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Tests of rock drill bits for Water-Leyner machine

Riley Marsh Simrall

Edmond Otis Stoliker

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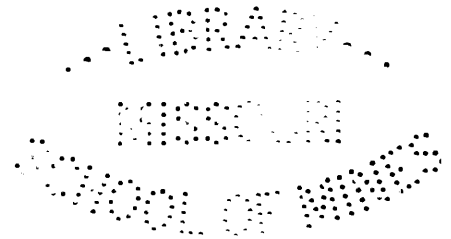
T 3 2 4

TESTS OF ROCK DRILL BITS FOR WATER-LEYNER MACHINE.

- B Y -

R. M. Simrall

E. O. Stoliker



A

THESIS

submitted to the faculty of the
SCHOOL OF MINES AND METALLURGY OF THE UNIVERSITY OF MISSOURI
in partial fulfillment of the work required for the
DEGREE OF
BACHELOR OF SCIENCE IN MINE ENGINEERING.

Rolla, Mo.

1914

Approved by:

C. P. Forbes

Professor of Mining.

17332

TESTS OF ROCK DRILL BITS FOR WATER-LEYNER MACHINE.

Introduction:

The above investigation was made in the Mining Laboratory of the Missouri School of Mines, under the direction of Prof. C. R. Forbes, with the following object in view:

To make comparative tests of various types of regular and special bits for the Water-Leyner machine as to drilling speed and total distance drilled by each bit without resharpening.

The No.7 Water-Leyner machine was mounted on a vertical bar in a timber drilling frame, and the drilling was done in a hard granite block from Southeast Missouri.

Special endeavor was made to keep certain factors which would greatly influence the results constant. With this idea in view a pop-off valve in the air transmission line was set to keep the air pressure constant at 80 pounds gage. All drill steel used in the investigation was sharpened on a No.5 Leyner sharpener and tempered in oil by an experienced man.

With these two variables eliminated as far as possible the only remaining possibilities for great

error lay in the operation of the machine and the taking and recording of data.

Considerable difficulty was experienced on numerous occasions however, in the operation of the machine due to water leaking into the valve chest, to wearing and lost motion of the rotating device, and to certain inequalities in drilling speed due to the position of the machine in the guides.

Each bit was used until it lost its gauge and ceased rotating properly.

The data taken in the investigation follows in tabulated form:

**MISSOURI SCHOOL OF MINES
MINING LABORATORY**

TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner

Kind of Bit Regular Cross-bit

Gauge 2 inches

Length of Steel Starter

Kind of Steel F.P.B. 1/8" Hollow round

Air Pressure 80 pounds

Names

R. M. Simrall

E. O. Stoliker

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
		<u>4P-1</u>			<u>2"</u>		
<u>26.12</u>							
<u>24.50</u>	<u>1.62</u>						
<u>21.50</u>	<u>3.00</u>	<u>4.62</u>	<u>2</u>	<u>1.5</u>		<u>1 3/32</u>	
<u>26.00</u>		<u>New hole</u>					<u>New hole</u>
<u>23.00</u>	<u>3.00</u>	<u>7.62</u>	<u>1</u>	<u>3.0</u>			
<u>18.37</u>	<u>4.63</u>	<u>12.25</u>	<u>3</u>	<u>1.54</u>			
<u>17.50</u>	<u>.87</u>	<u>13.12</u>	<u>1</u>	<u>.87</u>			
<u>16.87</u>	<u>.63</u>	<u>13.75</u>	<u>1</u>	<u>.63</u>			
		<u>4P-7</u>					
<u>23.75</u>							
<u>20.95</u>	<u>2.80</u>	<u>2.80</u>	<u>1</u>	<u>2.80</u>	<u>2"</u>		
<u>18.60</u>	<u>2.35</u>	<u>5.15</u>	<u>1</u>	<u>2.35</u>			
<u>16.50</u>	<u>2.10</u>	<u>7.25</u>	<u>1</u>	<u>2.10</u>		<u>1 25/32</u>	
<u>25.75</u>		<u>New hole</u>					
<u>24.62</u>	<u>1.13</u>	<u>8.38</u>	<u>1</u>	<u>1.13</u>			<u>Temper too soft</u>
		<u>4P-9</u>					
<u>21.50</u>					<u>1 3/32</u>		
<u>20.15</u>	<u>1.35</u>	<u>1.35</u>	<u>1</u>	<u>1.35</u>	<u>7"</u>	<u>1 50/32</u>	
<u>18.28</u>	<u>1.87</u>	<u>3.22</u>	<u>1</u>	<u>1.87</u>			

MISSOURI SCHOOL OF MINES

MINING LABORATORY

TESTS OF ROCK DRILL BITS

Machine No. 7 Water Leyner

Kind of Bit Regular Cross Bit

Gauge 2 inches

Length of Steel Starter

Kind of Steel FJA 13 1/8" Hollow Run.

