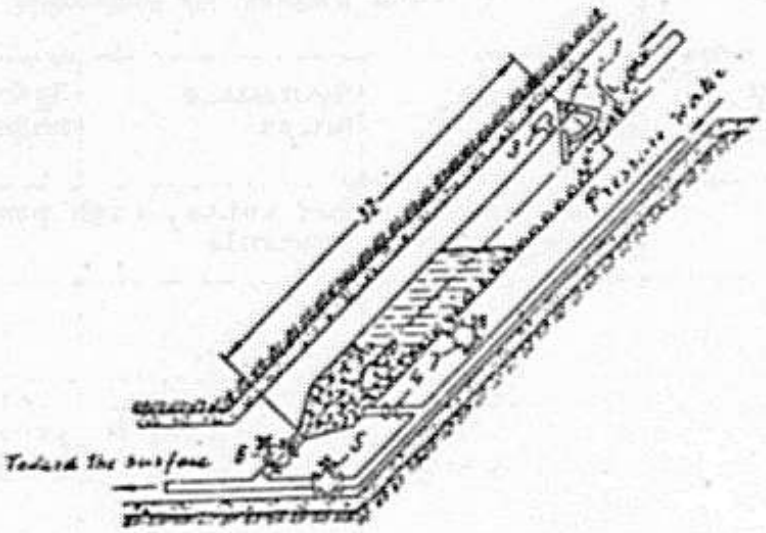


Fig.99. Bin-Feeder

1) gate valve; 2) valve; 3) air escape valve or vent; 4), 5), 6) gates regulating the chamber washout during loading; 7) drain pipe gate valve

DATA SHEET 5.12.6-8

DATA ON COMPONENTS AND SUB-SYSTEMS

	BIN FEEDERS		
1. A. Name and Model Number	AZT	AZV-4	AZV-2m
B. Country of Origin	USSR	USSR	USSR
C. Distinguishing Characteristics		4 chambers of 1.8 m^3 capacity each	2 chambers of 2 m^3 capacity each
2. Function	Feed slurry to pipeline		
3. Designation of Mining Systems for which Applicable	Hydraulic hoist	Hydraulic hoist	Hydraulic hoist
4. Major Components	Gate valves, bleed vents, high pressure water pipes, valves, controls		
5. Design Parameters			
6. Performance Parameters A. Input	Operating press. 1000 m water head	Operating press. 1200 m water head	Operating press. to 1000 m water head
B. Output			
C. Performance Capacity	320 m^3/hr slurry	coal 250 m^3/hr rock 500 m^3/hr	180 m^3/hr coal slurry
D. Efficiency			
E. Limiting Environmental and Coal Seam Conditions			
7. Size of Equipment A. Length		6600 mm	3970 mm
B. Width		4100 mm	2410 mm
C. Height			6220 mm
8. Weight of Equipment			
9. Cost (and Year of Cost Evaluation and Basis for Costs)			
10. Developing Agency			
11. Status of Development	In use	In use	In use

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	
13.	Number of Units Manufactured (and Time Period)	
14.	Using Agency	
15.	Designation of Mines where Used	
16.	Type of Control A. Input	
	B. Comments	
17.	Reliability	
18.	Safety	
19.	Major Causes of Failure	
20.	Maintenance Requirement	
21.	Major Overhaul	
22.	Replacement Period	
23.	Comments on Suitability A. Advantages	
	B. Disadvantages	Chambers cannot be used at high pressures
24.	Pertinent Reference Documents	739, p. 43, table 10,
25.	Drawing(s)	
26.	Photograph(s)	

TABLE 1

	FEEDER							
	chamber DonUGI	TP-4	AZT	AZV-4	AZV-2M	PSG	coal pump tubular	VZV-2
Production rate, slurry, m^3/h	4,000	78-106	320	coal 250 rock 500	coal 160	75	150 - 200	coal 90 Rock 160
Operating pressure, m.wat.c.	64	300-400	1000	1200	to 1000	to 1000	800	to 700
Number of chambers	12	-	-	4	2	2	-	2
Capacity of one chamber, m^3	125	-	-	1.8	2.0	30	-	0.6
Type of drive	hydraul	electr.	-	-	-	-	-	-
Coarseness of load. mater.	-	to 100	-	-	-	-	-	-
Power, kw	-	170	-	-	-	-	-	-
Dimensions, mm:								
length	-	6,250	-	6,600	3,970	-	-	2,500
width	-	6,720	-	4,100	2,410	-	-	2,200
height	-	1,900	-	-	6,220	120,000	-	4.750
Mass, kg	-	17,600	-	-	-	-	-	15,630

DATA SHEET 5.12.6-9
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Feeder RD-X
B. Country of Origin	Czechoslovakia
C. Distinguishing Characteristics	Rotating regulated feeder
2. Function	Feed coal into pressure line of pump
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Ministry of Fuels
11. Status of Development	In development 1958

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Prague Pit Mechanisation Institute (UDM)
15. Designation of Mines where Used	To be tested at Stalin II Mine in Ostrava-Karvina Coalfield
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	543, p. 10
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.12.6-10
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hydraulic Hoist, Vessel Feeder (Moving Containers)
B. Country of Origin	USSR
C. Distinguishing Characteristics	Containers are filled with coal to liquid ratio of 1:0.6 & introduced into pipeline & moved to surface where containers are emptied and put back in pipeline for return
2. Function	Hoist coal
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Containers, high pressure water line, container loading mechanism, container emptying mechanism, conveyors, hopper
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	High coal to water ratio (1:1)
B. Disadvantages	High expense of containers, loading and unloading mechanisms
24. Pertinent Reference Documents	739, p. 45-46
25. Drawing(s)	739, p. 46, fig. 100
26. Photograph(s)	

Reference 739

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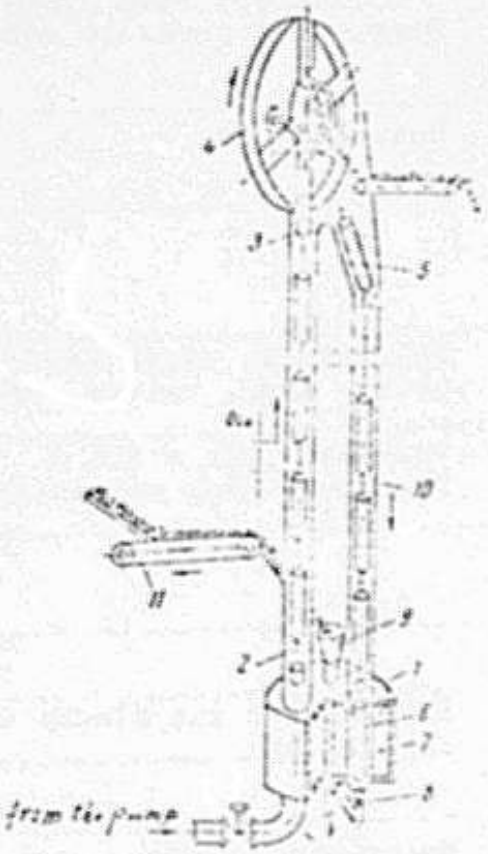


Fig. 100.

Hydraulic hoisting of coal in vessels

DATA SHEET 5.12.7-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hydraulic Hoist, Pipe Feeder Type (Hitachi Horizontal Hydrohoist Model No. 1)
B. Country of Origin	Japan
C. Distinguishing Characteristics	3 horizontal feed pipes, low pressure slurry pump, high pressure water pump
2. Function	Hoist slurry
3. Designation of Mining Systems for which Applicable	
4. Major Components	Feed pipes, clear water high pressure pump, slurry pump, valves, controller
5. Design Parameters	Vertical lift = 520 m Transport high concentration (25-30%)
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	100 tons/hr (at slurry volume density of 25% solids)
D. Efficiency	
E. Limiting Operational or Coal Seam Conditions	Maximum coal grain size 30 mm
7. Size of Equipment A. Length	Feed pipes and valves 70 m
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	200 million Yen for test equipment at Noborgawa pits of Mitsui-Sunagawa Colliery (Ref. 451), July 1962-Aug. 1963
10. Developing Agency	Coal Mining Research Center
11. Status of Development	Operating since July 1965, 9300 hours until Feb. 1973

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Hitachi, Ltd., Japan
13. Number of Units Manufactured (and Time Period)	Nine - 1959-1971
14. Using Agency	CMRC, Japan
15. Designation of Mines where Used	Mitsui-Sunagawa Colliery, 1965; Kanbayashi Tanko Co. Ltd, 105 tons/hr, 1959; Furukawa Mining Co. - Yoshima Colliery, 100 tons/hr, 1962
16. Type of Control A. Input	Automatic
B. Comments	
17. Reliability	Excellent
18. Safety	Excellent
19. Major Causes of Failure	Valve wear
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Elimination of reloading, doubles as drain system, smooth non-pulsating operation
B. Disadvantages	
24. Pertinent Reference Documents	269; 451; 454; 453; 452
25. Drawing(s)	Refer to referenced documents
26. Photograph(s)	Refer to referenced documents

DATA SHEET 5.12.7-2
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pipe Feeder
B. Country of Origin	Hungary (Operated in Germany)
C. Distinguishing Characteristics	
2. Function	Transport of coal from pit bottom to the coal wash plant
3. Designation of Mining Systems for which Applicable	
4. Major Components	Pipe feeders, filling pump, high pressure water pump
5. Design Parameters	Vertical height 700 m with 200 mm pipe, Pressure 850-900 atm
6. Performance Parameters A. Input	Coal of density 1.62 tons/m^3
B. Output	150 tons/hr of coal at 36% solid by weight
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	50 mm maximum particle size
7. Size of Equipment A. Length	Pipe diameter 200 mm Working Pressure 900 atm
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	State Planning Office for Civil Engineering, Hungary
11. Status of Development	In operation at Dortmund starting summer of 1971

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	Hungarian firm using German components
13.	Number of Units Manufactured (and Time Period)	One for coal and three for sand, dirt, slag and fly ash, 1966-71
14.	Using Agency	
15.	Designation of Mines where Used	Germany
16.	Type of Control A. Input	Automatic
	B. Comments	
17.	Reliability	
18.	Safety	Excellent
19.	Major Causes of Failure	Valves
20.	Maintenance Requirement	
21.	Major Overhaul	
22.	Replacement Period	
23.	Comments on Suitability A. Advantages	
	B. Disadvantages	
24.	Pertinent Reference Documents	761
25.	Drawing(s)	761, p. H4-80, fig. 4
26.	Photograph(s)	

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Reference 761

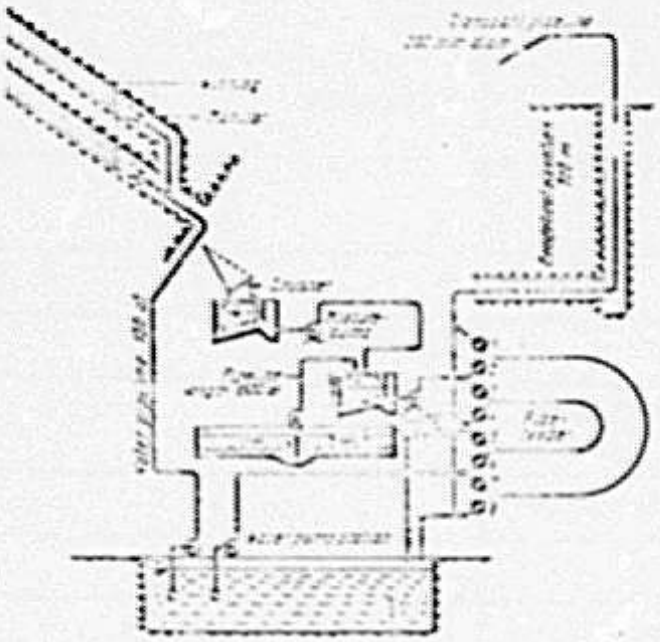


Fig. 4

DATA SHEET 5.12.7-3
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Feeder (Pipe Feeder)
B. Country of Origin	United Kingdom
C. Distinguishing Characteristics	Horizontal pipe serves as lockhopper
2. Function	Lift coal out of mine to wash plant
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	
5. Design Parameters	Lift coal vertically 280 ft and then horizontally 300 ft.
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	1000 tons/day maximum (3 in. maximum coal size)
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	8 in. pipeline - 79 ft. long
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	National Coal Board
11. Status of Development	Operating in 1960

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Cowdenbeath Workshops
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	National Coal Board Central Engineering Establishment/Hydraulic Transport Section
15. Designation of Mines where Used	Woodend Colliery, West Lothian, Scotland
16. Type of Control A. Input	Automatic Cam Pneumatic Control
B. Comments	39 Sec. cycle time Lubricated Valves Automatically
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	1. Increase haulage & winding efficiency without reconstruction of roadways, shafts, winding systems or surface transport 2. Eliminates transferring or reloading 3. Single system of transport without moving elements 4. Reduces accidents
B. Disadvantages	Coal to be crushed to 1/3-1/2 transport pipe diameter
24. Pertinent Reference Documents	727; 1031
25. Drawing(s)	727, p. 67, fig. 10, p. 68, fig. 11, p. 70, fig. 13; 1031, p. 10, fig. 5
26. Photograph(s)	727, p. 67, fig. 8, 9, p. 69, fig. 12

