RESEARCH REPORT

REPLICATION OF EYE-BARS AND MEASUREMENT OF LOSSES IN CROSS SECTION DUE TO CORROSION

(Central Bridge Over Ohio River, Newport-Cincinnati, Bridge No. 19-6411-1)

KYP-56

by

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REPLICATION OF EYE-BARS AND MEASUREMENT OF LOSSES IN CROSS SECTION DUE TO CORROSION

Recent availability of high pressure water blasters made it possible to remove rust accumulated between the eye-bars near pin connections on the Central Bridge (Figure 1) over the Ohio River at Newport. Previously, they had never been thoroughly cleaned. Cleaning of two connections on a trial basis enabled an inspection between the bars. It was apparent then that the deterioration was critical enough to neccesitate examination of the several bar groups and to accurately measure their least cross sections.

The Research Division undertook the task of replicating and measuring the bars. Figures 2 and 3 show one set of bars before and after cleaning. Considerable difficulty was encountered in making moldings or impressions because the space between the two center bars, referred to here as 1, 2, 3 and 4 (Figure 4), varied between one-quarter and one-half inch. Thin sheet metal forms (Figure 5) were used to fit around each section. These forms were then tied in place (Figure 6) and sealed around the edges with paraffin to prevent liquid leakage. A two-component compound, referred to as Sika-Flex, was used to fill these forms and provide a negative molding. Sika-Flex is a liquid joint filler which hardens into a rubbery type of material after mixing --- thereby retaining the exact shape of the bar sections after removal. Wire mesh was used inside the forms around the bars to prevent stretching or deformation of the Sika-Flex mold. Figures 7 and 8 show the forms installed.

The forms were removed after several hours of curing and taken to the laboratory where hydrostone was used to make an exact positive casting of the bar sections (Figure 9). Thereafter, each of these replicates was measured at three or four places where the least section was thought to be. A contour gauge was used to transfer these cross sections onto paper and then the area was measured with a planimeter. This method is believed to be reasonably accurate. The percent loss of section in each bar was calculated in reference to the original section taken from calculations made previously by the Maintenance Division.

A key for identifying the bars as listed is provided in Figure 10. Attached are copies of the measured sections of the respective bars listed in Table 1.

Eye Bar No.	Original Section (Sq. In.)	Percent Loss
U_{15} L_3L_2-1	5.625	10.84
U_{15} L_3L_2-2	5.625	8.80
U_{15} L_3L_2-3	5.625	15.91
U_{15} L_3L_2-4	5.625	12.18
U_{15} $L_5'L_4'$-2	7.1875	6.57
U_{15} $L_5'L_4'$-3	7.1875	22.78
U_{15} $L_5'L_4'$-4	7.1875	15.00
U_{14} L_6L_5'-1	7.1875	8.38
U_{14} L_6L_5'-2	7.1875	13.81
U_{14} L_6L_5'-3	7.1875	22.23
D_{15} L_3L_2-3	5.625	13.42
D_{15} L_3L_2-4	5.625	21.68
D_{15} L_6L_5'-3	7.1875	16.52
D_{15} L_6L_5'-4	7.1875	14.3
D_{14} L_3L_2-3	5.625	22.31
D_{14} L_3L_2-4	5.625	14.58
D_{14} $L_5'L_4'$-3	7.1875	12.83