Air Pressure 80 #

Names

R. M. Simrall

E. O. Stoliker

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED FTS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
<u>4P-9</u>	<u>cont</u>	<u>New hole</u>					
<u>21.50</u>	<u>1.12</u>						
<u>22.50</u>	<u>1.12</u>	<u>4.34</u>	<u>1</u>	<u>1.12</u>			
<u>21.37</u>	<u>1.13</u>	<u>5.46</u>	<u>1</u>	<u>1.13</u>			
<u>20.00</u>	<u>1.37</u>	<u>6.83</u>	<u>1</u>	<u>1.37</u>		<u>1 27/32</u>	
	<u>4P-13</u>						
<u>22.50</u>					<u>2"</u>		
<u>19.87</u>	<u>2.02</u>	<u>2.02</u>	<u>1</u>	<u>2.02</u>			
<u>17.75</u>	<u>2.12</u>	<u>4.74</u>	<u>1</u>	<u>2.12</u>			
<u>15.37</u>	<u>1.87</u>	<u>6.61</u>	<u>1</u>	<u>1.87</u>			
<u>14.50</u>	<u>1.37</u>	<u>7.98</u>	<u>1</u>	<u>1.37</u>		<u>1 29/32</u>	
	<u>4P-18</u>						
<u>24.25</u>					<u>1 31/32</u>		
<u>22.02</u>	<u>1.63</u>	<u>1.63</u>	<u>1</u>	<u>1.63</u>			
<u>21.12</u>	<u>1.50</u>	<u>3.13</u>	<u>1</u>	<u>1.50</u>			
<u>19.37</u>	<u>1.25</u>	<u>4.38</u>	<u>1</u>	<u>1.25</u>		<u>1 29/32</u>	<u>Temper too soft</u>

MISSOURI SCHOOL OF MINES

MINING LABORATORY

TESTS OF ROCK DRILL BITS

Machine *No. 7 Water-Keyner*
 Kind of Bit *Regular Cross-bit*
 Gauge *2"*
 Length of Steel *Long starter*
 Kind of Steel *FIAB 1/8" hollow round*
 Air Pressure *80 #s*

Names *E. O. Stoliker*
R. M. Simrall
 Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total		TIME	SPEED INS. PR. MIN.	GAUGE		REMARKS
		DISTANCE DRILLED				START	FINISH	
	<i>4 P-10</i>							
<i>23.50</i>						<i>1 31/32</i>		
<i>20.87</i>	<i>2.63</i>	<i>2.63</i>	<i>1</i>	<i>2.63</i>				
<i>18.87</i>	<i>2.50</i>	<i>5.13</i>	<i>1</i>	<i>2.50</i>				
<i>15.87</i>	<i>2.50</i>	<i>7.63</i>	<i>1</i>	<i>2.50</i>				
<i>13.37</i>	<i>2.50</i>	<i>9.13</i>	<i>1</i>	<i>2.50</i>			<i>1 28/32</i>	
<i>22.37</i>		<i>New hole</i>				<i>1 28/32</i>		
<i>21.50</i>	<i>1.87</i>	<i>11.00</i>	<i>1</i>	<i>1.87</i>				
<i>19.87</i>	<i>1.63</i>	<i>12.63</i>	<i>1</i>	<i>1.63</i>				
<i>18.87</i>	<i>1.00</i>	<i>13.63</i>	<i>1</i>	<i>1.00</i>				
<i>18.00</i>	<i>.87</i>	<i>14.50</i>	<i>1</i>	<i>.87</i>			<i>1 27/32</i>	
	<i>4 P-10 7</i>							
<i>24.30</i>								
<i>20.75</i>	<i>3.55</i>			<i>3.55</i>		<i>2"</i>		
<i>18.87</i>	<i>1.88</i>	<i>5.43</i>	<i>1</i>	<i>1.88</i>				
<i>16.87</i>	<i>2.00</i>	<i>7.43</i>	<i>1</i>	<i>2.00</i>				
<i>14.87</i>	<i>2.00</i>	<i>9.43</i>	<i>1</i>	<i>2.00</i>				
<i>12.50</i>	<i>2.27</i>	<i>11.70</i>	<i>1</i>	<i>2.27</i>				
<i>9.88</i>	<i>2.62</i>	<i>14.42</i>	<i>1</i>	<i>2.62</i>				
<i>7.35</i>	<i>2.53</i>	<i>16.95</i>	<i>1</i>	<i>2.53</i>			<i>1 28/32</i>	