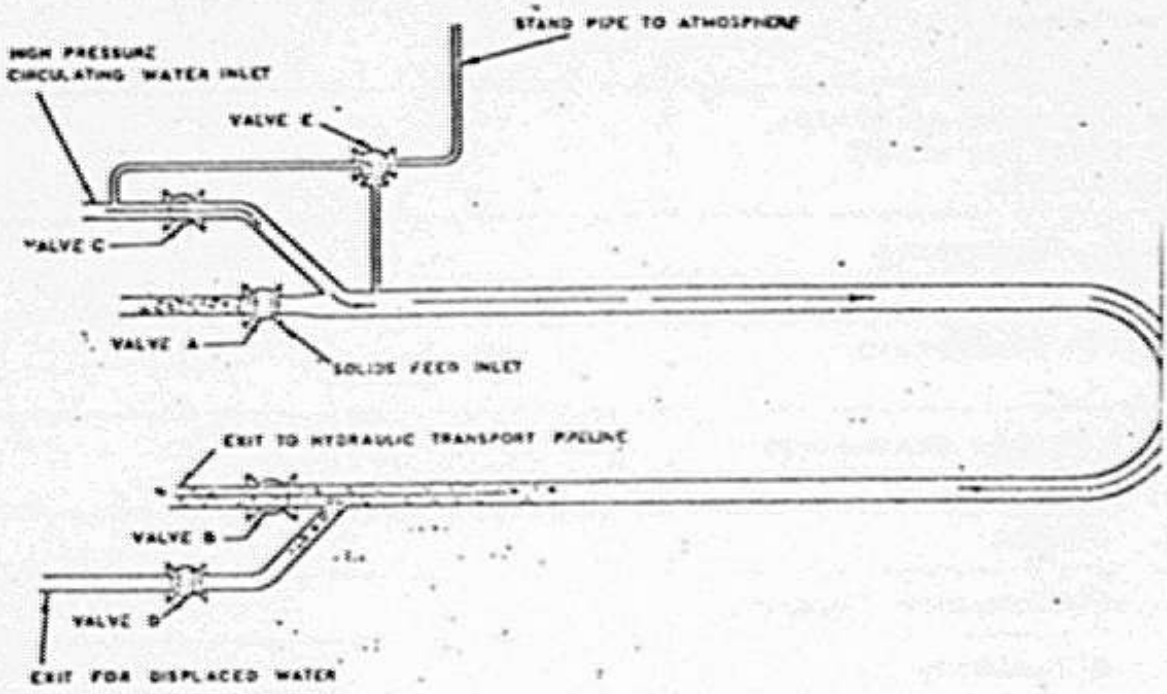


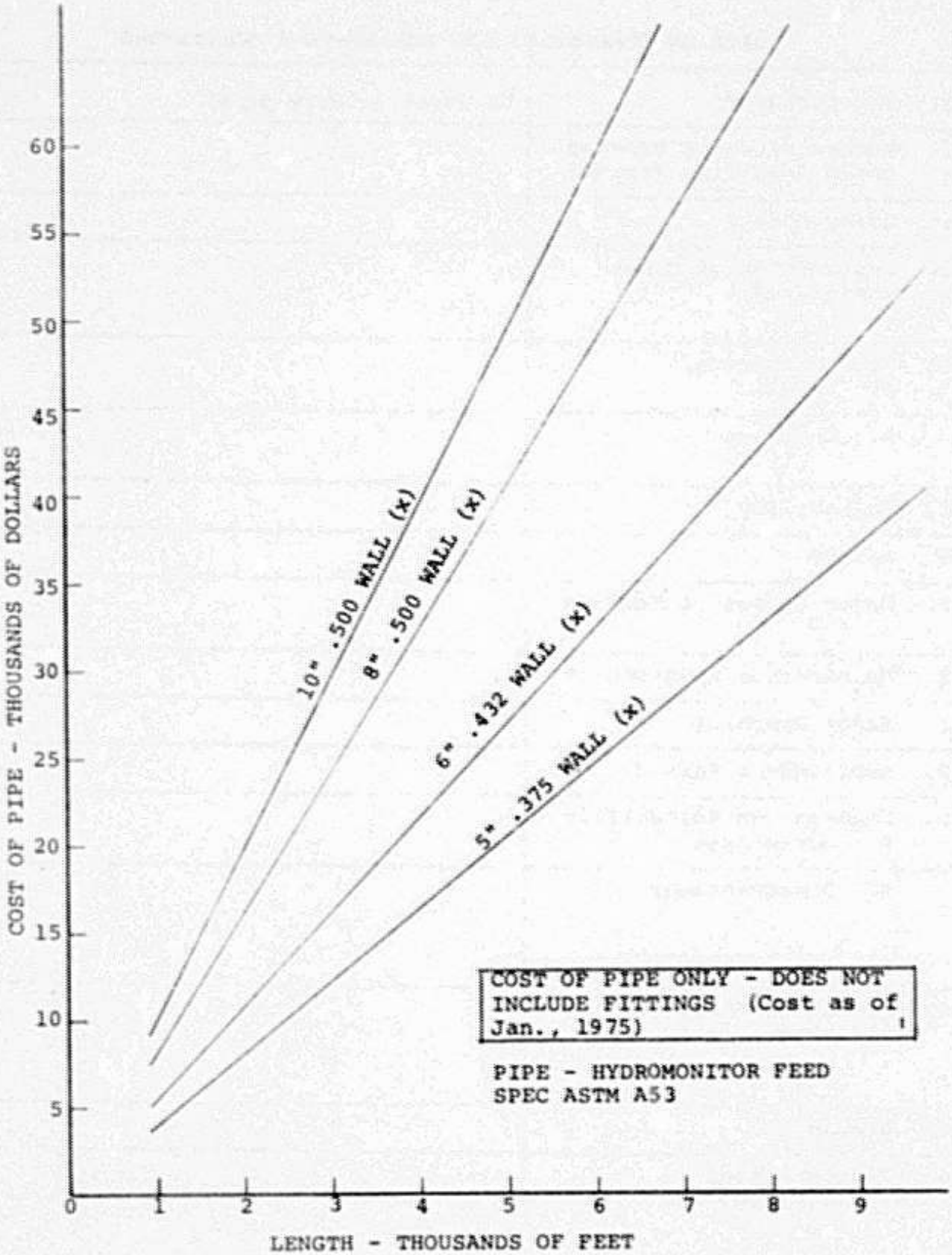
Fig.5 Horizontal lockhopper feeder

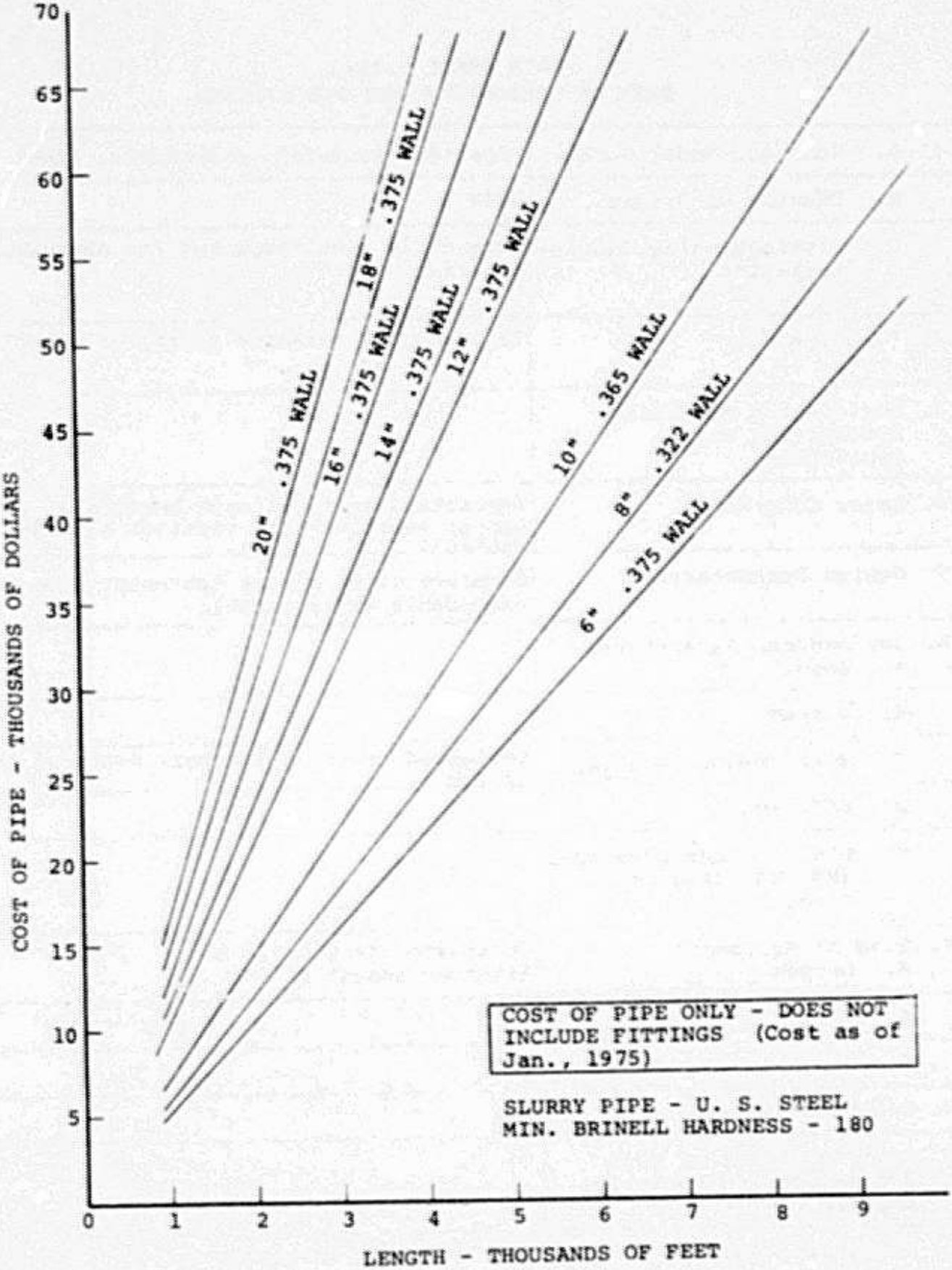
DATA SHEET 5.13-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Water and Slurry Pipes
B. Country of Origin	USA
C. Distinguishing Characteristics	Slurry pipe - Brinell Hardness - 180
2. Function	
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	See attached graphs for Terraspace estimates (1975)
10. Developing Agency	
11. Status of Development	Commercially available

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	US Steel (slurry pipe)
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	
25. Drawing(s)	
26. Photograph(s)	


COST OF PIPE - THOUSANDS OF DOLLARS
60
55
50
45
40
35
30
25
20
15
10
5
0
1
2
3
4
5
6
7
8
9
LENGTH - THOUSANDS OF FEET
10" .500 WALL (x)
8" .500 WALL (x)
6" .432 WALL (x)
5" .375 WALL (x)
COST OF PIPE ONLY - DOES NOT INCLUDE FITTINGS (Cost as of Jan., 1975)
PIPE - HYDROMONITOR FEED
SPEC ASTM A53


COST OF PIPE - THOUSANDS OF DOLLARS
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
1
2
3
4
5
6
7
8
9
LENGTH - THOUSANDS OF FEET
20" .375 WALL
18" .375 WALL
16" .375 WALL
14" .375 WALL
12" .375 WALL
10" .365 WALL
8" .322 WALL
6" .375 WALL
COST OF PIPE ONLY - DOES NOT INCLUDE FITTINGS (Cost as of Jan., 1975)
SLURRY PIPE - U. S. STEEL
MIN. BRINELL HARDNESS - 180

DATA SHEET 5.13-2
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pipeline, swiveled, extendable, steel
B. Country of Origin	USSR
C. Distinguishing Characteristics	Extendable steel pipeline for abrasive slurries
2. Function	To transport abrasive slurry or water
3. Designation of Mining Systems for which Applicable	
4. Major Components	Connecting sections with horizontal swivels, Linear sections with vertical swivels, end fittings
5. Design Parameters	Seamless steel slurry transport pipe - extendable and rotatable
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	Collapsed length 1.8 meter, extended length 12.4 m
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	Contracted length 1.8 m Extended length 12.4 m
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	VNIIGidrougol Institute
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	Much longer than flexible rubber hoses which wear out quickly
23. Comments on Suitability A. Advantages	Long wearing compared to flexible rubber hose
B. Disadvantages	
24. Pertinent Reference Documents	696, p. 54
25. Drawing(s)	696, p. 54, fig. 24
26. Photograph(s)	

Reference 696

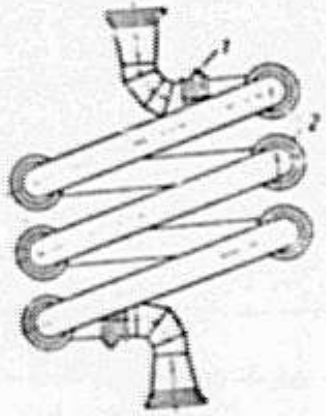


Fig.24

DATA SHEET 5.14-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Valves, Slide, Js100, Js150, Js200, Jt64
B. Country of Origin	Czechoslovakia
C. Distinguishing Characteristics	
2. Function	
3. Designation of Mining Systems for which Applicable	
4. Major Components	Equipped with quick change couplings
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Ministry of Fuels
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Prague Institute for Pit Mechanization (UDM)
15. Designation of Mines where Used	Czechoslovak Army Mine
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	Short service life, 3 to 5 months
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	543, p. 5
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.14-2
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Valve, Water and Coal
B. Country of Origin	Poland
C. Distinguishing Characteristics	During closing, strong stream of water washes away pieces of coal from seat
2. Function	Shuts off flow of water and coal mixture from screw feeder to line
3. Designation of Mining Systems for which Applicable	GIG-3
4. Major Components	Body, seat, valve piston, seat, clear water, port, hydraulic control cylinder
5. Design Parameters	Open and close coal water mixture at full pressure (120 ATM) (0-80 mm coal)
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Maximum coal size 80 mm
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Main Institute of Mining, Poland
11. Status of Development	In production after 1962

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Main Institute of Mining
15. Designation of Mines where Used	Andaluzja Mine
16. Type of Control A. Input	Servo-Hydraulic cylinder
B. Comments	
17. Reliability	Good
18. Safety	Good
19. Major Causes of Failure	Dirt on seat, corrosion
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Uninterrupted flow of water to clean valve seat in both the open and closed position
B. Disadvantages	
24. Pertinent Reference Documents	655
25. Drawing(s)	655 , p. 17, fig. 11
26. Photograph(s)	

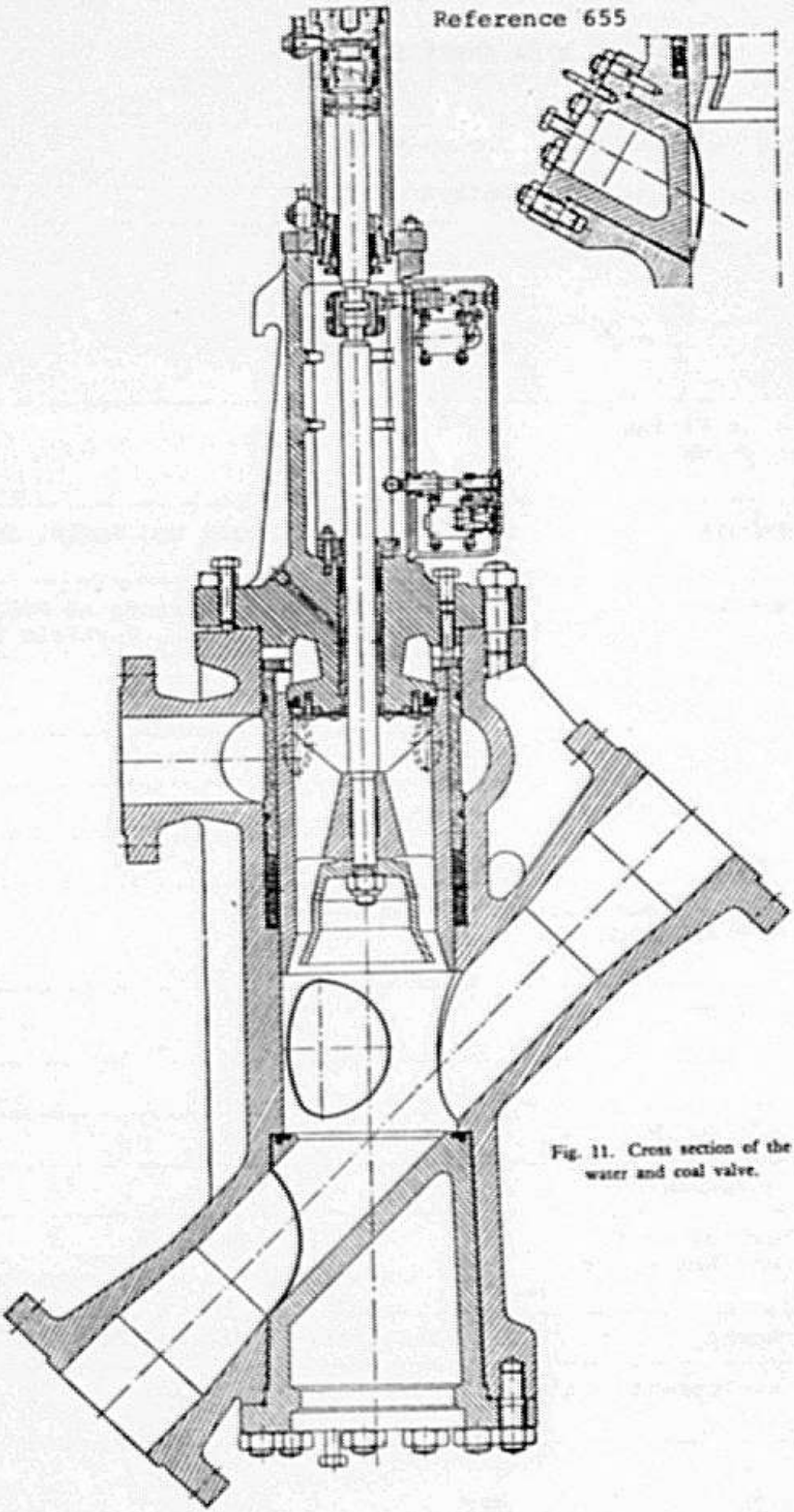


Fig. 11. Cross section of the water and coal valve.

DATA SHEET 5.14-3
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	**Piston Valve**
B. Country of Origin	**Poland**
C. Distinguishing Characteristics	
2. Function	**Shut Off Valves**
3. Designation of Mining Systems for which Applicable	**GIG-3**
4. Major Components	**Body, Piston, Control Rod Seals, Seat**
5. Design Parameters	**Shut Off Coal-Water Mixture at Full Pressure, 120 ATM, 80 mm Max. Particle Size**
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	**0 - 80 mm Coal Size**
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	**Main Institute of Mining, Poland**
11. Status of Development	**In Production since 1962**

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Main Institute of Mining
15. Designation of Mines where Used	Andaluzja Mine
16. Type of Control A. Input	Servo-Hyd. Piston
B. Comments	Rubber Piston Seat Partial Relief
17. Reliability	Excellent
18. Safety	
19. Major Causes of Failure	Jamming - Eliminated by Chrome Plating Piston
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	655
25. Drawing(s)	pp 42, Fig. 12
26. Photograph(s)	

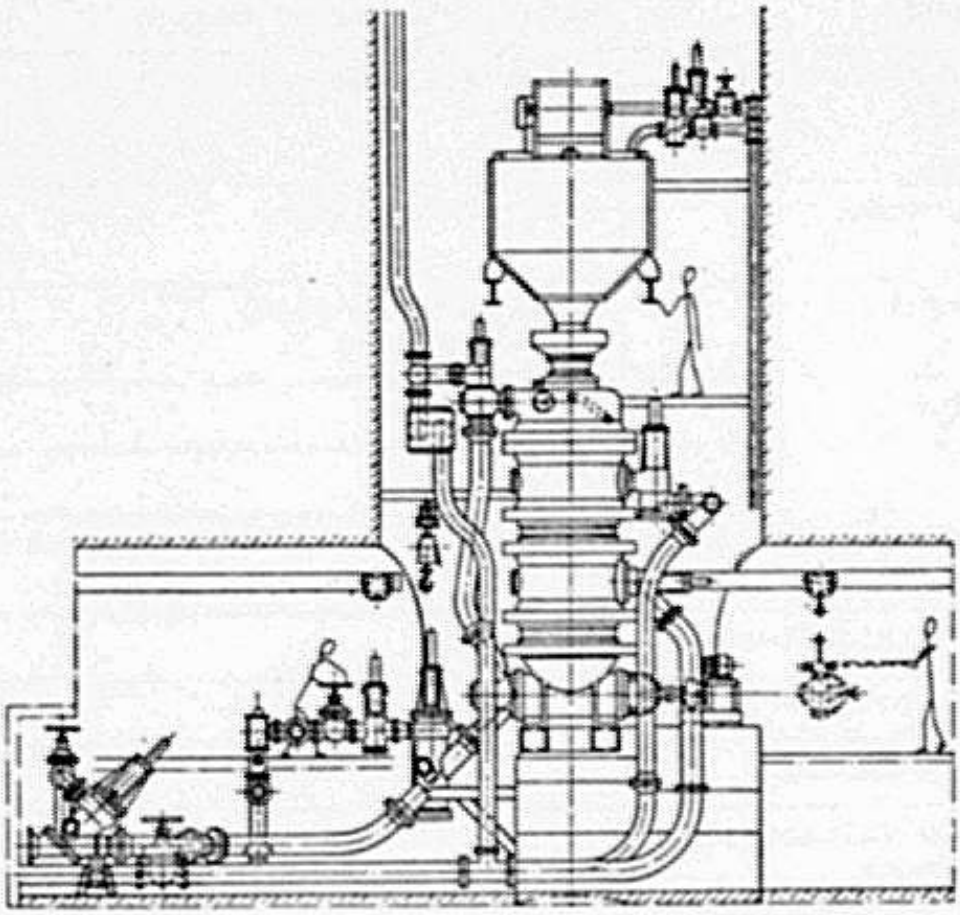


Fig. 12. Shaft pattern of the installation of the GIG-3 feeder.