Table 1. Maximum Percent Loss in Bar Sections

MEASURED BAR SECTIONS

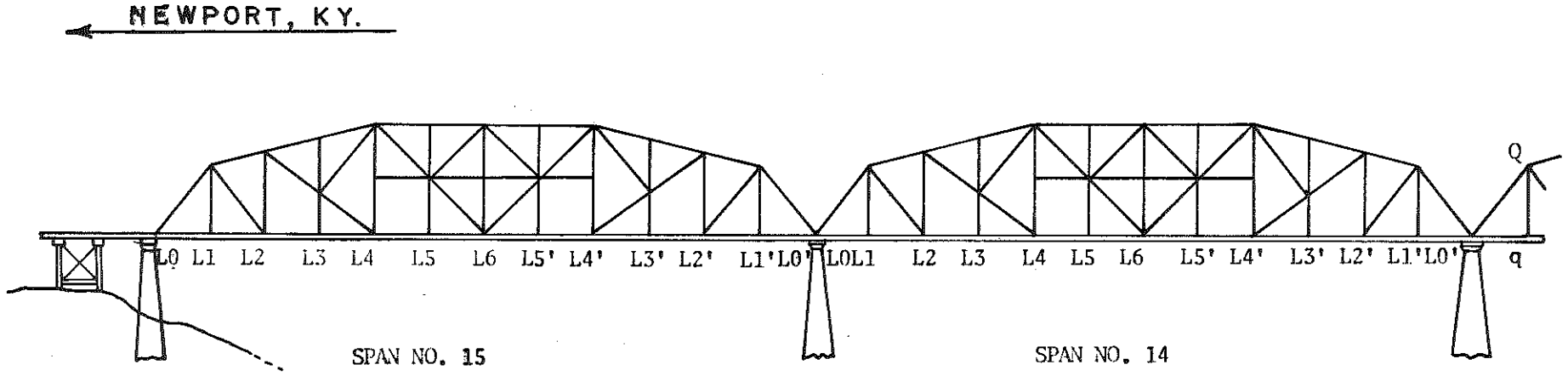