MISSOURI SCHOOL OF MINES

MINING LABORATORY

TESTS OF ROCK DRILL BITS

Machine *No. 7 Water-Leyner*

Kind of Bit *Flat cross-bit*

Gauge *2"*

Length of Steel *Long starter*

Kind of Steel *FJAB 1 1/8" hollow round*

Air Pressure *80**

Names

R. M. Simrall

E. O. Stoliker

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
	<i>4 P.</i>	<i>F-21</i>		<i>See column 2-</i>	<i>2"</i>		
<i>23.12</i>			<i>1</i>				
<i>19.87</i>	<i>3.25</i>	<i>3.25</i>	<i>1</i>				
<i>17.15</i>	<i>2.72</i>	<i>5.97</i>	<i>1</i>				
<i>14.87</i>	<i>2.28</i>	<i>8.25</i>	<i>1</i>				
<i>12.70</i>	<i>2.17</i>	<i>10.42</i>	<i>1</i>				
<i>10.40</i>	<i>2.30</i>	<i>12.72</i>	<i>1</i>				
<i>8.15</i>	<i>2.25</i>	<i>14.97</i>	<i>1</i>				<i>1 29/32</i>
<i>23.25</i>		<i>New hole</i>				<i>1 29/32</i>	
<i>21.06</i>	<i>2.19</i>	<i>17.16</i>					
<i>18.75</i>	<i>2.31</i>	<i>19.47</i>					
<i>15.80</i>	<i>2.95</i>	<i>22.42</i>					
<i>13.87</i>	<i>1.93</i>	<i>24.35</i>					
<i>11.00</i>	<i>2.87</i>	<i>27.22</i>				<i>1 27/32</i>	
<i>23.18</i>		<i>New hole</i>			<i>1 27/32</i>		
<i>21.93</i>	<i>1.25</i>	<i>28.47</i>	<i>1</i>			<i>Held up good to</i>	
<i>21.25</i>	<i>.68</i>	<i>29.15</i>	<i>1</i>			<i>1 27/32 end</i>	

**MISSOURI SCHOOL OF MINES
MINING LABORATORY**

TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
 Kind of Bit Regular G-point
 Gauge 2"
 Length of Steel Starter-regular
 Kind of Steel FTFB 1 1/8" hollow round
 Air Pressure 80#

Names
E. O. Staliker
T. M. Sinclair
 Date

CHUCK TO ROCK.	TOTAL DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED FMS. PR. MIN.	GAUGE		REMARKS	
					START	FINISH		
19.12		67-1		Same as Column 2	1 30/32			
16.12	3.00	3.00	1					
13.62	2.50	5.50	1					
11.37	2.25	7.75	1					
9.50	1.87	9.62	1			1 27/32		
18.40	-	New hole				1 27/32		
17.00	1.40	11.02	1				75#s	
14.68	2.32	13.34	1					
12.62	2.06	15.40	1					
11.28	1.34	16.74	1				Bit flattened and chipped	
9.80	1.48	18.22	1		1 26/32			
		67-9						
28.12					2"		Much difficulty experienced with machine.	
25.62	2.50	2.50	1					
23.37	2.25	4.75	1					
21.25	2.12	6.87	1					
19.50	1.75	8.62	1					
17.50	2.00	10.62	1					
17.37			+					
15.50	1.87	12.49	1					
13.37	2.13	14.62	1					
11.75	1.62	16.27	1			1 27/32		

MISSOURI SCHOOL OF MINES

MINING LABORATORY

TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
 Kind of Bit Regular 6 point
 Gauge 2" T
 Length of Steel Regular Starter
 Kind of Steel FJAB 1 1/8" Hollow round
 Air Pressure 80 #

Names
E. O. Stoliker
R. M. Simrall
 Date

CHUCK TO ROCK.	TOTAL DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED FMS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
14.25		<u>6 P-4</u>			2"		
10.62	3.63	3.63	1	3.63			
7.62	3.00	6.63	1	3.00			
5.15	2.47	9.10	1	2.47		1 ²⁸ / ₃₂	
		<u>New hole</u>					
14.50					1 ²⁸ / ₃₂		
13.87	.63	9.73	1	.63			
13.25	.64	10.37	1	.64			
12.50	.75	11.12	1	.75		1 ²³ / ₃₂	One point broke off
		<u>6 P-5</u>					
11.75					1 ³¹ / ₃₂		
9.87	1.88	1.88	1	1.88			
7.45	2.42	4.30	1	2.42		1 ²⁸ / ₃₂	
12.25		<u>New hole</u>					
9.50	2.75	7.05	1	2.75		1 ²⁸ / ₃₂	
11.75		<u>New hole</u>					
10.50	1.25	8.30	1	1.25			
12.37		<u>New hole</u>					
10.75	1.62	9.92	1	1.62			

**MISSOURI SCHOOL OF MINES
MINING LABORATORY**

TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
 Kind of Bit Regular 6 point
 Gauge 2"
 Length of Steel long - starter
 Kind of Steel F5AB 1 1/8" hollow round
 Air Pressure 80 #

Names
E. O. Stoliker
R. M. Simrall
 Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED MS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
17.62		<u>6P-8</u>					<u>long starter</u>
16.50	1.12	1.12	1	1.12	2"		
27.50							
26.56	.94	2.06	1	.94			
25.25	1.31	3.37	1	1.31			
24.60	.65	4.02	1	.65		1 ²⁷ / ₃₂	
		<u>6P-13</u>					
27.25							<u>long starter</u>
25.40	1.85	1.85		1.85	2"		
23.87	1.53	3.38		1.53			
22.37	1.50	4.88		1.50			
21.06	1.31	6.19		1.31			
19.87	1.19	7.38		1.19			
18.75	1.12	8.50		1.12			
17.75	1.00	9.50		1.00			
16.80	.95	10.45		.95			
15.93	.77	11.22		.77			
15.06	.87	12.09		.87			
15.00	1.00	13.09					
14.00	1.00	13.09	1	1.00			
13.00	1.00	14.09	1	1.00		1 ²⁷ / ₃₂	