DATA SHEET 5.14-4
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Valve, Water, High Pressure
B. Country of Origin	Poland
C. Distinguishing Characteristics	Roller Bearing Supported Spindle
2. Function	Must Open and Close Quickly at Full Pressure
3. Designation of Mining Systems for which Applicable	GIG-3 Hydraulic Hoist System
4. Major Components	Spindle, Body, Cover, Seals, Roller Bearings, Control Arm
5. Design Parameters	Operate at Full Pressure (120 ATM) with Slurry, Quick Acting, 80 mm Pipe Size
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	Quick Opening Under Full Pressure
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	480 mm
B. Width	240 mm
C. Height	400 mm
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Main Institute of Mining, Poland
11. Status of Development	In Production Since 1962

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Andaluzja Mine, Main Institute of Mining
16. Type of Control A. Input	Servo-Hydraulic Cylinder
B. Comments	4-way cock can replace 4 valves
17. Reliability	Excellent
18. Safety	Excellent
19. Major Causes of Failure	Corrosion
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	655
25. Drawing(s)	655, p. 43, fig. 13, p. 44, fig. 14
26. Photograph(s)	

DATA SHEET 5.14-5
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Water Sluice Valve Type ZUG
B. Country of Origin	USSR
C. Distinguishing Characteristics	
2. Function	Control pipelines and slurry conduits of hydromines
3. Designation of Mining Systems for which Applicable	Mechanical and hydrualic
4. Major Components	Body, compact wedge, sealing rings, hydraulic actuating mechanism
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKrNIIGidrougol Institute
11. Status of Development	Experimental set of valves built and tested

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	UKrNIIGidrougol
13. Number of Units Manufactured (and Time Period)	Mass Produced
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	Valves closing device is a compact wedge
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	696, p. 55
25. Drawing(s)	
26. Photograph(s)	696, p. 54, fig. 26

Reference 696



Fig.26
Type-ZUG water sluice valve

DATA SHEET 5.14-6
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Disc Gate Valve, Type ZD, ZD-3, ZP-5, 3PR-5
B. Country of Origin	USSR
C. Distinguishing Characteristics	Working surfaces of seal ring are not abraded by slurry in open position
2. Function	Control water and slurry lines in hydromines
3. Designation of Mining Systems for which Applicable	
4. Major Components	Body, disc, seals, level gears, control rod, electric drive or hydraulic drive
5. Design Parameters	
6. Performance Parameters A. Input	Electric motor controlled or hydraulically controlled
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	VNIIGidrougol
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Gidrouglemash
13. Number of Units Manufactured (and Time Period)	Mass produced
14. Using Agency	
15. Designation of Mines where Used	Kuzbass
16. Type of Control A. Input	Two types - either electric or hydraulic motor
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	696, p. 55, 57
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.14-7
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Gate Valve, Type ZE, ZG, GDKOI
B. Country of Origin	
C. Distinguishing Characteristics	
2. Function	Open and close slurry and water pipelines, GDKOI has air bleed
3. Designation of Mining Systems for which Applicable	Mechanical-hydraulic
4. Major Components	Gate seal disc, body, gate lift, rod, bevel gears, open and close handwheel; type ZG has light weight electric drive to operate valve; type ZE has handwheel
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	Made for 200, 250, and 300 mm diameter lines
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKrNIIGidrougol Institute
11. Status of Development	Mass produced

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Kadievskiy Machine Works
13. Number of Units Manufactured (and Time Period)	Mass produced
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	Type ZE manual by handwheel Type ZG electric by motor
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Interchangeable parts with other valves Type GDKOI has air bleed
B. Disadvantages	
24. Pertinent Reference Documents	696, p. 55, 57
25. Drawing(s)	696, p. 56, fig. 25
26. Photograph(s)	

Reference 696

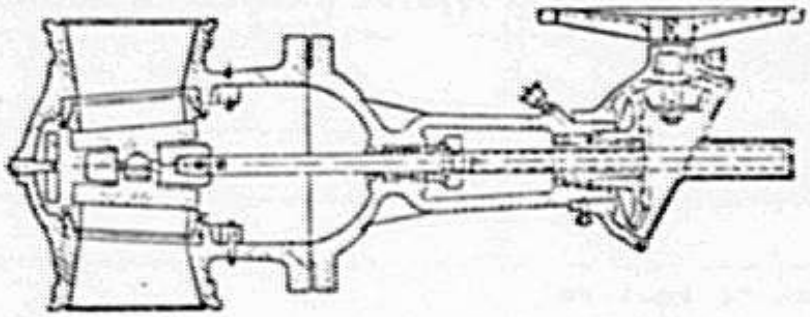


Fig. 25. The ZÉ-type gate valve

DATA SHEET 5.14-8
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Valve, Hydraulically Controlled Type VG
B. Country of Origin	USSR
C. Distinguishing Characteristics	Hydraulic cylinder type valve
2. Function	Open and close pressure line to monitor
3. Designation of Mining Systems for which Applicable	Hydraulic
4. Major Components	Control lever with counterweight piston seals, body, internal gage, upper cavity, lower cavity, sealing rubber ring
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKrNIIGidrougol Institute
11. Status of Development	Mass produced

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Kadiyevskiy Machine Works
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	Hydraulic by line pressure
B. Comments	Can be set in intermediate positions
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	696, p. 56
25. Drawing(s)	
26. Photograph(s)	696, p. 56, fig. 27

Reference 696

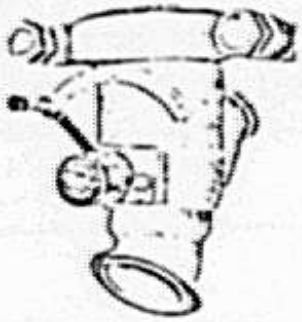


Fig.27
The hydraulically-controlled valve VG

DATA SHEET 5.14-9
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Valve - Piston - Type ZL100
B. Country of Origin	USSR
C. Distinguishing Characteristics	Inclined spindle-piston with pressure relief pilot valve
2. Function	Control high pressure lines
3. Designation of Mining Systems for which Applicable	
4. Major Components	Steel body, lower cover, large valve or screw, small valve and flywheel drive
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	UKrNIIGidrougol
11. Status of Development	Mass produced

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Kadiyev Machine Works
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	To actuate valve, pilot valve first is opened to equalize pressure behind valve
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	696, p. 55
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.14-10
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pipe Coupling, Quick Disconnect
B. Country of Origin	USSR
C. Distinguishing Characteristics	Quick disconnect coupling
2. Function	For ease in extending or shortening water pipelines underground
3. Designation of Mining Systems for which Applicable	
4. Major Components	Two half-collars, welded flanges on pipe ends, tapered locking pin, rubber seal
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	Permits changing length of line in 4-5 min. with 2 men
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	For use with 12 to 14 ft long pipe sections
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Kuznetsk Coal Institute (KusNIUI)
11. Status of Development	Used since 1952 in Tyrgan mine, mass produced

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	VNIIGidrougol
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Widely used
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Quick and reliable
B. Disadvantages	
24. Pertinent Reference Documents	549, p. 11; 739, p. 17-18
25. Drawing(s)	739, p. 18
26. Photograph(s)	

Reference 739

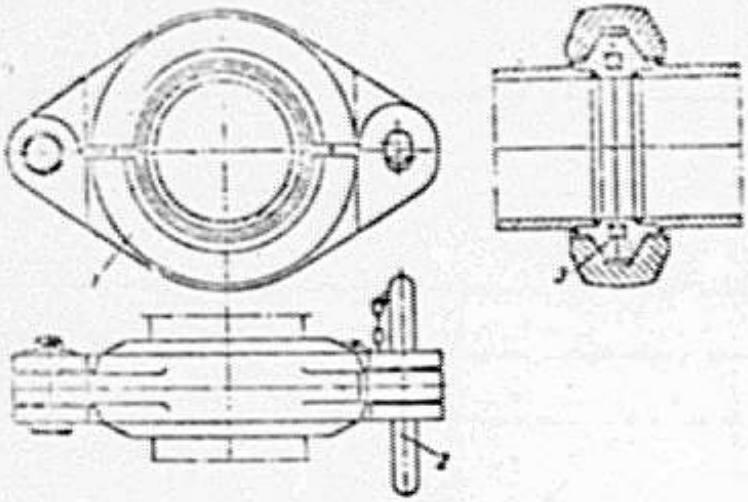
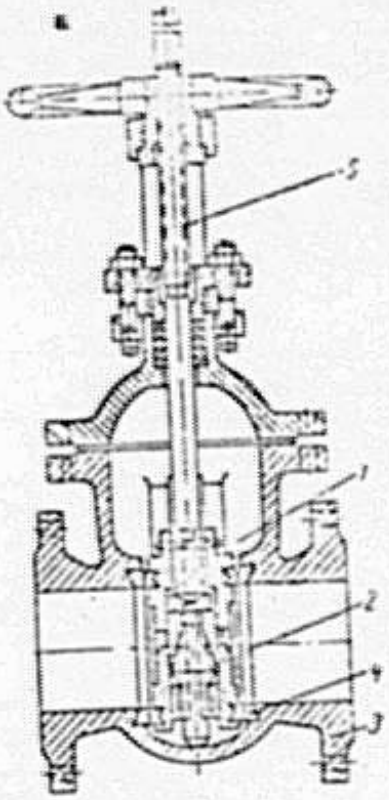


Fig.81. Quick-split connection of pipelines



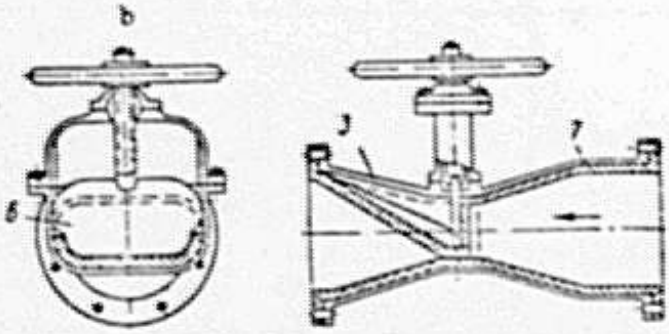


Fig.82. Gates:

a) clinker; b) for slurry; 1) discs; 2) wedge; 3) frame; 4) sealing surface; 5) spindle; 6) gate - valve; 7) rubber sheath.

DATA SHEET 5.15-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Crusher DKU-1
B. Country of Origin	USSR
C. Distinguishing Characteristics	Hammer (Stamp) Crusher
2. Function	Crush coal to less tha 25 to 75 mm from sluices before feeding to slurry sump
3. Designation of Mining Systems for which Applicable	
4. Major Components	Hammer
5. Design Parameters	
6. Performance Parameters A. Input	Drive motor MA-36-41/6, but MA-36-51/6 sh should be used
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In use in 1974

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Yuzhkuzbassugol
15. Designation of Mines where Used	Yubileynoye
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	1083, p. 1
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.15-2
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Crusher DZSH
B. Country of Origin	USSR
C. Distinguishing Characteristics	Toothed (or cogged) roller crusher
2. Function	Crush large lumps of coal or rock (up to 300 mm)
3. Designation of Mining Systems for which Applicable	Hydraulic
4. Major Components	Toothed roller, electric motor, pedestal, carriage, drive belts
5. Design Parameters	Crush lumps of 300 mm diameter to 60 mm diameter or 100 mm diameter
6. Performance Parameters A. Input	Coal or rock up to 300 mm
B. Output	60 mm maximum particle size
C. Performance Capacity	50 tons per hour
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	2550 mm
B. Width	1300 mm
C. Height	1650 mm
8. Weight of Equipment	Crusher only 2000 kg; with electric motor 2940 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Mass produced

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Yasinovatskiy works of the Donetskiy Sovrnarkhoz
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	Charging opening 650 x 550 mm; toothed roller; 600 mm diameter x 600 mm long; rotates at 50 rpm
17. Reliability	
18. Safety	Has shear pin
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
	Powered by electric motor KO-32/8 , 20 kw, 735 rpm
24. Pertinent Reference Documents	1059, p. 47; 739, p. 61
25. Drawing(s)	1059, p. 47, fig. 19
26. Photograph(s)	

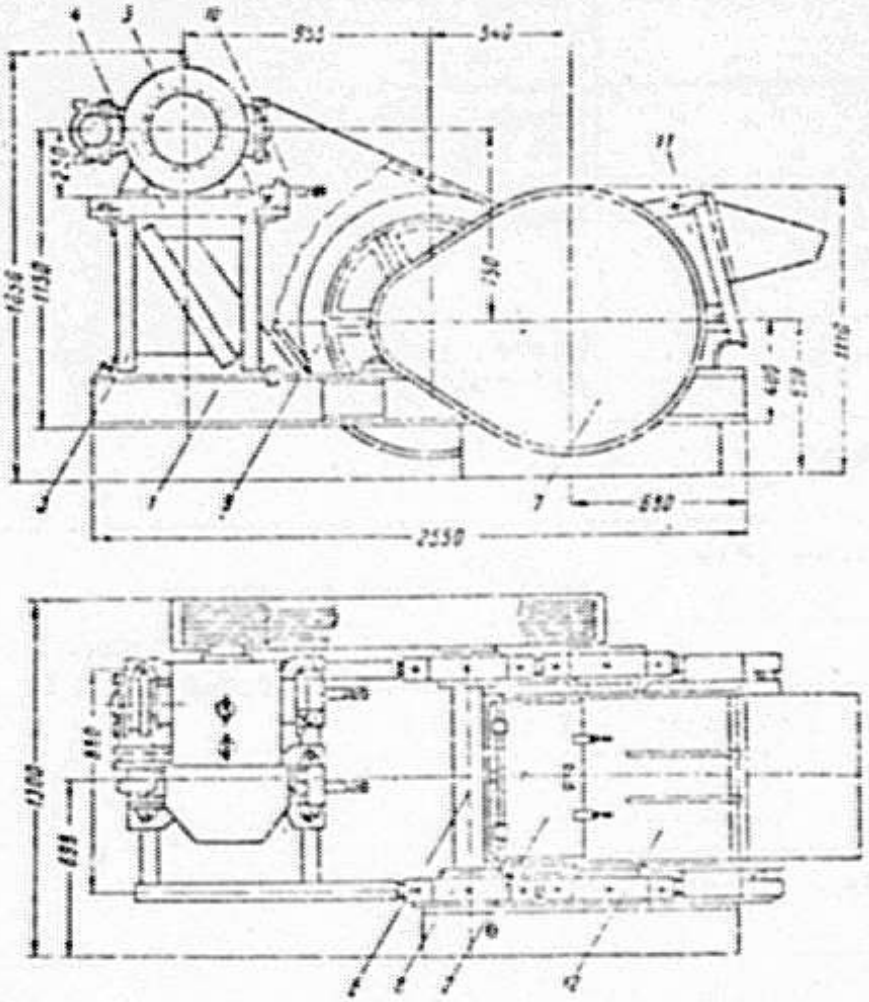


Fig.19. The toothed crusher DZSH

DATA SHEET 5.15-3
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Crusher DMSH, DMSH-1A
B. Country of Origin	USSR
C. Distinguishing Characteristics	Hammer crusher
2. Function	Crush large lumps of coal or rock (up to 300 mm)
3. Designation of Mining Systems for which Applicable	Hydraulic hoist
4. Major Components	Frame, rotor, electric motor, drive belts and pulleys
5. Design Parameters	
6. Performance Parameters A. Input	Coal or rock to 300 mm
B. Output	0-60 mm coal for pump 5SHNV 0-100 mm coal for pump 10UVT
C. Performance Capacity	50 tons/hr
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	2463 mm
B. Width	1400 mm
C. Height	1980 mm
8. Weight of Equipment	Crusher with electric motor 3328 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Mass produced

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Yasinovatskiy Machine Works of the Donetskiy Sovnarkhoz
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	1059, p. 49; 739, p. 61
25. Drawing(s)	1059, p. 50, fig. 20
26. Photograph(s)	