Figure 10. Code for identifying bars

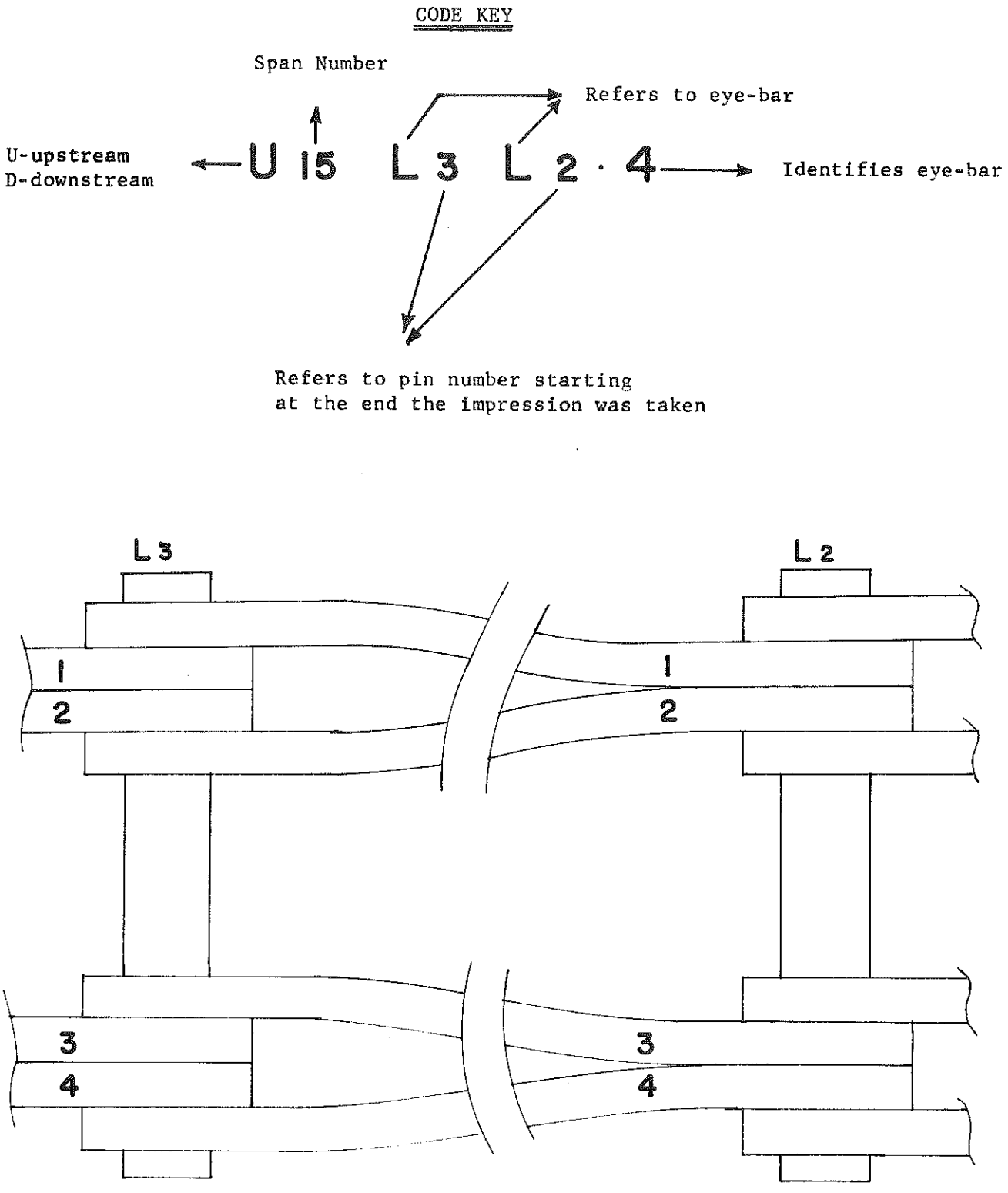
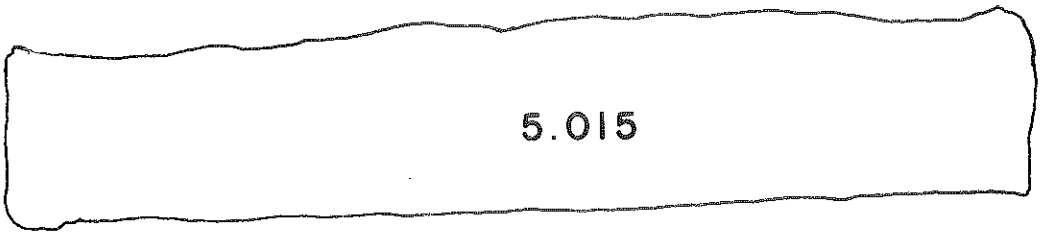