MISSOURI SCHOOL OF MINES

MINING LABORATORY

TESTS OF ROCK DRILL BITS

Machine *No. 7 Water-Leyner*
 Kind of Bit *Regular 4 point*
 Gauge *1 3/4*
 Length of Steel *Second*
 Kind of Steel *FJAB 1/8" Hollow St*
 Air Pressure *80#*

Names

R. M. Simrall
E. O. Stoliker

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
<i>31.50</i>		<i>47-2</i>			<i>1 23</i>	<i>32</i>	
<i>26.50</i>	<i>5.00</i>						
<i>18.00</i>	<i>8.50</i>	<i>13.50</i>	<i>3'</i>	<i>2.83</i>			
<i>13.37</i>	<i>4.63</i>	<i>18.13</i>	<i>2'</i>	<i>2.31</i>			
<i>30.50</i>		<i>New hole</i>					
<i>26.12</i>	<i>4.38</i>	<i>22.51</i>	<i>1'</i>	<i>4.38</i>			
<i>22.12</i>	<i>4.00</i>	<i>26.50</i>	<i>1'</i>	<i>4.00</i>			
<i>18.50</i>	<i>3.60</i>	<i>3.12</i>	<i>1'</i>	<i>3.60</i>			
<i>15.25</i>	<i>3.25</i>	<i>33.37</i>	<i>1'</i>	<i>3.25</i>			
<i>12.50</i>	<i>2.75</i>	<i>36.12</i>	<i>1'</i>	<i>2.75</i>			
<i>23.35</i>		<i>New hole</i>					
<i>20.25</i>	<i>3.10</i>	<i>39.22</i>	<i>1'</i>	<i>3.10</i>			
<i>17.35</i>	<i>2.90</i>	<i>42.12</i>	<i>1'</i>	<i>2.90</i>			
<i>15.75</i>	<i>1.60</i>	<i>43.71</i>	<i>1'</i>	<i>1.60</i>	<i>1 20</i>	<i>32</i>	

MISSOURI SCHOOL OF MINES

MINING LABORATORY

TESTS OF ROCK DRILL BITS

Machine *No 7 Water-Leyzer*

Kind of Bit *Regular 4 point*

Gauge *1 3/4*

Length of Steel *Regular Second*

Kind of Steel *F.J.A.B. 1/8 Hollow round.*

Air Pressure *80^{psi}*

Names

R.M. Simrall

E.O. Stoliker

Date

CHUCK TO ROCK.	TOTAL DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
<i>30.65</i>		<i>4 P-N</i>			<i>22</i>	<i>132</i>	
<i>29.15</i>							
<i>28.25</i>	<i>2.40</i>	<i>2.40</i>	<i>1'</i>				
<i>26.25</i>	<i>2.00</i>	<i>4.40</i>	<i>1'</i>	<i>2.00</i>			
<i>23.87</i>	<i>2.38</i>	<i>6.78</i>	<i>1'</i>	<i>2.38</i>			
<i>21.12</i>	<i>2.75</i>	<i>9.53</i>	<i>1'</i>	<i>2.75</i>			
<i>18.62</i>	<i>2.50</i>	<i>12.03</i>	<i>1'</i>	<i>2.50</i>			
<i>16.22</i>	<i>2.40</i>	<i>14.43</i>	<i>1'</i>	<i>2.40</i>		<i>19</i> <i>132</i>	
<i>14.05</i>	<i>2.17</i>	<i>16.62</i>	<i>1 1/4</i>	<i>1.77</i>			
<i>31.62</i>		<i>New hole</i>					
<i>29.00</i>	<i>2.62</i>	<i>19.22</i>	<i>1'</i>	<i>2.62</i>			
<i>26.00</i>	<i>3.00</i>	<i>22.22</i>	<i>1'</i>	<i>3.00</i>			
<i>26.37</i>							
<i>23.50</i>	<i>2.85</i>	<i>25.07</i>	<i>1'</i>	<i>2.85</i>			
<i>20.62</i>	<i>2.88</i>	<i>27.95</i>	<i>1'</i>	<i>2.88</i>			
<i>18.12</i>	<i>2.50</i>	<i>30.45</i>	<i>1'</i>	<i>2.50</i>			
<i>16.05</i>	<i>2.07</i>	<i>32.52</i>	<i>1'</i>	<i>2.07</i>		<i>35</i> <i>132</i>	
<i>21.75</i>		<i>New hole</i>					
<i>17.87</i>	<i>3.88</i>	<i>36.40</i>	<i>1'</i>	<i>3.88</i>			
<i>14.50</i>	<i>3.38</i>	<i>39.77</i>	<i>1</i>	<i>3.38</i>			<i>Steel lost</i> <i>gauge</i>