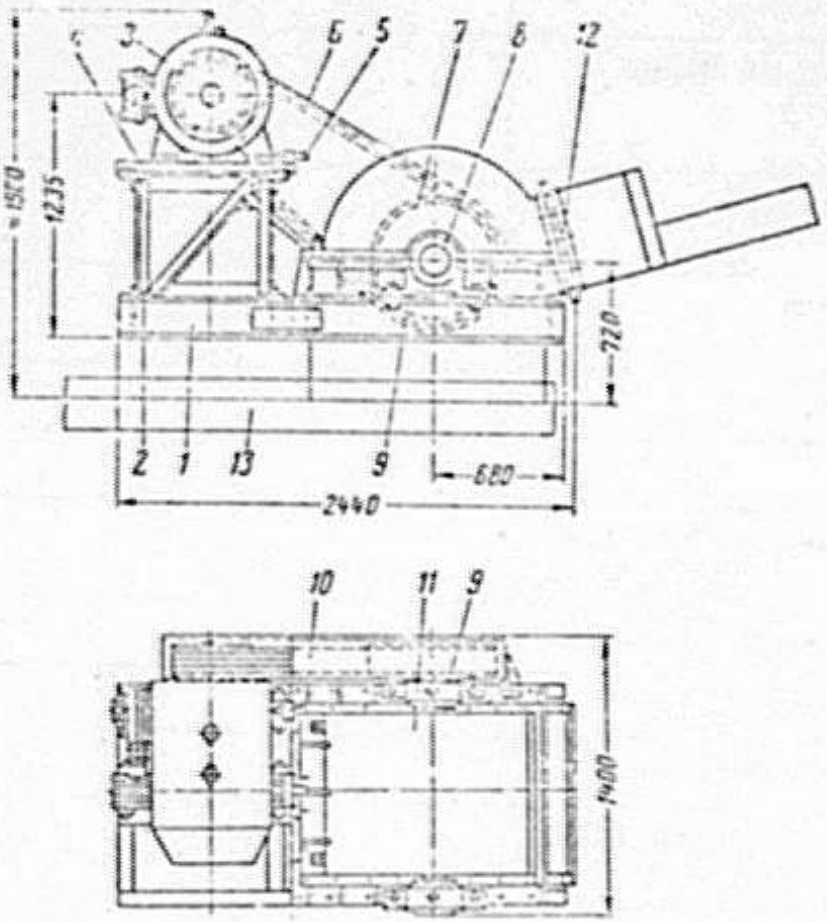


Fig.20. The Crusher DMSH

DATA SHEET 5.15-4
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Cone Crusher KDM-4 (KDMK-4)
B. Country of Origin	USSR
C. Distinguishing Characteristics	
2. Function	Break up oversize coal
3. Designation of Mining Systems for which Applicable	All hydraulic hoisting systems
4. Major Components	Shaft, cone, crushers
5. Design Parameters	
6. Performance Parameters A. Input	350-400 mm lumps
B. Output	50-70 mm
C. Performance Capacity	150 metric tons of coal per hour
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	2400 mm
B. Width	1440 mm
C. Height	1440 mm
8. Weight of Equipment	2500 kg without motor
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	VNIIGidrougol Institute
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Polysayevskaya Northern Colliery, and Tyrganskiye Uklony Colliery both of the Kuzbass
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Improvement over D-2 hammer crusher
B. Disadvantages	
24. Pertinent Reference Documents	678; 549, p. 7; 739, p. 61
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.15-5
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hammer Crusher 40 x 5 mm
B. Country of Origin	Poland
C. Distinguishing Characteristics	
2. Function	Second stage of coal crushing for OWB-200 type pump
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	40 x 5 mm particle size
C. Performance Capacity	30 tons per hour
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In operation

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	646, p. 6, table 6
25. Drawing(s)	
26. Photograph(s)	

Table 6

Type	Efficiency tons per hour	Particle diameter mm	Application
GIG crusher	50	400 × 40	for coal crushing for PLP-150 and WP-200 type pumps, or as first stage of crushing for WWB-200 and OWB-200 type pumps
Hammer crusher	30	40 × 15	as second stage of crushing for WWB-200 type pump
Hammer crusher	30	40 × 5	as second stage of crushing for OWB-200 type pump

DATA SHEET 5.15-6
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	GIG Crusher
B. Country of Origin	Poland
C. Distinguishing Characteristics	Crush coal for PLP-150 and WP-200 type pumps, or as first stage of crushing for WWB-200 and OWB-200 type pumps
2. Function	Hydraulic
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	400 x 40 mm partical size
C. Performance Capacity	50 tons per hour
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In operation

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	646, p. 6, table 6
25. Drawing(s)	
26. Photograph(s)	

Table 6

Type	Efficiency tons per hour	Particle diameter mm	Application
GIG crusher	50	400 × 40	for coal crushing for PŁP-150 and WP-200 type pumps, or as first stage of crushing for WWB-200 and OWB-200 type pumps
Hammer crusher	30	40 × 15	as second stage of crushing for WWB-200 type pump
Hammer crusher	30	40 × 5	as second stage of crushing for OWB-200 type pump

DATA SHEET 5.15-7
DATA ON COMPONENTS AND SUB-SYSTEMS

Reproduced from best available copy.

1. A. Name and Model Number	Hammer Crusher D-2
B. Country of Origin	USSR
C. Distinguishing Characteristics	Rotary Hammer Crusher
2. Function	Break Oversize Coal
3. Designation of Mining Systems for which Applicable	All Hydraulic Hoist Systems
4. Major Components	Casing, Hammer Shaft, Inlet Chute Sizing, Grate
5. Design Parameters	4 Foot Diameter
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	4 Feet 10 Inches
C. Height	4 Feet
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In Production Prior to 1958

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Polysayevskaya Northern Colliery, and Tyrganskiye Uklony Colliery both of the Kuzbass
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	Excessive Degradation of Coal
24. Pertinent Reference Documents	678
25. Drawing(s)	Pp 10, Fig. 9
26. Photograph(s)	

Reference 678

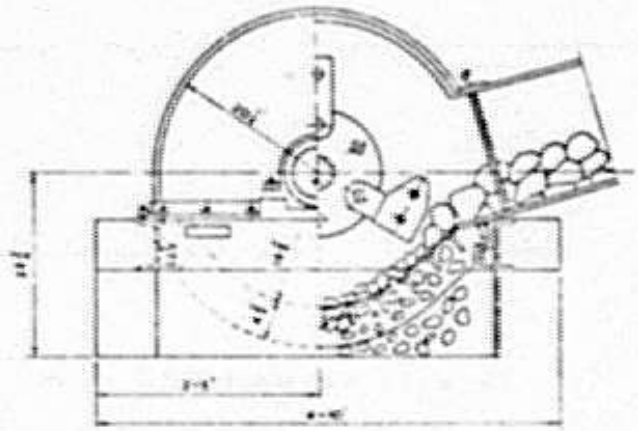


Fig. 9. D-2 hammer crusher.

DATA SHEET 5.15-8
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hammer Crusher 40 x 15 mm
B. Country of Origin	Poland
C. Distinguishing Characteristics	
2. Function	Second stage of coal crushing for WWB-200 type pump
3. Designation of Mining Systems for which Applicable	Hydraulic
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	40 x 15 mm particle size
C. Performance Capacity	30 tons per hour
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In operation

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	646, p. 6, table 6
25. Drawing(s)	
26. Photograph(s)	

Table 6

Type	Efficiency tons per hour	Particle diameter mm	Application
GIG crusher	50	400 × 40	for coal crushing for PLP-150 and WP-200 type pumps, or as first stage of crushing for WWB-200 and OWB-200 type pumps
Hammer crusher	30	40 × 15	as second stage of crushing for WWB-200 type pump
Hammer crusher	30	40 × 5	as second stage of crushing for OWB-200 type pump

DATA SHEET 5.15-9
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Crusher "KOAL KING" Ring Type Granulator
B. Country of Origin	USA
C. Distinguishing Characteristics	
2. Function	Secondary crushing of coal at mine
3. Designation of Mining Systems for which Applicable	
4. Major Components	Frame, cage, screen, rotor assembly, crushing rings, bearings, tramp iron trap
5. Design Parameters	
6. Performance Parameters A. Input	From 350 to 1600 hp Maximum coal feed size 6 in.
B. Output	
C. Performance Capacity	From approximately 700 to 3000 tons per hour
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	8 ft 3 1/4 in. to 12 ft 11 5/8 in.
B. Width	7 ft 10 1/8 in. to 15 ft 6 1/8 in.
C. Height	5 ft 3 3/4 in. to 8 ft. 3 in.
8. Weight of Equipment	23,000 to 101,500 lbs
9. Cost (and Year of Cost Evaluation and Basis for Costs)	$5,000 to $100,000
10. Developing Agency	
11. Status of Development	Manufactured to order

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Pennsylvania Crusher Corporation
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.15-10
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Dewatering Feeder (&creen) OP-1
B. Country of Origin	USSR
C. Distinguishing Characteristics	Short twin-chain conveyor with fixed longitudinal grating
2. Function	Separate large lump coal to feed to crusher (e.g., KDMK-4 crusher)
3. Designation of Mining Systems for which Applicable	
4. Major Components	Twin-chain conveyor, grating
5. Design Parameters	
6. Performance Parameters A. Input	Run-of-mine coal and water slurry
B. Output	Lump coal over 50 to 70 mm to crusher
C. Performance Capacity	150 metric tons/hr - run-of-mine coal
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	2000 mm
B. Width	1046 mm
C. Height	536 mm
8. Weight of Equipment	800 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	VNIIgidrougol
11. Status of Development	Production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	739, p. 61
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.16-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	High Pressure Water Pumping Station
B. Country of Origin	USSR
C. Distinguishing Characteristics	Fixed output station using 4 high pressure centrifugal pumps, two 8NDV pumps and one "type Komsomolets" pump (KSM) with electric motors
2. Function	Pump clear liquids (Mine Water)
3. Designation of Mining Systems for which Applicable	Using monitors
4. Major Components	
5. Design Parameters	Station complete with mine water reservoirs, coal settling tanks & pump-over coal pumping stations feeding the slurry to the preparation plant
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	See attached pages for estimates of U.S. equivalents
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	742, p. 9, fig. 122
25. Drawing(s)	
26. Photograph(s)	

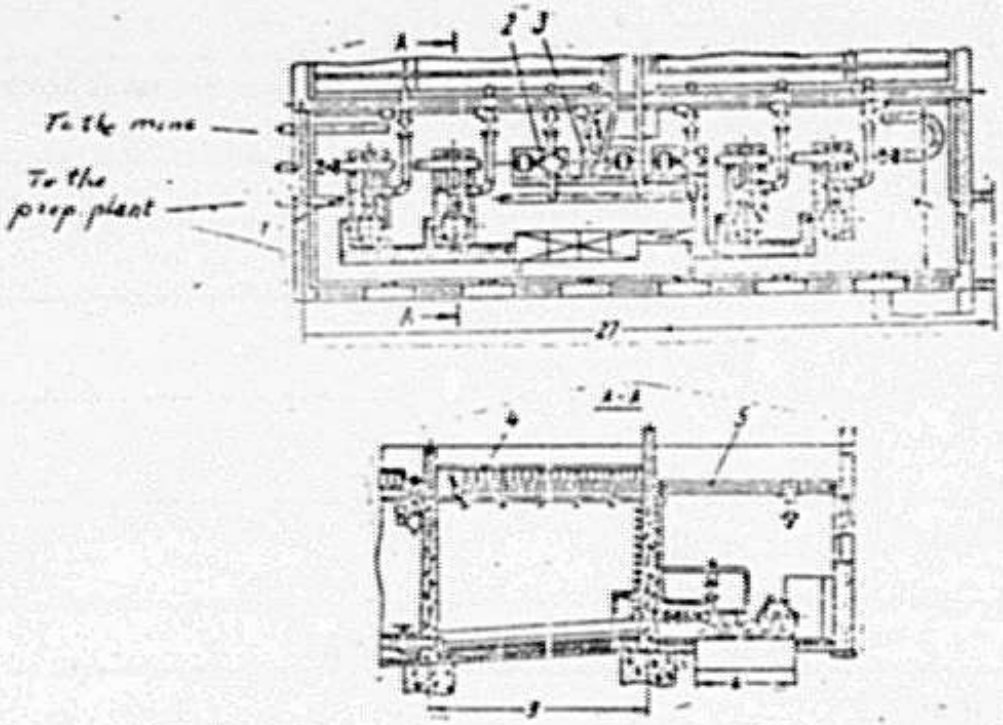


Fig.122. High-Pressure Pumping Station

1) main centrifugal pump; 2) 8NDV pump; 3) KSN-pump; 4) hydro-monitor; 5) crane-girder of 3 t loading capacity

DATA SHEET 5.16-2
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pump Sigma BVA/VIII-HD
B. Country of Origin	Czechoslovakia
C. Distinguishing Characteristics	Two stage centrifugal pump
2. Function	Provide high pressure water to monitors
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	530 kw
B. Output	180 m^3/hr head of 551 m
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Ministry of Fuels
11. Status of Development	1958

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Institute for Pit Mechanisation, Prague (UDM)
15. Designation of Mines where Used	Czech Army Mine, Seam 24
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	543, p. 4
25. Drawing(s)	543, p. 12, fig. 4
26. Photograph(s)	

DATA SHEET 5.16-3

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pump HD (Clean Water); OHD (Muddy Water)
B. Country of Origin	Czechoslovakia
C. Distinguishing Characteristics	
2. Function	Pump clean water (HD) Pump muddy water (OHD)
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Ministry of Fuels
11. Status of Development	1958

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Institute for Pit Mechanisation, Prague (UDM)
15. Designation of Mines where Used	Czechoslovak Army Mine, Seam 24
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	Pump HD proved highly defective due to the impurity of water. Adjustments to the pumps eliminated the problems. OHD pumps are more suitable for mine service.
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	543, p. 4
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.16-4
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pump, Water, OW-200
B. Country of Origin	Poland
C. Distinguishing Characteristics	Centrifugal
2. Function	Feed monitor, washout shot-fired run-of-mine coal for transport in flumes with large difference between level of pump station & face
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	210-240 kw
B. Output	240 m^3/hr (1050 gpm)
C. Performance Capacity	195-220 m head (640-720 ft)
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Operational

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	646
25. Drawing(s)	646, p. 2, table 1
26. Photograph(s)	

Table 1

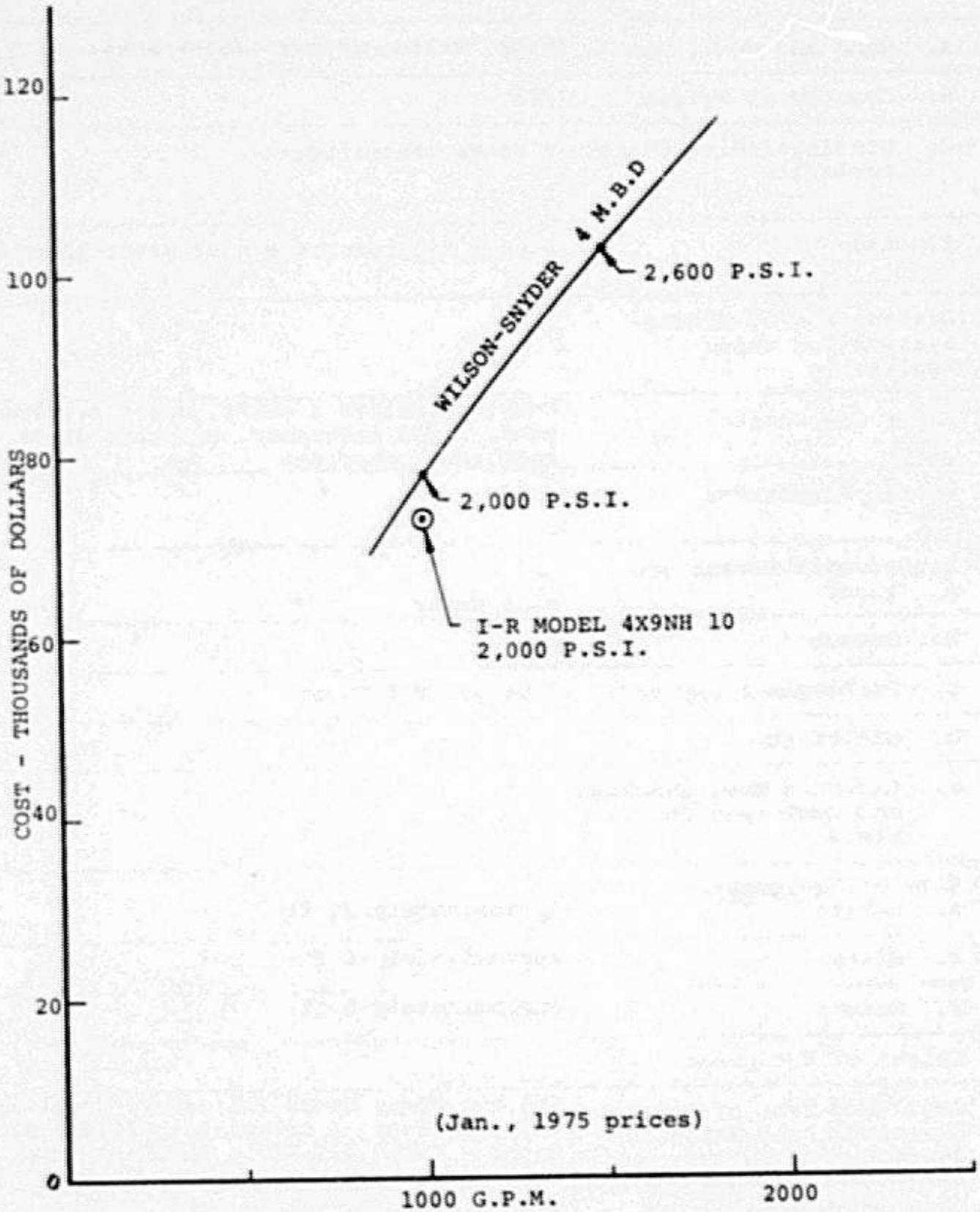
Type	Working parameters		Power	Application
	Q cu m/min	H m H_2O	kw	
OS-150	2.5	40—230	20—160	washing out fired run-of-mine coal with high angle of slope
OS-200	4	40—160	45—170	washing out fired run-of-mine coal and transporting in troughs
OW-200	4	185—220	210—240	washing out fired run-of-mine coal and transporting in troughs with a considerable difference between the levels of the pump station and the field
OW -200/10	4	640	740	processing of fissured or compact coals during loosening blasts

DATA SHEET 5.16-5
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pump, High Pressure, I-R 4x9NH10
B. Country of Origin	USA
C. Distinguishing Characteristics	Multistage centrifugal
2. Function	Supply high pressure mine water to monitors
3. Designation of Mining Systems for which Applicable	
4. Major Components	Case, impellers & shaft, bearings, lube oil pump, speed increaser, electric drive motor, coupling, baseplate
5. Design Parameters	
6. Performance Parameters A. Input	Mine water
B. Output	
C. Performance Capacity	1000 gpm @ 2000 psi
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	Approximately 20 ft
B. Width	Approximately 5 ft
C. Height	Approximately 6 ft
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	Pump $25,000, Couplings $2000, 2000 hp electric motor $33,000, speed increaser $5000, baseplate & motor $5,000, TOTAL $73,000
10. Developing Agency	
11. Status of Development	Built to order, approximately 9-12 months delivery time