Figure 10. Code for identifying bars

1



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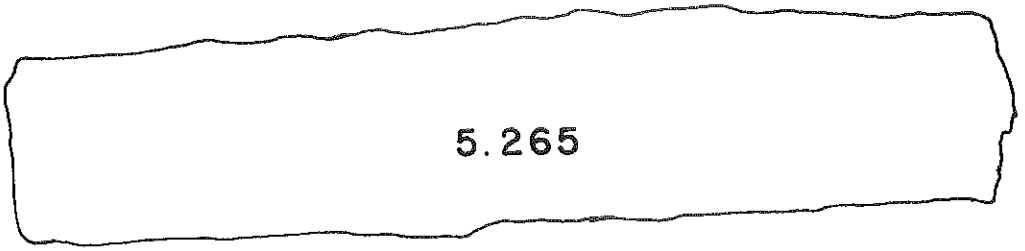

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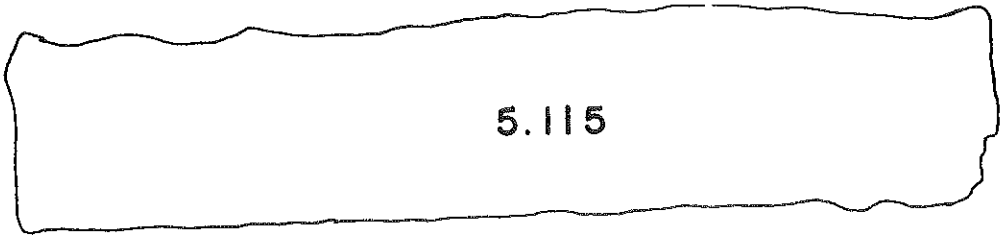
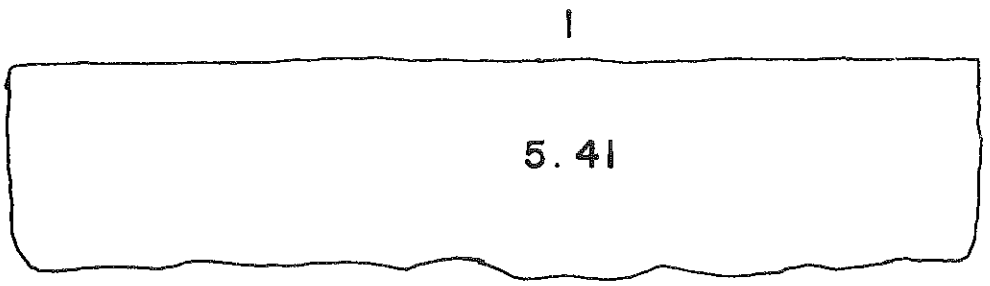
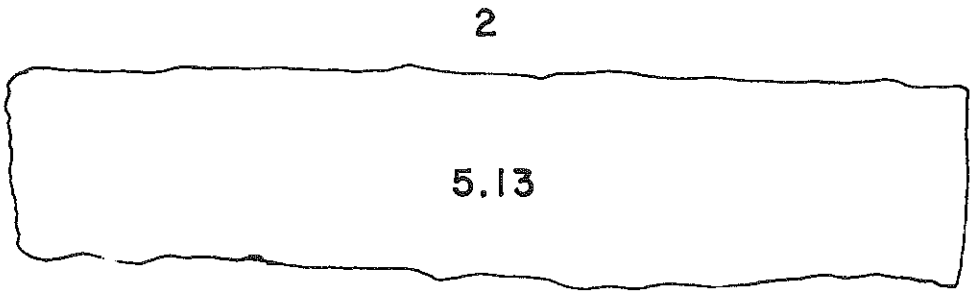
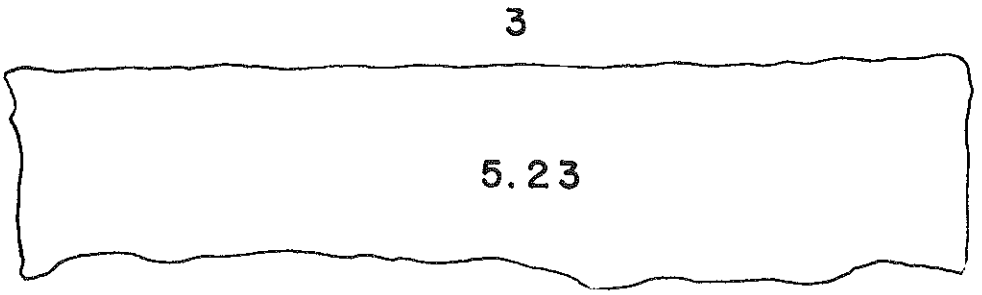


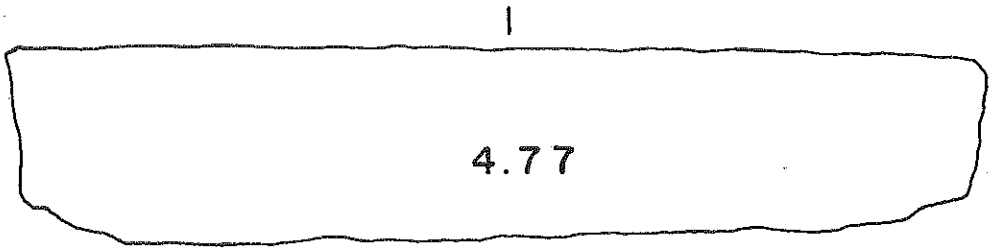
U·15 (L·3 L·2 - 1)
Original Section = 5.625 Sq. In.
Percent Loss = 10.84