**MISSOURI SCHOOL OF MINES
MINING LABORATORY**

TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
 Kind of Bit Regular Cross-bit
 Gauge 1 3/4"
 Length of Steel Regular 2nd
 Kind of Steel P.J.A.B. 1/2" Hollow round
 Air Pressure 80 lbs

Names
R. M. Simrall
E. O. Stoliker
 Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED MS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
<u>26.50</u>		<u>4 P-5</u>					
<u>22.75</u>	<u>3.75</u>	<u>3.75</u>	<u>1</u>	<u>Same as column 2</u>	<u>1 24</u>		
<u>19.62</u>	<u>3.13</u>	<u>6.88</u>	<u>1</u>				
<u>29.00</u>	<u>—</u>	<u>New hole</u>					
<u>27.12</u>	<u>1.88</u>	<u>8.76</u>	<u>1</u>				
<u>25.12</u>	<u>2.00</u>	<u>10.76</u>	<u>1</u>				
<u>33.50</u>	<u>—</u>	<u>New hole</u>					
<u>31.87</u>	<u>1.63</u>	<u>12.39</u>	<u>1</u>				
<u>28.50</u>	<u>3.87</u>	<u>15.86</u>	<u>1</u>				
<u>25.50</u>	<u>3.00</u>	<u>18.76</u>	<u>1</u>				
<u>21.75</u>	<u>3.75</u>	<u>22.51</u>	<u>1</u>				
<u>18.00</u>	<u>3.75</u>	<u>26.26</u>	<u>1</u>				
<u>31.30</u>	<u>—</u>	<u>New hole</u>					
<u>28.75</u>	<u>2.55</u>	<u>28.81</u>	<u>1</u>				
<u>27.50</u>	<u>1.25</u>	<u>30.06</u>	<u>1</u>				
<u>23.87</u>	<u>3.63</u>	<u>33.69</u>	<u>2</u>		<u>1.81</u>	<u>1 18</u>	<u>1 32</u>

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
 Kind of Bit Regular Cross-bit
 Gauge 1 3/4"
 Length of Steel Regular 2nd.
 Kind of Steel F.J.A.B. 1 1/8" Hollow round
 Air Pressure 80 lbs

Names
E. O. Stoliker
P. M. Simrall
 Date

CHUCK TO ROCK.	TOTAL DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
26.50		<u>4 P-14</u>		Same as column 2	<u>1 23/32</u>		
23.00	3.50	3.50	1				
19.75	3.25	6.75	1				
16.50	3.25	10.00	1				
13.25	3.25	13.25	1				<u>1 21/32</u>
23.12		<u>New hole</u>					
19.25	3.87	17.12	1				
15.75	3.50	20.62	1				
13.37	2.37	22.99	1				<u>1 19/32</u>
31.37		<u>New hole</u>					
27.25	4.12	27.11	1				
23.50	3.75	30.86	1				
21.00	2.50	33.36	1				
18.62	2.37	35.73	1				
15.75	2.87	38.60	1				
14.00	1.75	40.35	1			<u>1 15/32</u>	
30.87		<u>4 P-19</u>			<u>1 3/4"</u>		
26.95	3.92	3.92	1				
24.30	2.65	6.57	1				
22.00	2.30	8.87	1			<u>1 19/32 Too soft</u>	

**MISSOURI SCHOOL OF MINES
MINING LABORATORY**

TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner

Kind of Bit Flat X-bit-high center

Gauge 1 3/4"

Length of Steel Regular 2nd.

Kind of Steel F. J. A. B. hollow round 1 1/8"

Air Pressure 80 *s

Names

E. O. Staliker

R. M. Simrall

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
29.05		4 P-F-16		See column 2	1 3/4		Poor rotation. Too soft also.
26.75	2.30	2.30	1				
24.87	1.88	4.18	1				
23.15	1.72	5.90	1				
21.12	2.03	7.93	1				
20.22	.90	8.83	1				
19.60	.62	9.45	1		1 19/32		
15.75		4 P-F-20			1 3/4		
11.25	4.50	4.50	1				
11.87		New hole					
7.87	4.00	8.50	1				
17.06		New hole			1 20/32		
13.87	3.19	11.69	1				
12.30	1.57	13.26	1				
10.75	1.55	14.81	1		1 19/32		
28.50		New hole					
27.18	1.32	16.13	1				
26.37	.81	16.94	1		1 18/32		

MISSOURI SCHOOL OF MINES

MINING LABORATORY

TESTS OF ROCK DRILL BITS

Machine No. 7 Water-hayner

Kind of Bit Regular G point

Gauge 1 3/4"

Length of Steel Regular 2nd.