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Ingersoll-Rand - Cameron Pump Division, Philipsburg, New Jersey
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	Impeller corrosion, bearing wear
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Less expensive than piston or plunger pumps
B. Disadvantages	
24. Pertinent Reference Documents	1045
25. Drawing(s)	
26. Photograph(s)	



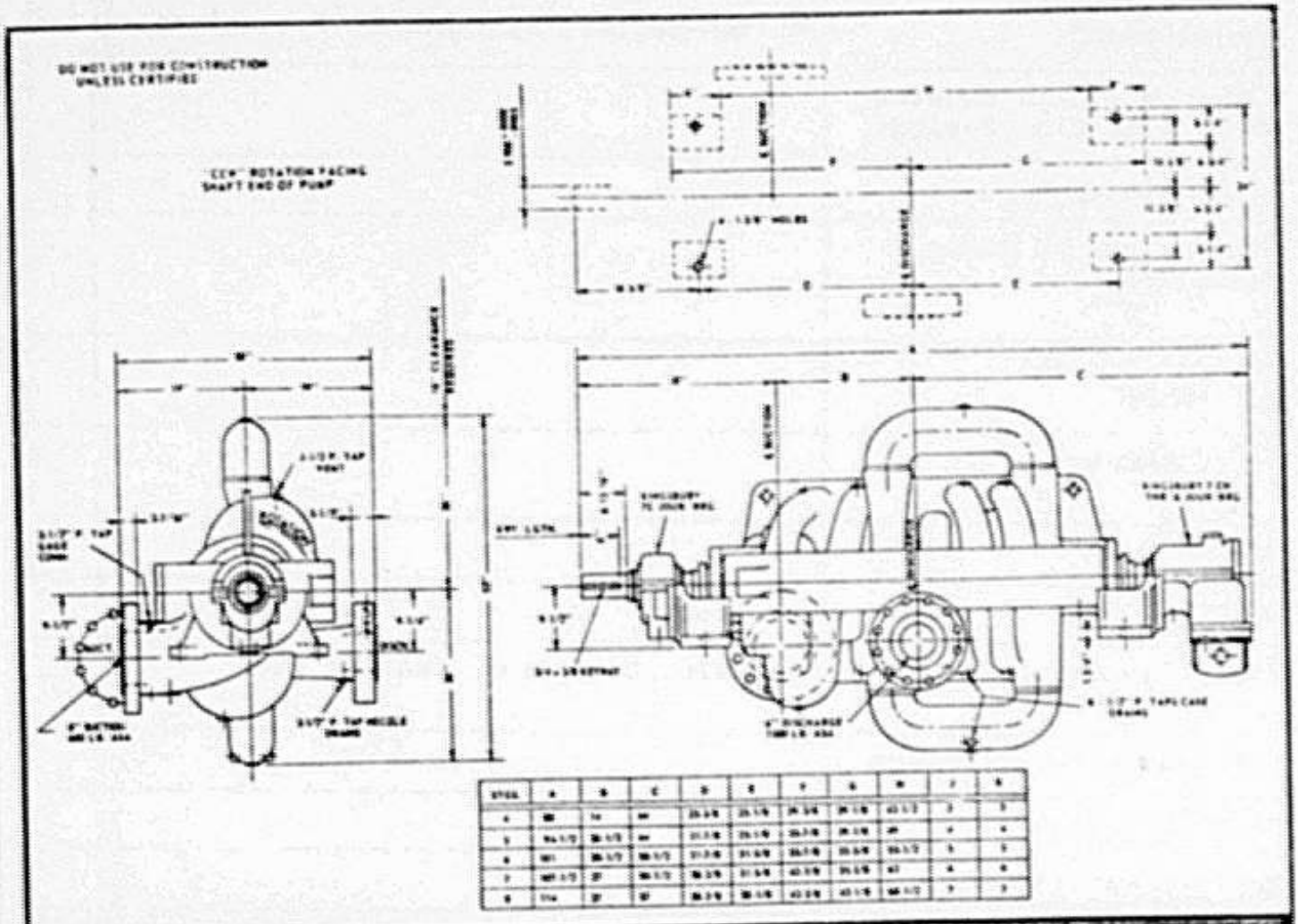
COST OF HIGH PRESSURE HYDROMONITOR FEED PUMP, MULTI-STAGE CENTRIFUGAL, INCLUDING ELECTRIC MOTOR, SPEED INCREASER AND FRAME.

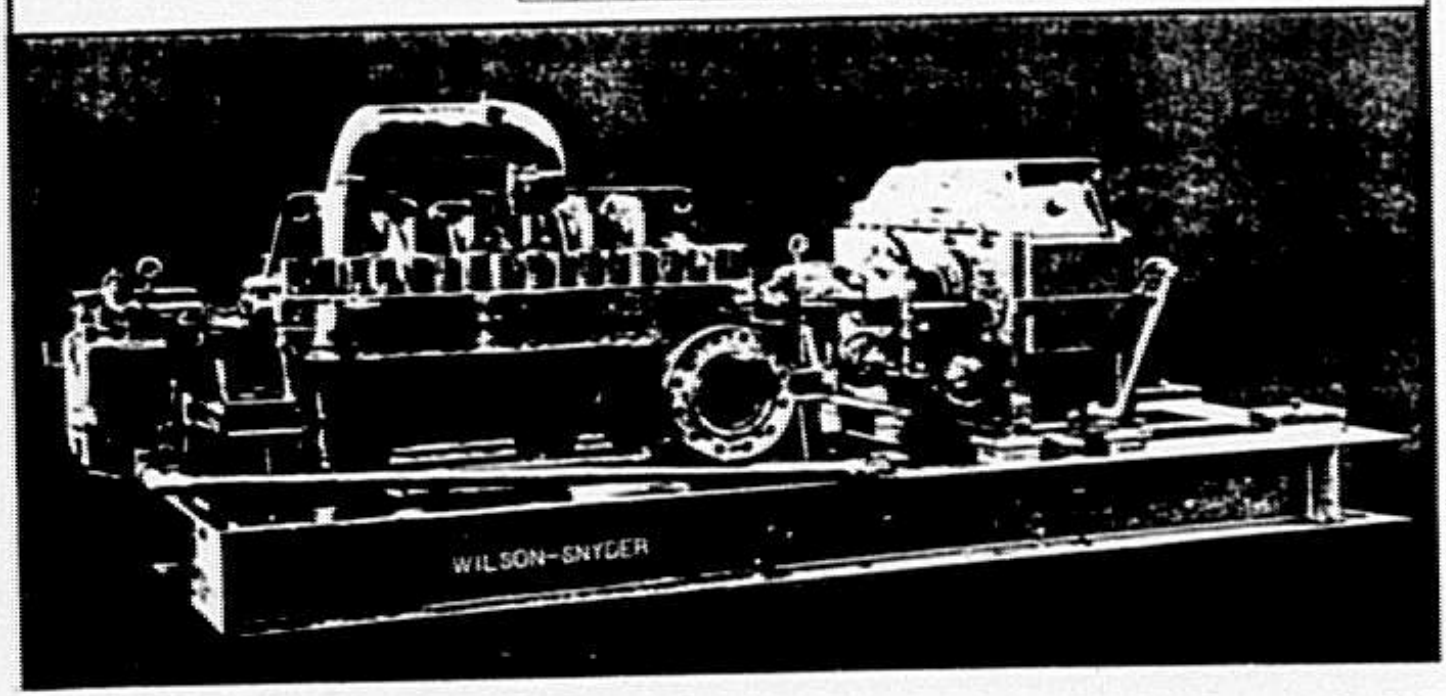
DATA SHEET 5.16-6
DATA ON COMPONENTS AND SUB-SYSTEMS

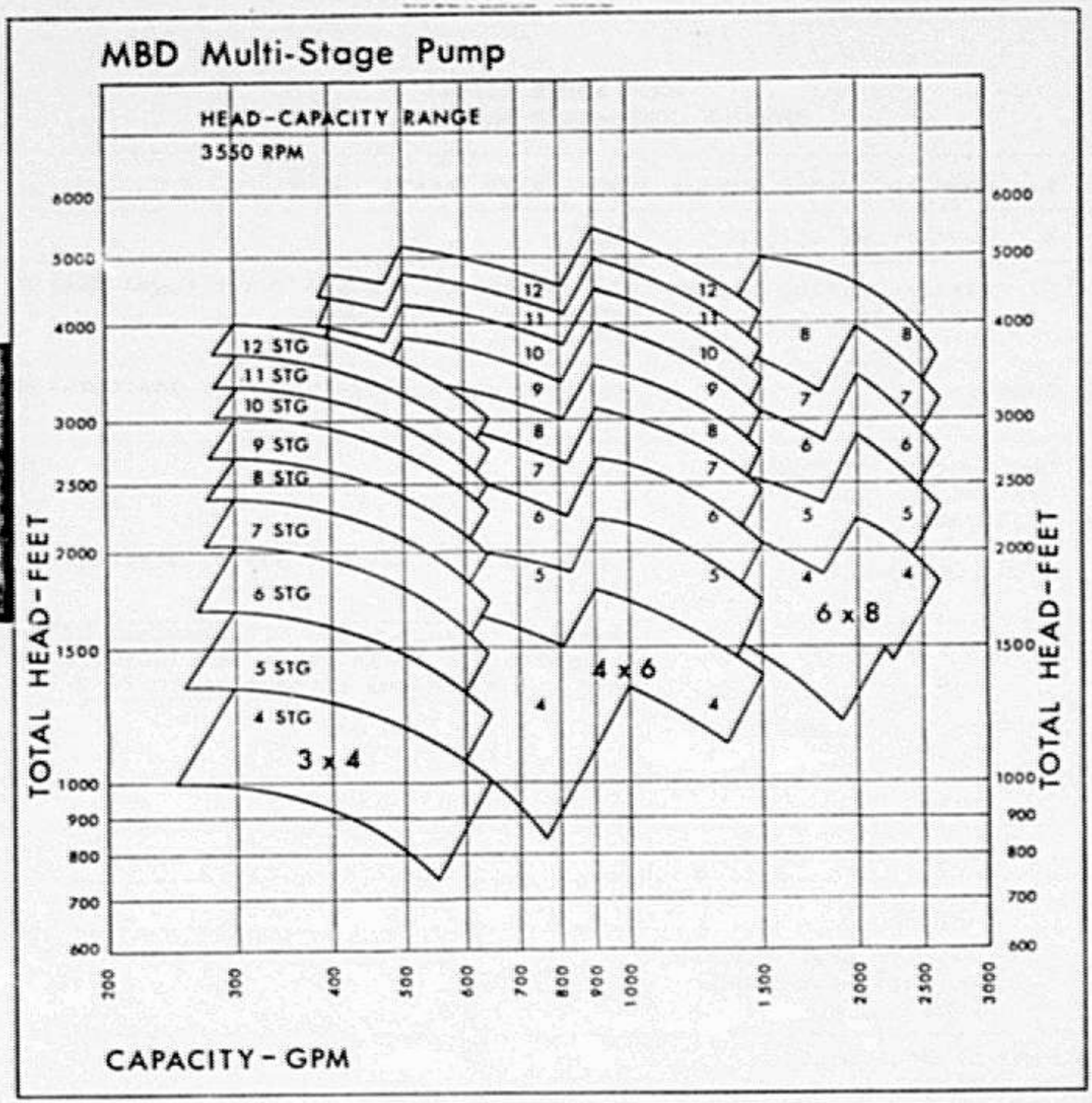
1. A. Name and Model Number	Pump, Wilson-Snyder 4MBD-9 stage
B. Country of Origin	USA
C. Distinguishing Characteristics	9 stage centrifugal
2. Function	Supply high pressure mine water to monitors
3. Designation of Mining Systems for which Applicable	
4. Major Components	Case, impellers & shaft, bearings, lube-oil pump, speed increaser, electric drive motor, coupling, baseplate
5. Design Parameters	
6. Performance Parameters A. Input	Mine Water
B. Output	
C. Performance Capacity	1000 gpm @ 2000 psi
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	Approximately 20 ft
B. Width	Approximately 6 ft
C. Height	Approximately 6 ft
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	$56,000 Pump, Speed Increaser, Coupling, Coupling Guard & Baseplate; $21,820 Electric Motor - TOTAL $77,820 - January, 1975
10. Developing Agency	Wilson-Snyder
11. Status of Development	Made to order (80 weeks delivery)

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Wilson-Snyder, Pittsburgh, Pennsylvania
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	Impeller Corrosion; bearing wear
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Less expensive than piston or plunger pumps
B. Disadvantages	
24. Pertinent Reference Documents	1046
25. Drawing(s)	1046
26. Photograph(s)	1046




WILSON-SNYDER



SCOPE OF STANDARD LINE

Discharge (Inches)	Suction (Inches)	Number of Stages	First Stage Double or Single Suction
6	8	5-8	Double
4	6	5-12	Double
3	6	4-12	Optional
3	4	4-12	Single

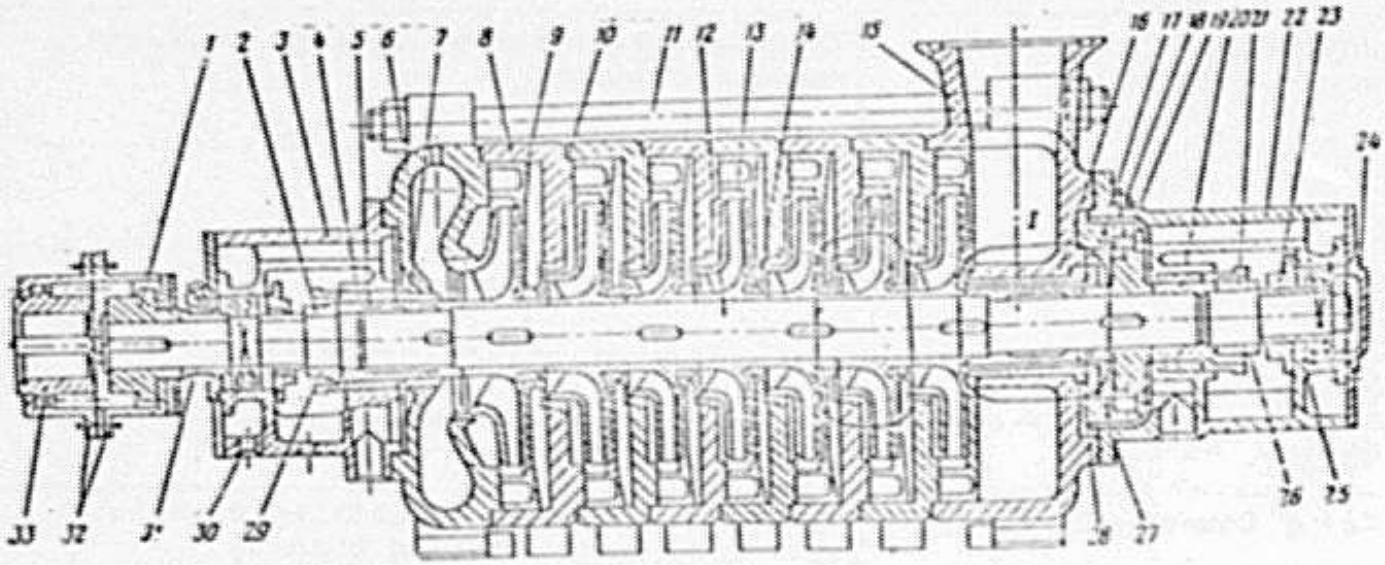
DATA SHEET 5.16-7
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pump, Mine Water, 12MSG-7
B. Country of Origin	USSR
C. Distinguishing Characteristics	High pressure, 7 stage centrifugal mine or industrial water pump
2. Function	Supply high pressure water to monitors, etc.
3. Designation of Mining Systems for which Applicable	
4. Major Components	Impellers (7), casing, shaft, bearings, packings
5. Design Parameters	Designed to pump water with maximum of 35 gram/liter of solid particles (Often used with higher solids content up to 74 g/l
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Kemerovskiy MNIIPTmash
11. Status of Development	Wear resisting parts tested Feb. to July 1973 (1344 hrs) at "Krasnogorskaya" Mine High pressure station

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Central Electromechanical Shops (TSEMM) of Kuzbassgidrougol Trust
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Krasnogorskaya hydromine high pressure pumping station
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	Hydroseal bushing, throttling bushing, hydroheel ring, bearing bushing
20. Maintenance Requirement	Uses ICHKH20RB alloy to increase wear life two-fold
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	833 (authors V.N. Malyshev, B.F. Balashov "UGOL" # 11, p. 45-46, 1974)
25. Drawing(s)	833, p. 2 (translated copy)
26. Photograph(s)	

Reference 833



General view in cutaway of the multisectional pump 12MSG-7

1) pump's bushing; 2) nut; 3) front bracket; 4) hemp packing; 5) shaft's casing; 6) intake cover; 7) hydroseal bush; 8) frame of the guide apparatus; 9) guide apparatus; 10) packing; 11) Coupling pins (studs); 12) pump's shaft; 13) running wheels; 14) packing rings; 15) delivering cover (?); 16) throttling bushing; 17) regulating ring; 18) ring; 19) hydroheel disc; 20) bushing; 21)nut; 22) rear bracket; 23) labyrinth packing; 24) hydroheel ring; 25) discharge bushing; 26) aperture; 27) bushing; 28) cover; 29) bush bearing; 30) 31) lock-nuts; 32) race; 33) drive bushing

