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METHODS OF ERECTING SUPPORTS IN MINE SHAFTS(U) FOREIGN  
TECHNOLOGY DIV WRIGHT-PATTERSON AFB OH  
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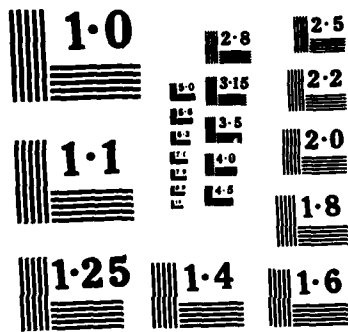
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NATIONAL BUREAU OF STANDARDS  
MICROCOPY RESOLUTION TEST CHART

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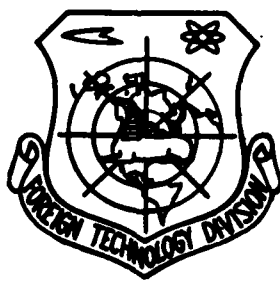
# FOREIGN TECHNOLOGY DIVISION



METHODS OF ERECTING SUPPORTS IN MINE SHAFTS

by

A.Z. Litvin and N.M. Polyakov



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# EDITED TRANSLATION

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By: A.Z. Litvin and N.M. Polyakov

English pages: 2

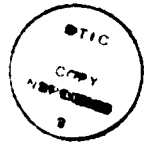
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pp. 1-2

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U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	<i>А а</i>	A, a	Р р	<i>Р р</i>	R, r
Б б	<i>Б б</i>	B, b	С с	<i>С с</i>	S, s
В в	<i>В в</i>	V, v	Т т	<i>Т т</i>	T, t
Г г	<i>Г г</i>	G, g	У у	<i>У у</i>	U, u
Д д	<i>Д д</i>	D, d	Ф ф	<i>Ф ф</i>	F, f
Е е	<i>Е е</i>	Ye, ye; E, e*	Х х	<i>Х х</i>	Kh, kh
Ж ж	<i>Ж ж</i>	Zh, zh	Ц ц	<i>Ц ц</i>	Ts, ts
З з	<i>З з</i>	Z, z	Ч ч	<i>Ч ч</i>	Ch, ch
И и	<i>И и</i>	I, i	Ш ш	<i>Ш ш</i>	Sh, sh
Й й	<i>Й й</i>	Y, y	Щ щ	<i>Щ щ</i>	Shch, shch
К к	<i>К к</i>	K, k	Ъ ъ	<i>Ъ ъ</i>	"
Л л	<i>Л л</i>	L, l	Ы ы	<i>Ы ы</i>	Y, y
М м	<i>М м</i>	M, m	Ь ь	<i>Ь ь</i>	'
Н н	<i>Н н</i>	N, n	Э э	<i>Э э</i>	E, e
О о	<i>О о</i>	O, o	Ю ю	<i>Ю ю</i>	Yu, yu
П п	<i>П п</i>	P, p	Я я	<i>Я я</i>	Ya, ya

\*ye initially, after vowels, and after ъ, ь; e elsewhere.  
When written as ë in Russian, transliterate as yë or ë.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	sinh <sup>-1</sup>
cos	cos	ch	cosh	arc ch	cosh <sup>-1</sup>
tg	tan	th	tanh	arc th	tanh <sup>-1</sup>
ctg	cot	cth	coth	arc cth	coth <sup>-1</sup>
sec	sec	sch	sech	arc sch	sech <sup>-1</sup>
cosec	csc	csch	csch	arc csch	csch <sup>-1</sup>

Russian      English

rot          curl  
lg          log

GRAPHICS DISCLAIMER

All figures, graphics, tables, equations, etc. merged into this translation were extracted from the best quality copy available.

## METHOD OF ERECTING SUPPORTS IN MINE SHAFTS

Authors of Invention, A. Z. Litvin and N. M. Polyakov

~~Known~~ <sup>is</sup> a method of erecting permanent supports in mine shafts which are sunk with the pre-freezing of the rock and where a concrete casing is sunk parallel with the installation of a tubing column.

The proposed method differs in that assembly of the tubing column, rigidly fixed between two cast-iron bearing rings, is carried out independent of the construction of a concrete casing with a space left which is filled with sand or gravel. This provides for an increase in the watertightness of the supports. (Translation, USSR  
Patent in Law No. 17)

The essence of the method is as follows.

Sinking of a shaft is accomplished by separate passes within which is sunk a concrete casing and then tubing is erected in an upward direction with a space left which is filled with sand or gravel. In the process of erecting the tubing, the latter acquires a stable negative temperature under the effects of the frozen concrete and the air in the shaft. After the tubing is erected, on a given pass the upper bearing ring is installed. The work is performed in such a way that the tubing column of a pass is rigidly fixed between two rings.

After erecting the permanent supports on a section of frozen rock, it is artificially thawed and grouting is injected into the sand-gravel layer between the tubing and concrete.

Watertightness of the support lining is achieved by creation of pre-stresses in the tubing column for which the assembly of the tubing column is carried out independent of the construction of the concrete casing.

The tubing column of a pass is fixed between two bearing rings with a lining temperature of from  $-5$  to  $-15^{\circ}\text{C}$ , and with further artificial thawing, the lining temperature rises and the column tends to elongate. Because of its rigid replacement elongation of the column is prevented and the increase in lining temperature produces compressive thermal stresses in it. These stresses are transmitted to lead gaskets in the horizontal joints, tightening them.

#### Claim of Invention

A method of erecting supports in mine shafts which are sunk with the pre-freezing of the rock. The method consists of building a concrete casing and assembly of a tubing column, The method differs in that in order to increase the watertightness of the lining, assembly of the tubing column, rigidly fixed between two cast-iron bearing rings, is carried out independent of the construction of the concrete casing with a space left which is filled with sand or gravel.

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