Kind of Steel FJAB 1 1/2" hollow round

Air Pressure 80#s

Names

E. O. Stoliker

R. M. Simrall

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED FMS. PR. MIN.	GAUGE		REMARKS	
					START	FINISH		
23.62		6 P-2			1 3/4			
20.12	3.50	3.50	1	See column 2				
17.12	3.00	6.50	1				75#s air	
13.62	3.50	10.00	1					
11.00	2.62	12.62	1					
7.75	3.25	15.87	1				1 20/32	
24.10	New hole							
20.05	4.05	19.92	1					
16.37	3.68	23.70	1					
13.16	3.21	26.91	1					
10.10	3.06	29.97	1					
8.00	2.10	32.07	1				1 18/32	
22.37	New hole							
19.37	3.00	35.07	1					
15.87	3.50	38.57	1					
12.50	3.37	41.94	1					
9.00	3.50	44.44	1					
5.75	3.25	47.69	1				1 18/32	
28.37	New hole							
26.82	1.55	49.24	1					
26.12	.70	49.94	1				1 18/32	

**MISSOURI SCHOOL OF MINES
MINING LABORATORY**

TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
 Kind of Bit Regular G point
 Gauge 1 3/4
 Length of Steel Regular 2nd
 Kind of Steel F. I. A. B. 1 1/2" hollow round
 Air Pressure 8.0 #0

Names
R. M. Simrall
E. O. Stoliker
 Date

CHUCK TO ROCK.	NET DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED MS. PR. MIN.	GAUGE		REMARKS	
					START	FINISH		
28.00	-	6 P-6			1 3/4			
24.25	3.75	3.75	1	S D R E S S C O L U M N R				
21.00	3.25	7.00	1					
18.00	3.00	10.00	1					
14.95	3.05	13.05	1					
12.12	2.83	15.88	1				1 20/32	
30.00	-	New hole						
26.75	3.25	19.13	1					
23.75	3.00	22.13	1					
20.75	3.00	25.13	1					
17.12	3.63	28.76	1					
13.25	3.87	32.63	1			1 39/64		
31.00	-	New hole						
27.87	3.13	35.76	1					
25.75	2.12	37.88	1			1 19/32		
22.37	-	New hole						
17.50	4.87	42.75	+					
13.62	3.88	46.63	1					
10.00	3.62	50.25	1			1 17/32		

**MISSOURI SCHOOL OF MINES
MINING LABORATORY**

TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
 Kind of Bit Regular 6 point
 Gauge 1 3/4
 Length of Steel 2nd
 Kind of Steel F.L.A.B. - hollow round 1 1/8"
 Air Pressure 80 #

Names
R.M. Simcall
E.O. Stoliker
 Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
		67-10			1 3/4		
26.55				See Column 2			
23.37	3.18	3.18	1				
20.62	3.75	6.93	1				
17.80	2.82	9.75	1				
15.55	2.25	12.00	1				
13.62	1.93	13.93	1				
10.92	2.70	16.63	1				1 20 32
							Machine to be overhauled

**MISSOURI SCHOOL OF MINES
MINING LABORATORY**

TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
 Kind of Bit Regular 8 point
 Gauge 1 $\frac{3}{4}$ "
 Length of Steel Regular 2nd
 Kind of Steel F. A. B. 1 $\frac{1}{2}$ " hollow round
 Air Pressure 80 $\frac{1}{2}$ "

Names R. M. Simrall
E. O. Staliker
 Date _____

CHUCK TO ROCK.	TOTAL DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED NOS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
23.25		<u>8P-12</u>		See	1 $\frac{3}{4}$ "		
19.38	3.87	3.87	1	Column 2			
16.25	3.13	7.00	1				→ Not retaling
13.62	2.63	9.63	1				→ properly
10.37	3.25	12.88	1			1 $\frac{20}{32}$	
11.78		New hole					
9.50	2.28	15.16	1				
19.62		New hole					
19.00	.62	15.78	1			1 $\frac{20}{32}$	Bit too soft
		<u>8P-14</u>					
25.40							
22.68	2.72	2.72	1		1 $\frac{3}{4}$ "		
20.06	2.62	5.34	1				
17.75	2.31	7.65	1				
15.70	2.05	9.70	1				
13.75	1.95	11.65	1				
12.43	1.32	12.97	1				
11.62	.81	13.78	1			1 $\frac{19}{32}$	
		<u>8P-16</u>					
		Did not hold up as well as 8P-14					

**MISSOURI SCHOOL OF MINES
MINING LABORATORY**

TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
 Kind of Bit Regular Cross-bit
 Gauge 1 1/2
 Length of Steel Regular 3rd
 Kind of Steel FJAB 1 1/8" hollow round
 Air Pressure 80 " "