DATA SHEET 5.16-8
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pump, Water, OW-200/10
B. Country of Origin	Poland
C. Distinguishing Characteristics	
2. Function	Feed monitor for processing of fissured or compact coal after loosening blasts
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	740 kw
B. Output	4 m^3/min with head of 640 meters
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In operation

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	646
25. Drawing(s)	646, p. 2, table 1
26. Photograph(s)	

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Table 1

Type	Working parameters		Power	Application
	Q cu m/min	H m H_2O	kw	
OS-150	2.5	40—230	22—160	washing out fired run-of-mine coal with high angle of slope
OS-200	4	40—160	45—170	washing out fired run-of-mine coal and transporting in troughs
OW-200	4	195—220	210—240	washing out fired run-of-mine coal and transporting in troughs with a considerable difference between the levels of the pump station and the field
OW -200 10	4	640	740	processing of fissured or compact coals during loosening blasts

DATA SHEET 5.16-9
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pump, water OS-150
B. Country of Origin	Poland
C. Distinguishing Characteristics	
2. Function	Feed monitor to wash out shot-fired run-of-mine coal with high angle of slope
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	28-106 kw
B. Output	2.5 m^3/min with head of 40 to 230 meters
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In operation

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	646
25. Drawing(s)	646, p. 2, table 1
26. Photograph(s)	

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Table 1

Type	Working parameters		Power	Application
	Q cu m/min	H m H_2O	kw	
OS-150	2.5	40—200	25—160	washing out fired run-of-mine coal with high angle of slope
OS-200	4	40—160	45—170	washing out fired run-of-mine coal and transporting in troughs
OW-200	4	180—220	210—240	washing out fired run-of-mine coal and transporting in troughs with a considerable difference between the levels of the pump station and the field
OW-200/10	4	640	740	processing of fissured or compact coals during loosening blasts

DATA SHEET 5.16-10
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pump, water OS-200
B. Country of Origin	Poland
C. Distinguishing Characteristics	
2. Function	Feed monitor to wash out shot-fired run-of-mine coal and transport it in troughs
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	45-170 kw
B. Output	4 m^3/min with head of 40-160 m
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In operation

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	646
25. Drawing(s)	646, p. 2, table 1
26. Photograph(s)	

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Table 1

Type	Working parameters		Power	Application
	Q cu m/min	H m H_2O	kw	
OS-150	2.5	40—230	2[illegible]—160	washing out fired run-of-mine coal with high angle of slope
OS-200	4	4[illegible]—160	4[illegible]—170	washing out fired run-of-mine coal and transporting in troughs
OW-200	4	195—225	210—240	washing out fired run-of-mine coal and transporting in troughs with a considerable difference between the levels of the pump station and the field
OW -200/10	4	640	740	processing of fissured or compact rocks during loosening blasts

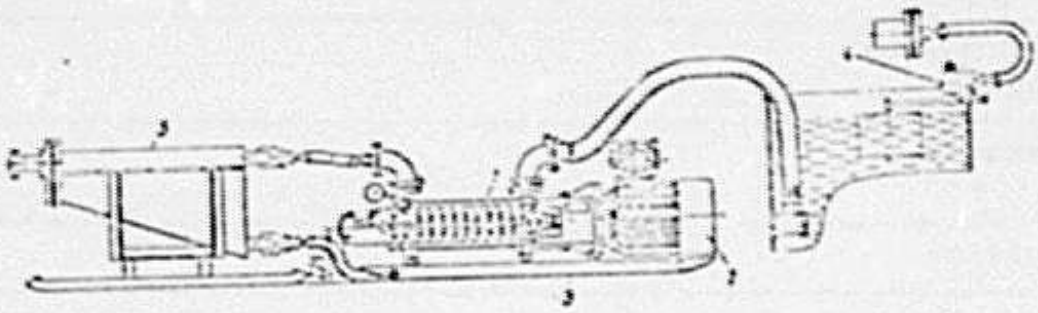
DATA SHEET 5.16-11
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pumping Installation "UTSMN"	
B. Country of Origin	USSR	
C. Distinguishing Characteristics		
2. Function	Provide water for sprinkler systems of stoping combines for dust suppression	
3. Designation of Mining Systems for which Applicable	All	
4. Major Components	TSMN 10 stage centrifugal pump, mounting frame, electric motor BAO 51-2 liquid level regulator RU, filter FSHIM, connecting & plumbing fittings	
5. Type of Pump (# of Stages)	HUMS-30M,ZMS10 (8)	UTSMN-TSMN (10)
6. Performance Parameters A. Input Electric Motor	BAO72-2, 30 kw, 2950 rpm	BAO51-2, 10 kw, 2920 rpm
B. Output - Working Zone of Sprinkler System	40 l/min, press. 22 kg/cm^2	80 l/min, press. 18-23 kg/cm^2
C. Performance Capacity	For stoping combines with output up to 2.5 tons/min (MK-67, 1K-101, KIROVETS, etc.)	
D. Efficiency	8-16%	24-30%
E. Limiting Environmental and Coal Seam Conditions		
7. Size of Equipment (without FISHM Filter) A. Length	2600 mm	1850 mm
B. Width	895 mm	488 mm
C. Height	925 mm	665 mm
8. Weight of Equipment	1070 kg	532 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)		
10. Developing Agency	Dongiprouglemash	
11. Status of Development	800 hrs tests	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Atkarsk Machine Works "UDARNIK"
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	"Krasnoarmeyskugol" Combine
15. Designation of Mines where Used	Industrial tests in mines "Rodinskaya" - MK-67 cutter loader, "Dimitrov's" - IK-101 combine
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	829.
25. Drawing(s)	829, p. 1
26. Photograph(s)	

Reference 829



Pumping installation USSR

DATA SHEET 5.16-12
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pump, Multi-Stage Centrifugal - Ebara
B. Country of Origin	Japan
C. Distinguishing Characteristics	7 stage centrifugal
2. Function	Feed monitors
3. Designation of Mining Systems for which Applicable	
4. Major Components	Shaft, impellers (7), base, housing, 8 in. suction diameter
5. Design Parameters	
6. Performance Parameters A. Input	Mine Water 2500 hp
B. Output	Up to 1500 gpm at up to 2200 psi
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In use prior to 1974

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Ebara Manufacturing Co., Ltd., 11 Haneda Asahi-Cho, Ota-Ku Tokyo, Kamata-Tokyo, Japan
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Kaiser Resources, Ltd.
15. Designation of Mines where Used	Sparwood Mine, British Columbia (Kaiser Hydraulic Mine # 1)
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	834, p. 95; 1100
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.16-13
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pump, Reciprocating, High Pressure, Water , Wilson-Snyder 125 HP
B. Country of Origin	USA
C. Distinguishing Characteristics	Triplex single acting horizontal plunger pump
2. Function	Supply high pressure water to monitor
3. Designation of Mining Systems for which Applicable	
4. Major Components	Pump, bypass choke valve, shear pin, filter relief valve, pressure gage, water-meter, drive belts, electric motor
5. Design Parameters	
6. Performance Parameters A. Input	125 hp, 440 v, V-belt drive motor
B. Output	
C. Performance Capacity	40 gpm at 4500 psi
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	10.5 ft Pump plus drive motor and accessory equipment
B. Width	5.5 ft Pump plus drive motor and accessory equipment
C. Height	6 ft Pump plus drive motor and accessory equipment
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Bureau of Mines
11. Status of Development	Tested 1961

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Wilson-Snyder
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Northern Pacific Railway Company
15. Designation of Mines where Used	Roslyn # 9 Mine, Roslyn, Washington
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	Pushbutton & deadman switch bolted to monitor, pressure relief valve set to 5000 psi
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	49, p. 7; 155, p. 75
25. Drawing(s)	49, p. 7, fig. 5
26. Photograph(s)	

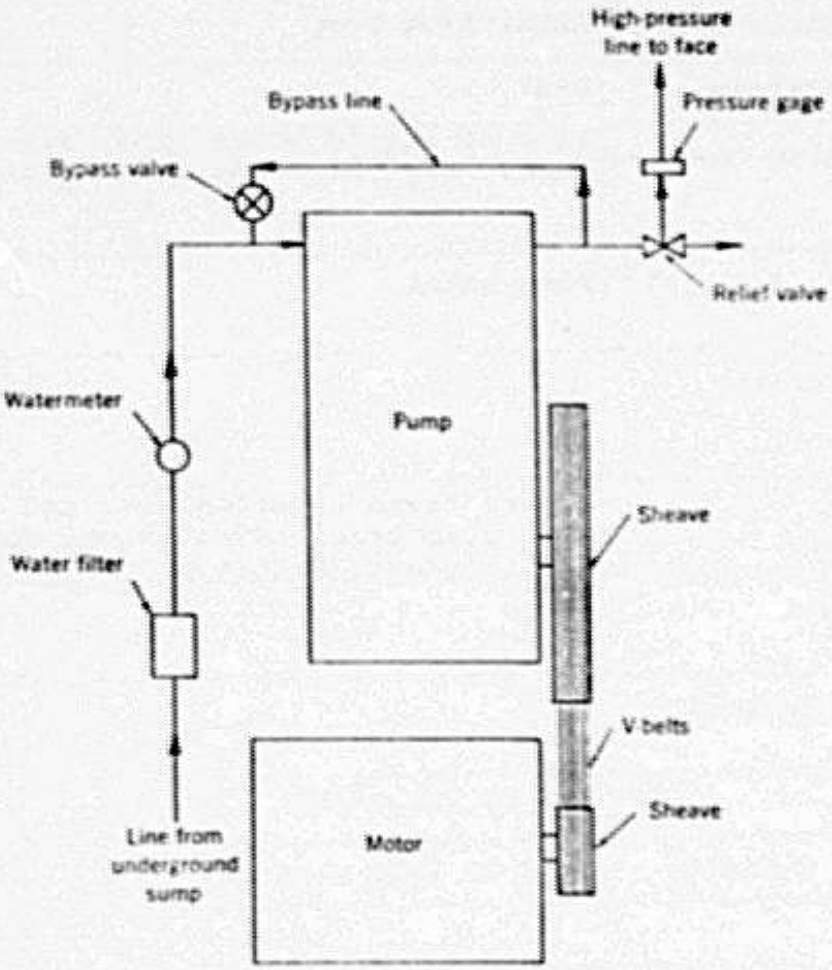


FIGURE 5. - Schematic Layout of Pumping Unit.

DATA SHEET 5.16-14
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Axial Flow Pump
B. Country of Origin	USSR
C. Distinguishing Characteristics	Flow of liquid moves along axis of running wheel; has rotor and stator vanes
2. Function	Pump water
3. Designation of Mining Systems for which Applicable	
4. Major Components	Rotor, frame, suction box, and pressure box with discharge installation, running wheel, stator vanes, bearings
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	200 to 300 m^3/hr
C. Performance Capacity	Head to 1050 m water
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	742
25. Drawing(s)	742, p. 7, fig. 119, p. 8, fig. 120
26. Photograph(s)	

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Reference 742

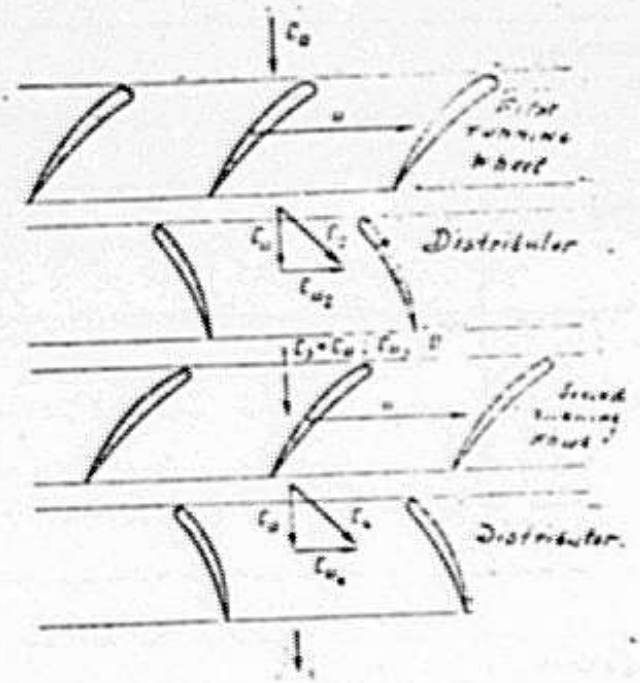


Fig. 119. Network of vanes of running wheels and distributors

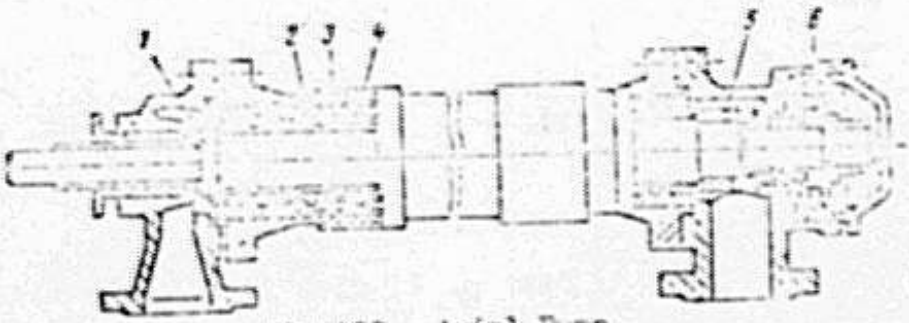


Fig. 120. Axial Pump

DATA SHEET 5.16-15
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	High Pressure Water Pump - Aldrich
B. Country of Origin	USA
C. Distinguishing Characteristics	Nonuplex vertical plunger pump
2. Function	Supply water to monitor from surface installation
3. Designation of Mining Systems for which Applicable	
4. Major Components	Nine plungers, motor, controls
5. Design Parameters	2 1/4 in. bore - 7 in. stroke; synchronous motor drive
6. Performance Parameters A. Input	1000 hp - 2300 volt AC
B. Output	300 gpm at 5000 psi
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Used fresh water to avoid corrosion
7. Size of Equipment A. Length	19 ft
B. Width	7 ft
C. Height	9 ft
8. Weight of Equipment	33 tons
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	U.S. Bureau of Mines & Glen Alden Coal Co.
11. Status of Development	Tested in 1961-62

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Aldrich Pump Division, Ingersoll-Rand
13. Number of Units Manufactured (and Time Period)	One
14. Using Agency	BuMines and Glen Alden Coal Co.
15. Designation of Mines where Used	Sugar Notch Mine, Pennsylvania
16. Type of Control A. Input	Controlled from jumbo operator's cab
B. Comments	Uses bypass of flow
17. Reliability	Good
18. Safety	Met BuMines safety code
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	164
25. Drawing(s)	
26. Photograph(s)	164, p. 5

DATA SHEET 5.19-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hydraulic Excavator (Dredge) ZGM-2M
B. Country of Origin	USSR
C. Distinguishing Characteristics	
2. Function	Such coal slurry from mine sump and feed to main coal pumps for hoisting
3. Designation of Mining Systems for which Applicable	
4. Major Components	Probably a jet pump
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Yubileynoye, Kuzbass
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	1083, p. 1-2
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.19-2
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pressure Intensifier GRPD
B. Country of Origin	USSR
C. Distinguishing Characteristics	Auto-oscillation produces high pressure pulses by water-hammer effect
2. Function	Break coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Oscillation generator, discharger, pipeline and barrel
5. Design Parameters	Uses water-hammer effect to attain high pressure pulses
6. Performance Parameters A. Input	
B. Output	Pulse frequency depends on length of pipeline
C. Performance Capacity	60-100 kg/cm^2
D. Efficiency	GRPD with discharger pressure of 60kg/cm^2 is more effective then monitor at pressure of 90-100 kg/cm^2
E. Limiting Environmental & Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Donets Polytechnical Institute
11. Status of Development	Experimental

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	Automatic - Oscillation
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 22
25. Drawing(s)	738, p. 22, fig. 66
26. Photograph(s)	

Reference 738

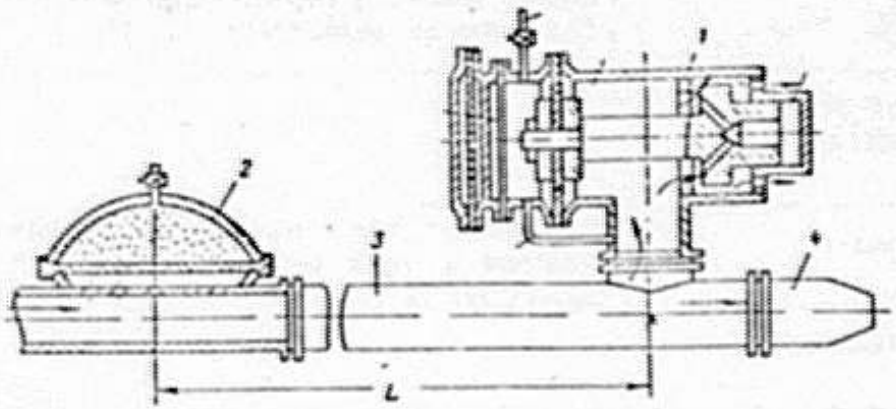


Figure 66.
DESIGN OF THE WATER-HAMMER PRESSURE INTENSIFIER, THE GRPD.