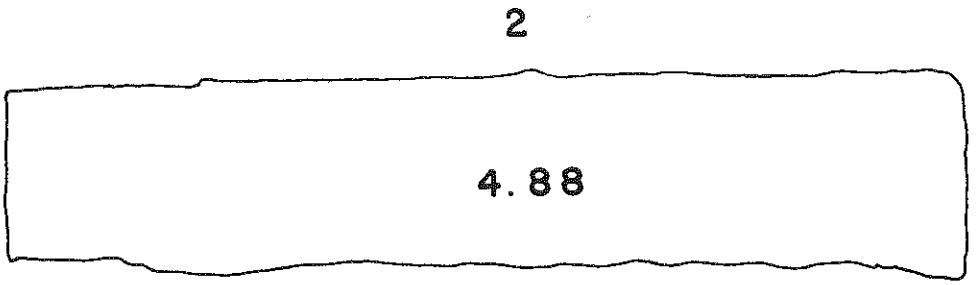


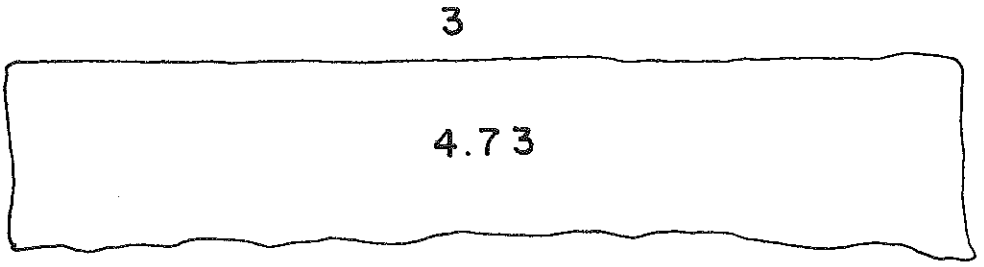




(U·15 L·3L·2-2)
Original Section = 5.625 Sq. In..
Percent Loss = 8.80

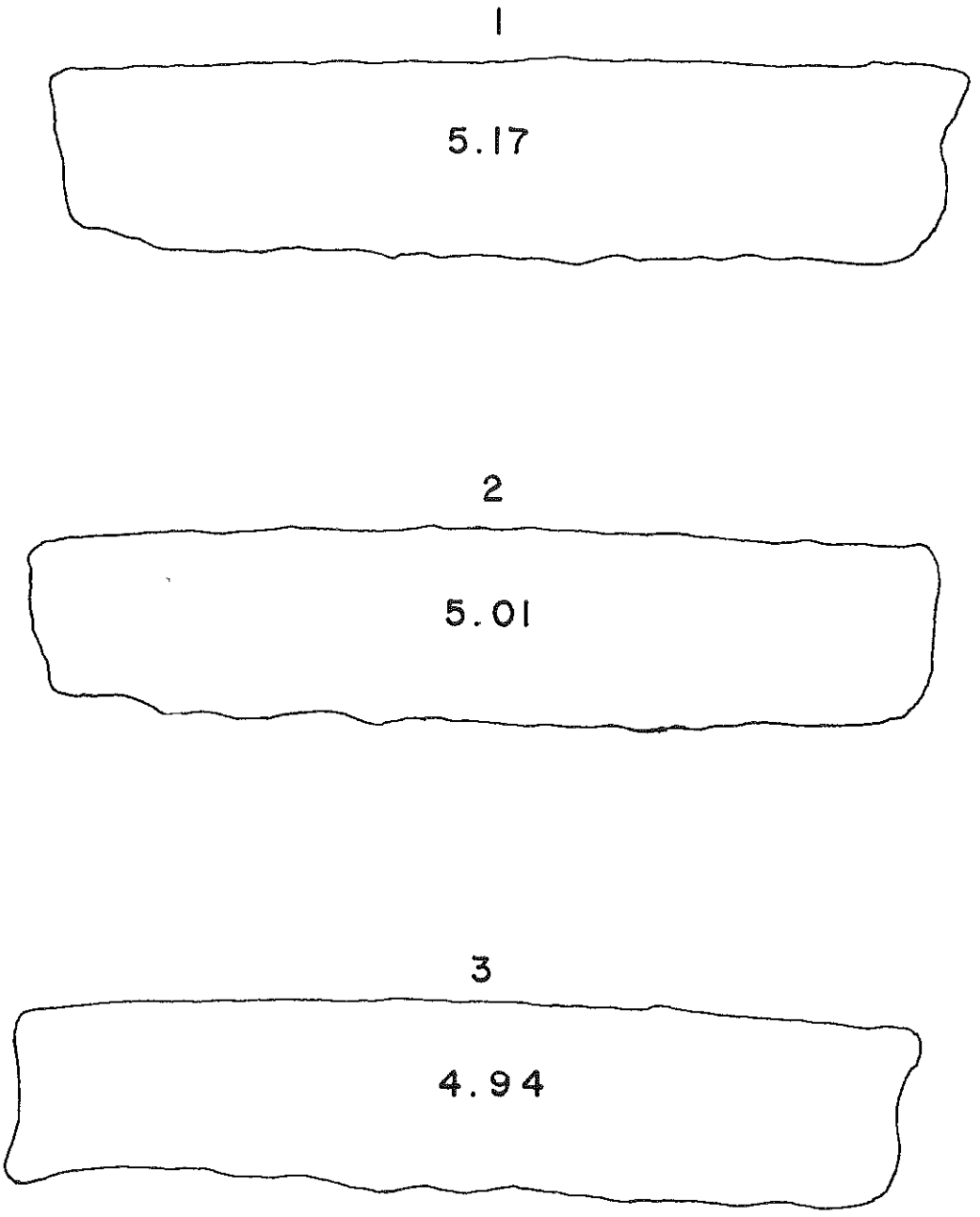






(U·15 L·3 L·2-3)

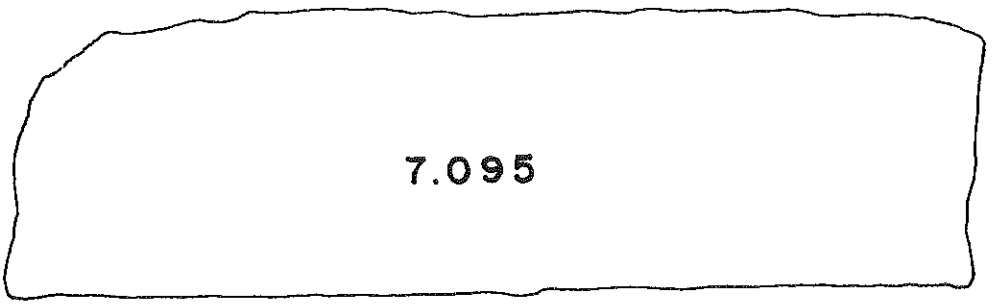
Original Section = 5.625 Sq. In.