Names
E. O. Stoliker
T. M. Simrall
 Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED HRS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
32.37		<u>4P-3</u>		<u>Same as</u>	<u>1 1/2</u>		
27.75	4.62	4.62	1	<u>Column 2</u>			
24.05	3.70	8.32	1				
21.05	3.05	11.37	1				
18.00	3.05	14.42	1				
15.75	2.75	17.17	1				
12.25	2.50	19.67	1				
10.00	2.25	21.92	1			<u>1 1/32</u>	
34.00	<u>New hole</u>						
30.25	3.75	25.67	1				
27.50	2.75	28.42	1				
25.12	2.38	30.80	1				
22.25	2.87	33.67	1				
20.00	2.25	35.92	1			<u>1 9/32</u>	<u>Points Considerably chipped</u>
	<u>→ Drilled into another hole</u>						
		<u>4P-6</u>					
34.87	1.37						<u>Temper too soft</u>
33.50	1.37		1				
33.00	.50		1				
32.50	.50		1				

MISSOURI SCHOOL OF MINES

MINING LABORATORY

TESTS OF ROCK DRILL BITS

Machine No. 7 Water-hayner

Kind of Bit Regular Cross bit

Gauge 1 1/2"

Length of Steel 3rd

Kind of Steel FJAB 1 1/8" hollow round

Air Pressure 80^{psi}

Names

E. O. Staliker

T. M. Simrall

Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED FMS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
33.00		47-8		Same as	1 16/32		
27.50	5.50	5.50	1	Column 2			
21.75	5.75	11.25	1				
15.87	5.88	17.13	1				
34.12	New hole						
31.37	2.75	19.88	1				
27.75	3.62	23.50	1				
24.62	3.13	26.63	1				
21.75	2.87	29.50	1				
18.12	3.63	33.13	1				
15.00	3.12	36.25	3/4	4.16			
38.65	New hole						
33.75	4.90	41.15	1				
29.50	4.25	45.40	1				
→	last gage					1 9/32	

MISSOURI SCHOOL OF MINES

MINING LABORATORY

TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner

Kind of Bit Regular Cross-bit

Gauge 1 1/2"

Length of Steel Regular 3rd

Kind of Steel F.J.A.B. 1/8" hollow round

Air Pressure 8.0 *a

Names

T. M. Simrall

E. O. Stoliker

Date

CHUCK TO ROCK.	TOTAL DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
31.25		4 P-12			15 1 3/2		
26.87	4.38	4.38	1				
23.50	3.37	7.75	1				
33.00		New hole					
27.75	5.25	13.00	1				
22.87	4.88	17.88	1				
19.37	4.50	22.38	1				
14.62	3.75	26.13	1				
10.25	4.37	30.50	1			21 1 6/4	
30.62		New hole					
25.62	5.00	35.50	1				
20.87	4.75	40.25	1				
16.50	4.37	44.62	1				
12.50	4.00	48.62	1			10 1 3/2	
30.00		New hole					
24.88	5.12	53.74	1				
19.62	5.25	58.99	1				
15.00	4.62	63.61	1				
13.62	1.37	64.98	1/2'	2.75"		19 1 3/4	
		Cont over					

**MISSOURI SCHOOL OF MINES
MINING LABORATORY**

TESTS OF ROCK DRILL BITS

Machine *No. 7 Water-Leyner*

Kind of Bit *Flat Cross-bit-high center*

Names

Gauge *1 1/2"*

F. O. Stoliker

Length of Steel *Regular 3rd.*

R. M. Simrall

Kind of Steel *FLAB 1 1/8" hollow round*

Date

Air Pressure *80***

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED INS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
<i>36.75</i>		<i>4 R-F-17</i>		<i>Same as</i>	<i>1 1/2"</i>		
<i>29.37</i>	<i>7.38</i>	<i>7.38</i>	<i>1</i>	<i>Column 2</i>			
<i>24.00</i>	<i>5.37</i>	<i>12.75</i>	<i>1</i>				
<i>18.10</i>	<i>5.90</i>	<i>18.65</i>	<i>1</i>				
<i>13.05</i>	<i>5.05</i>	<i>23.70</i>	<i>1</i>				
<i>7.87</i>	<i>5.18</i>	<i>28.88</i>	<i>1</i>			<i>25 1 64</i>	
<i>31.25</i>	<i>New hole</i>		<i>1</i>				
<i>27.45</i>	<i>3.80</i>	<i>32.68</i>	<i>1</i>				<i>Machine not working properly water leaking into valve chest.</i>
<i>24.50</i>	<i>2.95</i>	<i>35.63</i>	<i>1</i>				
<i>21.62</i>	<i>2.88</i>	<i>38.51</i>	<i>1</i>				
<i>18.45</i>	<i>3.17</i>	<i>41.68</i>	<i>1</i>				
<i>15.95</i>	<i>2.50</i>	<i>44.18</i>	<i>1</i>				
<i>14.08</i>	<i>1.87</i>	<i>46.05</i>	<i>1</i>			<i>1 32</i>	
<i>32.35</i>	<i>New hole</i>		<i>1</i>				
<i>27.50</i>	<i>4.85</i>	<i>50.90</i>	<i>1</i>				
<i>23.87</i>	<i>3.63</i>	<i>54.53</i>	<i>1</i>				
<i>19.62</i>	<i>4.25</i>	<i>58.78</i>	<i>1</i>				
<i>17.25</i>	<i>2.37</i>	<i>61.15</i>	<i>1</i>			<i>10 1 32</i>	