DATA SHEET 5.19-3
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pressure Intensifier (PDG)
B. Country of Origin	USSR
C. Distinguishing Characteristics	Double-acting pressure area intensifier operated by mine water
2. Function	Raise water pressure to 200 to 400 kg/cm^2 for use in monitors
3. Designation of Mining Systems for which Applicable	
4. Major Components	Two each: high pressure plungers, cylinders, valves & double-acting low pressure piston, cylinder & distributor with slide valves
5. Design Parameters	
6. Performance Parameters A. Input	Water from pipe network at 80 to 90 kg/cm^2
B. Output	Pressure = 400 kg/cm^2, waste water at 10 to 15 kg/cm^2
C. Performance Capacity	With input at 70 kg/cm^2 it produces 250 kg/cm^2; with input at 100 kg/cm^2 it produces 380 kg/cm^2
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	VNIIGidrougol, Novokuznetsk
11. Status of Development	Three development units prior to 1971, production of two more during 1971

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	
13.	Number of Units Manufactured (and Time Period)	Five (by 1971)
14.	Using Agency	Kuzbass, also Skochinsky Mining Institute for rotating jet cutter
15.	Designation of Mines where Used	
16.	Type of Control A. Input	
	B. Comments	
17.	Reliability	
18.	Safety	
19.	Major Causes of Failure	
20.	Maintenance Requirement	
21.	Major Overhaul	
22.	Replacement Period	
23.	Comments on Suitability A. Advantages	High pressure permits feeding monitors for use in hard coal
	B. Disadvantages	
24.	Pertinent Reference Documents	738, p. 18
25.	Drawing(s)	738, p. 18, fig. 64
26.	Photograph(s)	

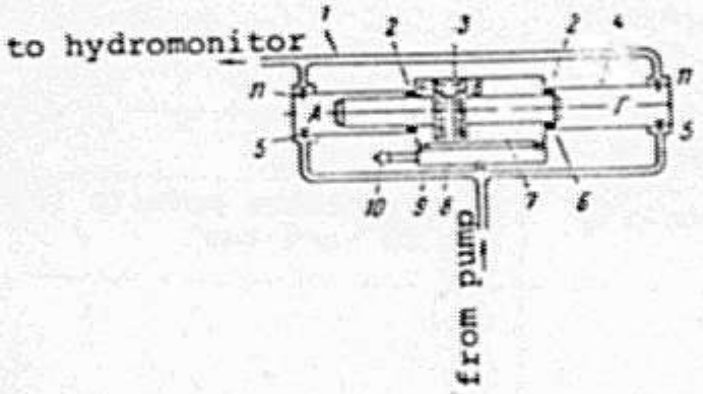


Figure 64.
PRESSURE INTENSIFIER:
1) high pressure pipeline;
2) sealing plungers with guide collars;
3) piston gasket; 4) high pressure cylinder and valve box;
5) inlet valve; 6) plunger; 7) low pressure cylinder;
8) piston; 9) distributor; 10) overflow valve and nozzle;
11) injection valve.

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Water Infusion Tester for Coal Seams, POV-3
B. Country of Origin	USSR
C. Distinguishing Characteristics	Standard equipment for measuring water infusion into coal
2. Function	Measure specific water absorption of a coal seam to determine monitor pressure required to break it
3. Designation of Mining Systems for which Applicable	
4. Major Components	Hydroseal, arresting device, hose, valve, water reservoir, sight gage, pressure reducer, compressed air cylinder
5. Design Parameters	Hole diameter - 4.5 cm Infusing area - 1430 cm^2 Infusing length - 100 cm
6. Performance Parameters A. Input	Flow rate - 550 to 580 cm^3/sec
B. Output	Measurement of specific water absorption in cm/atm-sec
C. Performance Capacity	Can determine whether pre-loosening of coal is necessary (water infusion or blasting)
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Any seam
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	A.A. Skochinskiy Mining Institute
11. Status of Development	Developed prior to 1965

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Skochinskiy Mining Institute
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	Many mines in the Donbass
16. Type of Control A. Input	
B. Comments	
17. Reliability	Good
18. Safety	Good
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Gives good indication of whether coal can be broken by monitor jet
B. Disadvantages	
24. Pertinent Reference Documents	450
25. Drawing(r)	450, p. 3
26. Photograph(s)	

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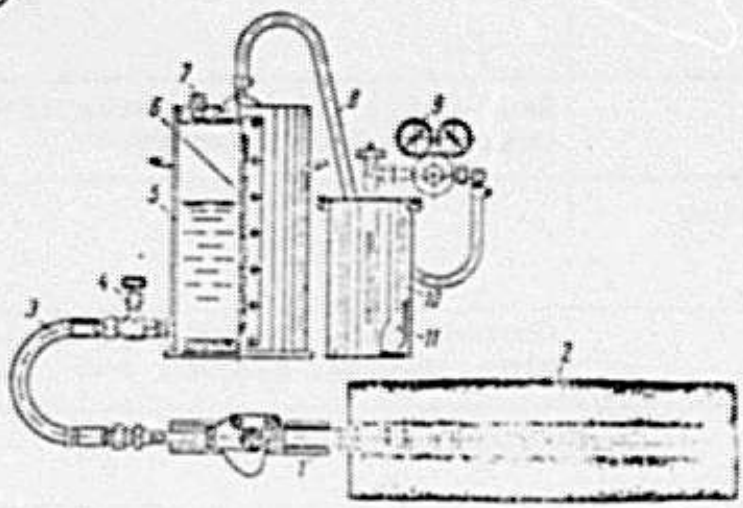


Fig.1. The KO-3 device for the determination of water permeability of rocks in the massif:

1) hydraulic seal; 2) armouring device; 3) nozzle; 4) cock; 5) reservoir; 6) air vent; 7) plugs; 8) cock; 9) pressure gauges; 10) casing; 11) cylinder for compressed air

DATA SHEET 5.19-5
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hydroseal (Packer) GAR-2
B. Country of Origin	USSR
C. Distinguishing Characteristics	
2. Function	Seal drill hole for water injection into coal seam to loosen coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Control nut, thrust cup, seal, barrel, seal ring, casing, piston, nut
5. Design Parameters	Holds up to 200 kg/cm^2
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	336 mm
B. Width	42 mm diameter
C. Height	
8. Weight of Equipment	
9. Cost and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Designed by Skochinsky IHD
11. Status of Development	Production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	Not for use above 200 kg/cm^2
24. Pertinent Reference Documents	738, p. 17
25. Drawing(s)	738, p. 18, fig. 63
26. Photograph(s)	

Reference 738

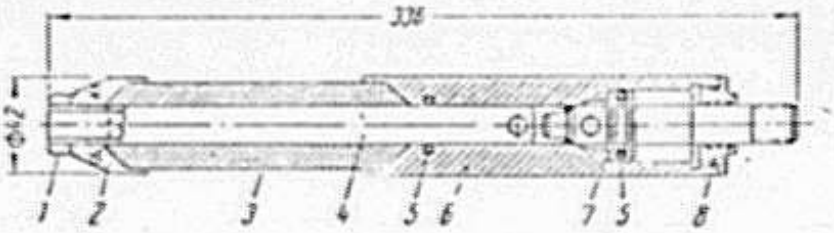


Figure 63.
GAR-2 HYDROSEAL
1) control nut; 2) thrust cup;
3) seal; 4) barrel; 5) sealing ring;
6) casing; 7) piston; 8) nut.

DATA SHEET 5.19-6
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hydroseals (Packers) (GAS-45, GAS-60, and GAS-100)
B. Country of Origin	USSR
C. Distinguishing Characteristics	Use elastic - expanding sleeves
2. Function	Seal drill hole for water injection into seam to loosen coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Similar to GAR-2
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Production in recent years prior to 1974

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	733. r. 19
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.19-7
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hydroseal (Parker) GAMU-1
B. Country of Origin	USSR
C. Distinguishing Characteristics	Similar to GAR-? but with a thrust-block unit which prevents axial displacement during sealing
2. Function	Seal drill hole for water injection into coal seam to loosen coal
3. Designation of Mining Systems for which Applicable	
4. Major Components	Control nut, thrust cup, seal, barrel, seal ring, casing, piston, nut, thrust-block unit (see Fig. 74, Ref. 738)
5. Design Parameters	For pressures above 200 kg/cm^2
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	Over 336 mm
B. Diameter	~42 mm
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Designed by Skochinsky IHD
11. Status of Development	Production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	
13.	Number of Units Manufactured (and Time Period)	
14.	Using Agency	
15.	Designation of Mines where Used	
16.	Type of Control A. Input	
	B. Comments	
17.	Reliability	
18.	Safety	
19.	Major Causes of Failure	
20.	Maintenance Requirement	
21.	Major Overhaul	
22.	Replacement Period	
23.	Comments on Suitability A. Advantages	Can be used above 200 kg/cm^2
	B. Disadvantages	
24.	Pertinent Reference Documents	738, p. 19, p. 45
25.	Drawing(s)	738, p. 46, fig. 74
26.	Photograph(s)	

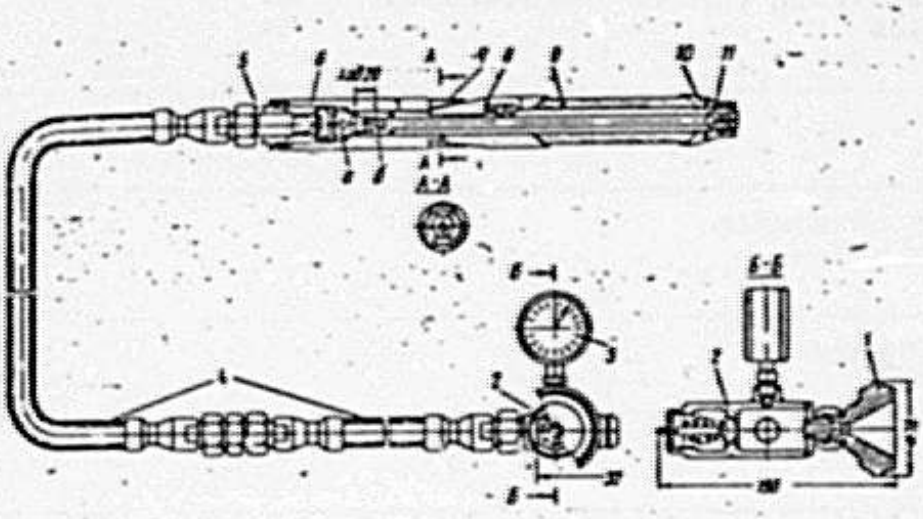


Figure 74.
GAMU-1 HYDROSEAL:
1) nozzle; 2) pressure reducer; 3) gauge; 4) water main; 5) shaft; 6) casing; 7) support; 8) wedges, 9) rubber seal; 10) regulator cup; 11) anti-impact valve.

DATA SHEET 5.19-8
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Famso-1512-4 Electric Motor
B. Country of Origin	USSR
C. Distinguishing Characteristics	Asynchronous Motor
2. Function	Power coal pumps
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In use

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	Started with actuating autotransformer with remote drive PPR
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	743, p. 2
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.19-9
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Electric Motors, SM-2500, SM-660-2, SM-12,000-2
B. Country of Origin	USSR
C. Distinguishing Characteristics	Synchronous motor, number after SM = power in kw, all two pole
2. Function	Power pumps, hoisting, and ventilation equipment, etc.
3. Designation of Mining Systems for which Applicable	Hydro and conventional
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In use

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	To start motor, remote drive PPR used with actuating autotransformer
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	743, p. 2
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.19-10
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Electric Motors
B. Country of Origin	USSR
C. Distinguishing Characteristics	
2. Function	Power, pumps. ventilation and hoists, etc.
3. Designation of Mining Systems for which Applicable	Hydro and conventional
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	For 6A through 6C see Ref. 743, p. 3, Table 2
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	In use

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	743, p. 3, table 22
25. Drawing(s)	
26. Photograph(s)	

Reference 743

TABLE 22

Make of the Motors	Power, kw	Rotation velocity of the rotor, rpm	Mass, kg
Blower asynchronous electric motors with short-circuited rotor			
[illegible]	0,4	3000	[illegible]
[illegible]	630	750	7270
[illegible]	75	[illegible]	745
[illegible]	[illegible]	750	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
11-1/2	200	[illegible]	[illegible]
13-2/4	1600	1500	[illegible]
Asynchronous motor with phase rotor			
[illegible]	55	1000	[illegible]
[illegible]	250	750	3110

DATA SHEET 5.19-11
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Declogger, Jet Slurry Pipeline, "Lastochka"
B. Country of Origin	USSR
C. Distinguishing Characteristics	Self moving automatic jet device for unclogging slurry pipelines
2. Function	Unclog slurry pipelines
3. Designation of Mining Systems for which Applicable	Hydraulic
4. Major Components	1. Forward aimed jet nozzle. 2. Rearward aimed jets for forward movement, high pressure water feed hose
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	Clogged slurry pipelines can be cleared without having to disassemble pipeline
B. Disadvantages	
24. Pertinent Reference Documents	739, p. 21
25. Drawing(s)	739, p. 21, fig. 84
26. Photograph(s)	

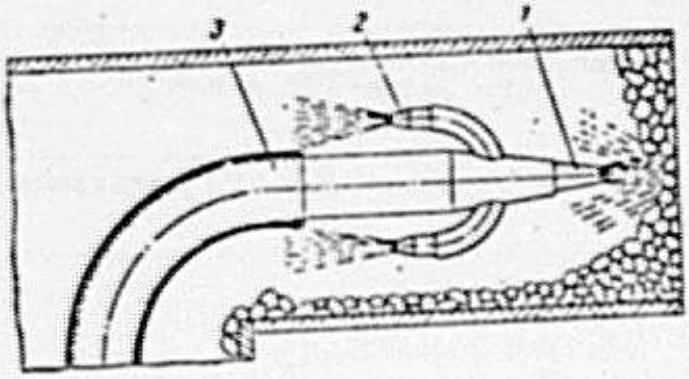


Fig. 84

Reactive self-moving (automatic) apparatus

1) forward nozzle; 2) reaction nozzles;
3) slurry conduit

DATA SHEET 5.19-12
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Monorail Diesel Locomotove DMV-5
B. Country of Origin	USSR
C. Distinguishing Characteristics	Explosion-proof Can climb 12° pitch
2. Function	Transport men and materials
3. Designation of Mining Systems for which Applicable	
4. Major Components	Cab and monorail suspension
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	Can move up 12° inclination angle (later models planned to climb 30°)
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	VNIIGidrougol, Novokuznetsk
11 Status of Development	Developed prior to 1969

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	Can only climb 12° pitch
24. Pertinent Reference Documents	158, p. 4
25. Drawing(s)	
26. Photograph(s)	158, fig. 2

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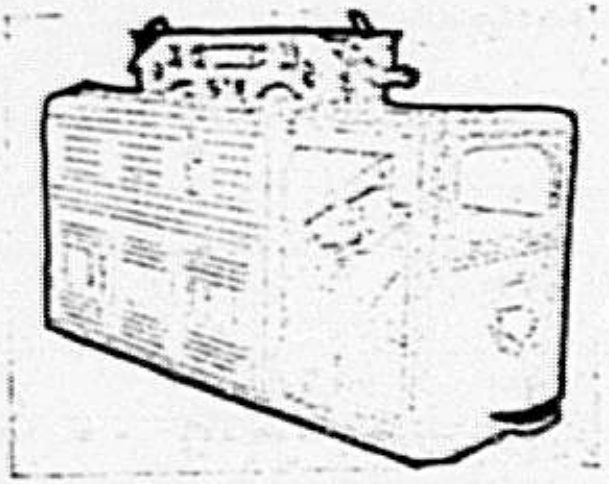


Figure 2. EXPLOSION-PROOF
DIESEL LOCOMOTIVE

DATA SHEET 5.19-13
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Diesel Monorail Transport System
B. Country of Origin	Germany
C. Distinguishing Characteristics	Hydraulic power transmission
2. Function	Haul materials and men in underground mines
3. Designation of Mining Systems for which Applicable	
4. Major Components	Monorail track, Diesel-powered vehicle
5. Design Parameters	
6. Performance Parameters A. Input	Small Diesel engine with exhaust scrubber (~35 hp)
B. Output	
C. Performance Capacity	Will climb 30° pitch slowly
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Ruhrthaler Maschinen Fabrik GMBH
11. Status of Development	Used prior to 1974

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Ruhrthaler Maschinen Fabrik GMBH
13. Number of Units Manufactured (and Time Period)	Many used in European mines
14. Using Agency	Anaconda Copper Company
15. Designation of Mines where Used	Butte, Montana Copper Mine, also mines in Europe
16. Type of Control A. Input	
B. Comments	
17. Reliability	Excellent, very reliable hydraulic system
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	Personal communication P. duToit of Ingersoll-Rand, Princeton, New Jersey
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.19-14
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hydro-Frac Pump, UN-2 (Electrical)
B. Country of Origin	USSR
C. Distinguishing Characteristics	Electrical drive
2. Function	Water infusion to loosen coal seam; for use with a hydroseal in drill hole
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	11 kw
B. Output	25-60 liters/min @ 200 kg/cm^2
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	900 mm
B. Width	840 mm
C. Height	1140 mm
8. Weight of Equipment	Pump: 460 kg; Pump unit: 780 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 17
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.19-15
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hydro-Frac Pump, IZGO-1
B. Country of Origin	USSR
C. Distinguishing Characteristics	
2. Function	Water infusion to loosen coal seam; for use with a hydroseal in drill hole
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	7.5 kw
B. Output	16-20 liters/min @ 200 kg/cm^2
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	1000 mm
B. Width	355 mm
C. Height	490 mm
8. Weight of Equipment	Pump: 200 kg; Pump Unit: 304 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 17
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.19-16
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hydro-Frac Pump BN-150
B. Country of Origin	USSR
C. Distinguishing Characteristics	
2. Function	Water infusion into coal seam to loosen coal; for use with a hydroseal in drill hole
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	15 kw
B. Output	35 liters/min @ 200 kw/cm^2
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	1450 mm
B. Width	600 mm
C. Height	940 mm
8. Weight of Equipment	Pump: 387 kg; Pump unit: 800 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 17
25. Drawing(s)	
26. Photograph(s)	