**MISSOURI SCHOOL OF MINES
MINING LABORATORY**

TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
 Kind of Bit Flat X-bit - high centre
 Gauge $1\frac{1}{2}$ "
 Length of Steel 3rd
 Kind of Steel F.A.B. $1\frac{1}{8}$ " hollow round
 Air Pressure 80#

Names
 R. M. Simrall
 E. O. Stoliker
 Date

CHUCK TO ROCK.	DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED FMS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
26.00		4 P-F-21		Same as 2nd Column	$1\frac{15}{32}$		
22.38	3.72	3.72	1				
18.17	4.11	7.83	1				
14.17	4.00	11.83	1			$1\frac{13}{32}$	
13.87	3.00	New hole					
10.87		14.83	1				
29.68		New hole					
24.50	5.18	20.01	1				
21.12	3.37	23.38	1				
17.70	3.42	26.80	1				
14.17	3.53	30.33	1				
10.50	3.67	34.00	1			$1\frac{12}{32}$	
		4 P-F-22					
31.30							
25.87	5.43	5.43			$1\frac{1}{2}$ "		
22.94	2.93	8.36					
17.38	4.56	12.92	$1\frac{1}{2}$ '	3.04			
14.87	2.51	15.43				$1\frac{13}{32}$ '	
		Can't over					

MISSOURI SCHOOL OF MINES

MINING LABORATORY

TESTS OF ROCK DRILL BITS

Machine No. 7 Water-Leyner
 Kind of Bit Regular G point
 Gauge 1 1/2"
 Length of Steel Regular 3rd
 Kind of Steel FLAB 1/8" hollow round
 Air Pressure 80#

Names

R. M. Simrall
E. D. Stalker

Date

CHUCK TO ROCK.	TOTAL DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED MS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
23.37		<u>GP-3</u>		Same as	1 1/2"		
18.35	5.02	5.02	1	2nd Column			
14.00	4.35	9.37	1				
10.37	3.63	13.00	1				
7.00	3.37	16.37	1			1 13/32	
23.62		<u>New hole</u>					
20.00	3.62	19.99	1				
15.62	4.37	24.36	1				
10.50	5.12	29.48	1				
6.30	4.20	43.68	1			1 12/32	
21.37		<u>New hole</u>					
16.50	4.87	48.55	1				
13.62	2.88	51.43	1				
12.50	1.12	52.55	1				
12.00	.50	53.05	1			1 11/32	
28.00		<u>GP-7</u>			1 1/2"		
24.16	3.84	3.84	1				
21.12	3.04	6.88	1				low press
17.00	4.12	11.00	1				
13.25	3.75	14.75	1			1 11/32	Not holding up well
		<u>Cont over</u>					

MISSOURI SCHOOL OF MINES
MINING LABORATORY
TESTS OF ROCK DRILL BITS

Machine.....
 Kind of Bit.....
 Gauge.....
 Length of Steel.....
 Kind of Steel.....
 Air Pressure.....

Names
E. O. Staliker
R. M. Simrall
 Date

CHUCK TO ROCK.	TOTAL DISTANCE DRILLED	Total DISTANCE DRILLED	TIME	SPEED FMS. PR. MIN.	GAUGE		REMARKS
					START	FINISH	
29.00							
		<i>6P-7 cont. New hole</i>					
26.12	2.87	17.62	1	<i>Same as Column 2</i>			
23.20	2.92	20.54	1				
20.62	2.58	23.12	1				
19.37	1.25	24.37	1				
19.00	.37	24.74	1			$1\frac{11}{32}$	<i>lost gauge</i>
		<i>6P-11</i>					
32.67						$1\frac{1}{2}$ "	
27.87	4.80	4.80	1				
24.62	3.25	8.05	1				
21.62	3.00	11.05	1				
18.75	2.87	13.92	1				
16.30	2.45	16.37	1				
13.75	2.55	18.92	1			$1\frac{12}{32}$	
31.20							<i>New hole</i>
29.30	1.90	20.82	1				
28.30	1.00	21.82	1				
27.87	.43	22.25	1			$1\frac{11}{32}$	

CONCLUSIONS:

Contrary to expectations based on tests of piston drills it is observed upon examination of a majority of the curves on plates I to VI inclusive, that the maximum drilling speed was obtained at the beginning of each hole, the drilling speed dropping to a minimum at the end of the hole. A like result was obtained for each succeeding hole in which the same bit was used without resharpening.

A number of the curves show a slight increase in drilling speed near the middle of the holes. This was influenced, in all probability, by the position of the machine in the guides.

The most favorable results as to drilling speed and total distance drilled were obtained with the special Flat cross-bit.

In conclusion, all bits for the water-leyner machine may be said to give a relatively high drilling speed in hard rock and a relatively low total distance drilled without resharpening.