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hydro-Frac Pump, UGNN
B. Country of Origin	USSR
C. Distinguishing Characteristics	
2. Function	Water infusion to loosen coal seam; for use with a hydroseal in drill hole
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	7 kw
B. Output	45 to 90 liters/min @ 200 to 300 kg/cm^2
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	1000 mm
B. Width	355 mm
C. Height	490 mm
8. Weight of Equipment	Pump Unit (with drive): 440 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 17
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.19-18
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hydro-Frac Pump UNV-2
B. Country of Origin	USSR
C. Distinguishing Characteristics	
2. Function	Water infusion to loosen coal seam; for use with a hydroseal in drill hole
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	11 kw
B. Output	30 liters/min @ 200 kg/cm^2
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	1910 mm
B. Width	810 mm
C. Height	730 mm
8. Weight of Equipment	Pump Unit: 783 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 17
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.19-19
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hydro-Frac Pump, UN-2 (Pneumatic)
B. Country of Origin	USSR
C. Distinguishing Characteristics	Pneumatic drive
2. Function	Water infusion to loosen coal seam; for use with a hydroseal in drill hole
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	20-48 liters/min @ 200 kg/cm^2
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	900 mm
B. Width	840 mm
C. Height	1020 mm
8. Weight of Equipment	Pump: 460 kg; Pump Unit: 620 kg
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	Production

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738, p. 17
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.19-20

DATA ON COMPONENTS AND SUB-SYSTEMS

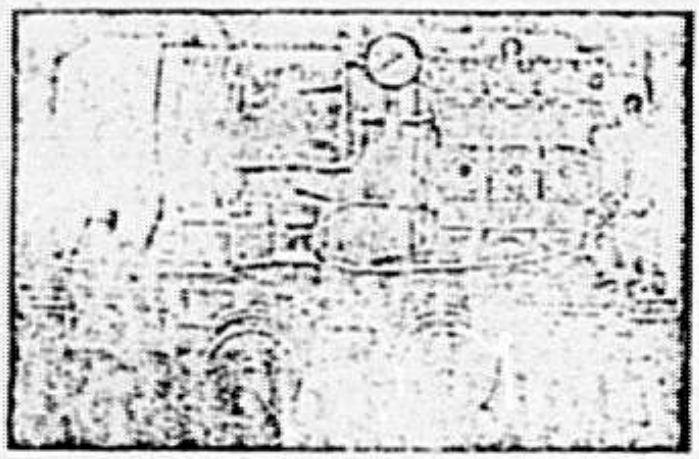
1. A. Name and Model Number	Hydro-Frac Pump 1UGN
B. Country of Origin	USSR
C. Distinguishing Characteristics	Largest hydro-frac pump in USSR
2. Function	Water infusion to loosen coal seam; for use with a hydroseal in drill hole
3. Designation of Mining Systems for which Applicable	Hydraulic
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	Feed water pressure to pump suction 3-5 kg/cm^2; 32 kw KOF 32-4 electric motor
B. Output	Operating pressure 200-300 kg/cm^2
C. Performance Capacity	Regulated in stages 45; 60; 75; 90 l/min
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	For seams dipping to 18° of 0.7-2 m thick, any strength and any category of mine as to its dust and gas content
7. Size of Equipment A. Length	2000 mm
B. Width	860 mm
C. Height	1100 mm
8. Weight of Equipment	Pump Unit (with drive): 2630 kg (2270 without
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Kirov
11. Status of Development	October 1969 units in operation

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	Rutchenskiy Machine Works Gorlovskiy Machine Works
13. Number of Units Manufactured (and Time Period)	Six (Ref. 470)
14. Using Agency	
15. Designation of Mines where Used	Three mines of the Donetskugol and Makeyevugol
16. Type of Control A. Input	
B. Comments	1UGN replaces type GB-354 with saving of 17,000 rubles/experience from "Kirovskaya" Mine
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	Operating valves - 600 hrs Restoration time (average) - 13.2 hrs
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	738; 470
25. Drawing(s)	
26. Photograph(s)	470, p. 1, fig. 1

Reference 470

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DATA SHEET 5.19-21

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pumps, Water Infusion, BN-150; UNV; GB-354; KHGN-2; UV-300			
B. Country of Origin	USSR			
C. Distinguishing Characteristics				
2. Function	Provide feed water for pre-loosening of coal by water injection			
3. Designation of Mining Systems for which Applicable				
4. Major Components	Pumping installation, priming tank, reducing valve, high pressure hose, flow meter, manometer, hydroseal			
5. Design Parameters				
6. Performance Parameters	UNV	GB-354	KHGN-2	UV-300
A. Input (Elec. Motor) kw	14	45	3.5	40
B. Output liters/min.	30	100	5-18	40-125
C. Performance Capacity Maximum pressure ATM	200	200	300	400
D. Efficiency				
E. Limiting Environmental and Coal Seam Conditions				
7. Size of Equipment A. Length				
B. Width				
C. Height				
8. Weight of Equipment With Motor kg	670	2450	150	1245
9. Cost (and Year of Cost Evaluation and Basis for Costs)				
10. Developing Agency	UV-300 by UKrNIIGidrougol (IGD)			
11. Status of Development	In use			

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	
13.	Number of Units Manufactured (and Time Period)	
14.	Using Agency	
15.	Designation of Mines where Used	Tests in Donetz Basin in hydromines Odesskaya-Komsomol'skaya #2, Dar'yevskaya #3, Zimogor'ye #63, Novo-Grodovka # 3
16.	Type of Control A. Input	
	B. Comments	Pumping installation UV-300 of UKrNIIGidrougol is self-regulating as to output rate and pressure of injected water
17.	Reliability	
18.	Safety	
19.	Major Causes of Failure	
20.	Maintenance Requirement	
21.	Major Overhaul	
22.	Replacement Period	
23.	Comments on Suitability A. Advantages	
	B. Disadvantages	
24.	Pertinent Reference Documents	668, p. 10
25.	Drawing(s)	668, p. 11, fig. 82, p. 12, fig. 83, p. 9, Table 49
26.	Photograph(s)	

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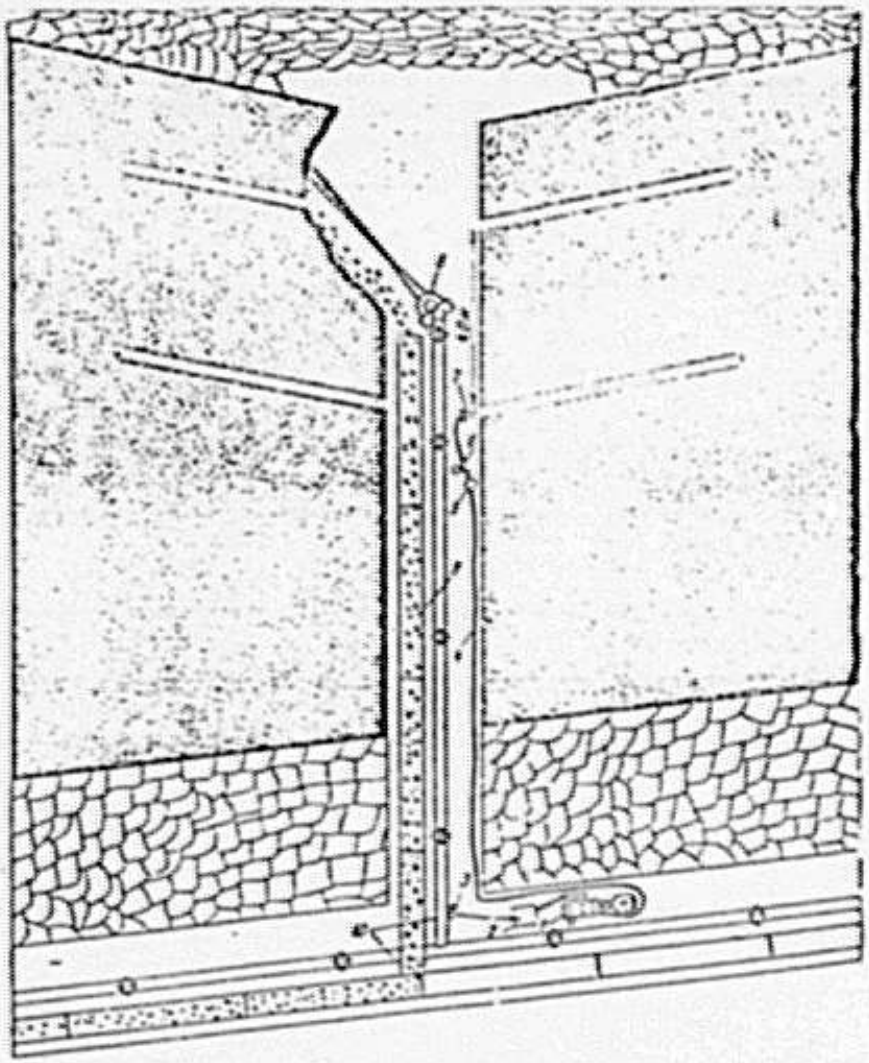


Fig.82. Water injection into the seam by a semistationary pumping installation

1) pumping installation; 2) priming tank; 3) reducing valve; 4) high-pressure hose; 5) flow meter; 6) manometer; 7) hydro seal; 8) hydromonitor; 9)launder; 10) hydromonitor stand

DATA SHEET 5.20-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Hydrocyclone
B. Country of Origin	Czechoslovakia
C. Distinguishing Characteristics	
2. Function	Dewater coal slurry
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Ministry of Fuels
11. Status of Development	1958

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	Institute for Pit Mechanisation, Prague (UDM)
15. Designation of Mines where Used	
16. Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	543, p. 9
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.20-2
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Worm Centrifuge, Type UCMI; II
B. Country of Origin	USSR
C. Distinguishing Characteristics	
2. Function	Dewater coal slurries
3. Designation of Mining Systems for which Applicable	
4. Major Components	
5. Design Parameters	
6. Performance Parameters A. Input	
B. Output	
C. Performance Capacity	180 m^3/hr
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	
7. Size of Equipment A. Length	
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	
11. Status of Development	

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	
13. Number of Units Manufactured (and Time Period)	
14. Using Agency	
15. Designation of Mines where Used	
16 Type of Control A. Input	
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	543, p. 9
25. Drawing(s)	
26. Photograph(s)	

DATA SHEET 5.22-1
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Slurry Pump, Wilson-Snyder 1750 HP
B. Country of Origin	USA
C. Distinguishing Characteristics	Double acting duplex piston pump
2. Function	Pump coal slurry for pipeline
3. Designation of Mining Systems for which Applicable	Black Mesa
4. Major Components	Piston rod, piston, liner, packing, stuffing box bushing, inlet and outlet valves
5. Design Parameters	273 mile pipeline (4 stations - 1 station has 3 1750 hp pumps & 1 station has 4 1750 hp pumps)
6. Performance Parameters A. Input	45-50% by weight solids
B. Output	4 pumps, 1400 gpm @ 1785 psi 3 pumps, 2100 gpm @ 1165 psi
C. Performance Capacity	4-8 million tons per year total system (16,000 tons/day system)
D. Efficiency	85-90%
E. Limiting Environmental and Coal Seam Conditions	14 mesh maximum particle size (low abrasion)
7. Size of Equipment A. Length	18" diameter pipeline
B. Width	Bore of pump 12"
C. Height	Stroke of pump 18"
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Wilson Snyder
11. Status of Development	Initial operation 1970

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	U.S. Steel, Oilwell Division
13.	Number of Units Manufactured (and Time Period)	7 for Black Mesa Pipeline
14.	Using Agency	Southern Pacific Pipe Lines, Inc.
15.	Designation of Mines where Used	Peabody Coal Company, Black Mesa # 1
16.	Type of Control A. Input	Automatic
	B. Comments	
17.	Reliability	
18.	Safety	
19.	Major Causes of Failure	Valve Seals
20.	Maintenance Requirement	
21.	Major Overhaul	
22.	Replacement Period	Valves 1100 hrs, piston liner 4000 hrs, piston rod 3000 hrs, packing 6000 hrs
23.	Comments on Suitability A. Advantages	
	B. Disadvantages	
24.	Pertinent Reference Documents	720; 721; 758
25.	Drawing(s)	758, p. H1-17, table 1, p. H1-19, fig. 1
26.	Photograph(s)	758, p. H1-22, fig. 12

DATA SHEET 5.22-2

DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Slurry Pump, Wilson-Snyder 1500 HP, Double Acting Duplex Piston Pump
B. Country of Origin	USA
C. Distinguishing Characteristics	
2. Function	Pump coal slurry
3. Designation of Mining Systems for which Applicable	Black Mesa
4. Major Components	Piston rod, piston, liner, packing, stuffing box bushing, inlet and outlet valves
5. Design Parameters	273 mile pipeline (4 stations - 2 stations have 3 1500 hp pumps)
6. Performance Parameters A. Input	45-50% by weight solid
B. Output	2100 gpm @ 1080 psi
C. Performance Capacity	4.8 million tons/year total system
D. Efficiency	85-90%
E. Limiting Environmental and Coal Seam Conditions	14 mesh maximum particle size (low abrasion)
7. Size of Equipment A. Length	18 in. diameter pipeline
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Wilson Snyder Pump Company
11. Status of Development	Initial operation 1970

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	U.S. Steel, Oilwell Division
13. Number of Units Manufactured (and Time Period)	6 for Black Mesa Pipeline
14. Using Agency	Southern Pacific Pipe Line, Inc.
15. Designation of Mines where Used	Black Mesa # 1
16. Type of Control A. Input	Automatic
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	Valves, Seals
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	Valves 1100 hrs, piston liner 4000 hrs, piston rod 3000 hrs, packing 6000 hrs
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	720; 721; 758
25. Drawing(s)	758, p. H1-17, table 1, p. H1-19, fig. 1
26. Photograph(s)	758, p. H1-22, fig. 12

DATA SHEET 5.22-3
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Pump, Slurry, Coal, Wilson-Snyder, 300 HP
B. Country of Origin	USA
C. Distinguishing Characteristics	Double acting duplex piston, reciprocating
2. Function	Pump gilsonite slurry for pipeline
3. Designation of Mining Systems for which Applicable	Gilsonite
4. Major Components	Piston rod, liner, packing, stuffing box bushing, inlet and outlet valves
5. Design Parameters	
6. Performance Parameters A. Input	48% solids by weight
B. Output	Pump gilsonite slurry 72 miles (1 pump station with 3 pumps), 165 gpm @ 2150 psi max.
C. Performance Capacity	0.4 million tons per year, system
D. Efficiency	
E. Limiting Environmental and Coal Seam Conditions	4 mesh maximum particle size (low abrasion particles)
7. Size of Equipment A. Length	6 in. diameter pipeline
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Wilson-Snyder for American Gilsonite
11. Status of Development	Initial operation 1957

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12.	Manufacturer	U.S. Steel, Oilwell Division
13.	Number of Units Manufactured (and Time Period)	3 for American Gilsonite
14.	Using Agency	American Gilsonite
15.	Designation of Mines where Used	72 mile gilsonite pipeline from Bonanza, Utah to Rifle, Colorado
16.	Type of Control A. Input	
	B. Comments	
17.	Reliability	Good
18.	Safety	Good
19.	Major Causes of Failure	Valves and seals
20.	Maintenance Requirement	Frequent valve refacing
21.	Major Overhaul	
22.	Replacement Period	
23.	Comments on Suitability A. Advantages	
	B. Disadvantages	
24.	Pertinent Reference Documents	720; 721; 758
25.	Drawing(s)	758, p. H1-17, table 1, p. H1-19, fig. 1
26.	Photograph(s)	

DATA SHEET 5.22-4
DATA ON COMPONENTS AND SUB-SYSTEMS

1. A. Name and Model Number	Coal Slurry Pump, Wilson+Snyder 450 HP
B. Country of Origin	USA
C. Distinguishing Characteristics	Double acting duplex piston
2. Function	Pump coal slurry for pipeline
3. Designation of Mining Systems for which Applicable	For use with slurry coal pipeline in Ohio
4. Major Components	Piston rod, piston, liner, packing, stuffing box bushing, inlet and outlet valves
5. Design Parameters	108 mile pipeline (3 stations - 3 pumps per station)
6. Performance Parameters A. Input	50% by weight solid
B. Output	550 gpm at 1200 psi maximum discharge pressure
C. Performance Capacity	1.3 million tons/yr (complete system)
D. Efficiency	85-90%
E. Limiting Environmental and Coal Seam Conditions	140 mesh maximum particle size (low abrasive)
7. Size of Equipment A. Length	10 in. diameter pipeline
B. Width	
C. Height	
8. Weight of Equipment	
9. Cost (and Year of Cost Evaluation and Basis for Costs)	
10. Developing Agency	Wilson-Snyder Pump Co. for Consolidation Coal Company
11. Status of Development	In operation from 1957 to 1963

DATA ON COMPONENTS AND SUB-SYSTEMS (Continued)

12. Manufacturer	U.S. Steel, Oilwell Division
13. Number of Units Manufactured (and Time Period)	Nine for 108 mile Ohio pipeline
14. Using Agency	Consolidation Coal Company
15. Designation of Mines where Used	Consolidation Coal Pipeline (to Cleveland, Ohio)
16. Type of Control A. Input	Automatic
B. Comments	
17. Reliability	
18. Safety	
19. Major Causes of Failure	Valves and seals
20. Maintenance Requirement	
21. Major Overhaul	
22. Replacement Period	Valves 1100 hrs, piston liner 4000 hrs, piston rod 3000 hrs, packing 6000 hrs
23. Comments on Suitability A. Advantages	
B. Disadvantages	
24. Pertinent Reference Documents	720, 721, 758
25. Drawing(s)	758, p. H1-17, table 1, p. H1-19, fig. 1
26. Photograph(s)	758, p. H1-22, fig. 11

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