Percent Loss = 15.91



(U·15 L·3 L·2 - 4)

Original Section = 5.625 Sq. In.
Percent Loss = 12.18

1



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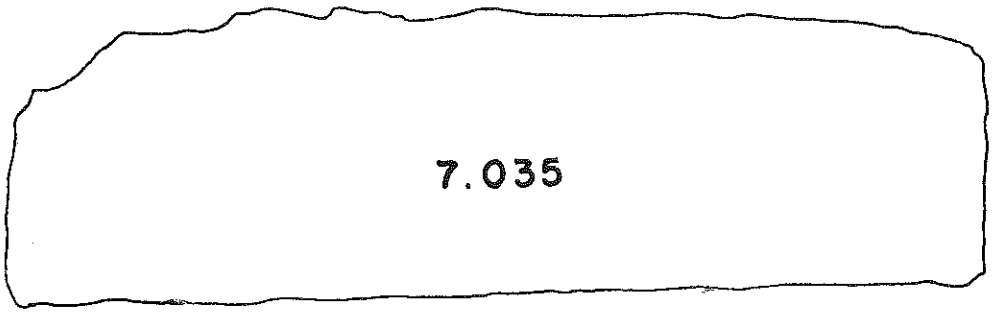

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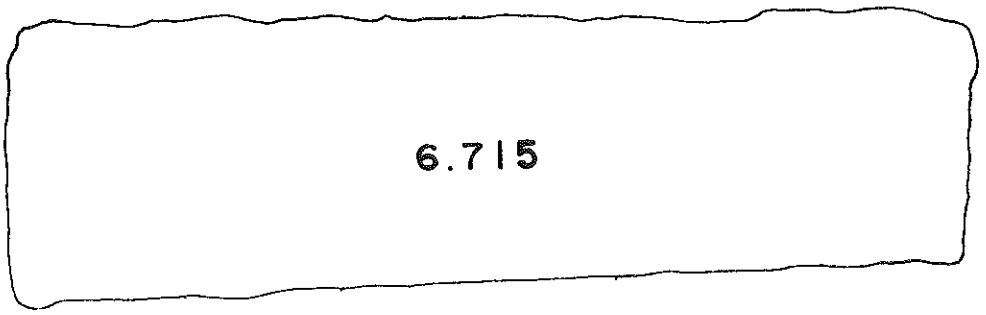
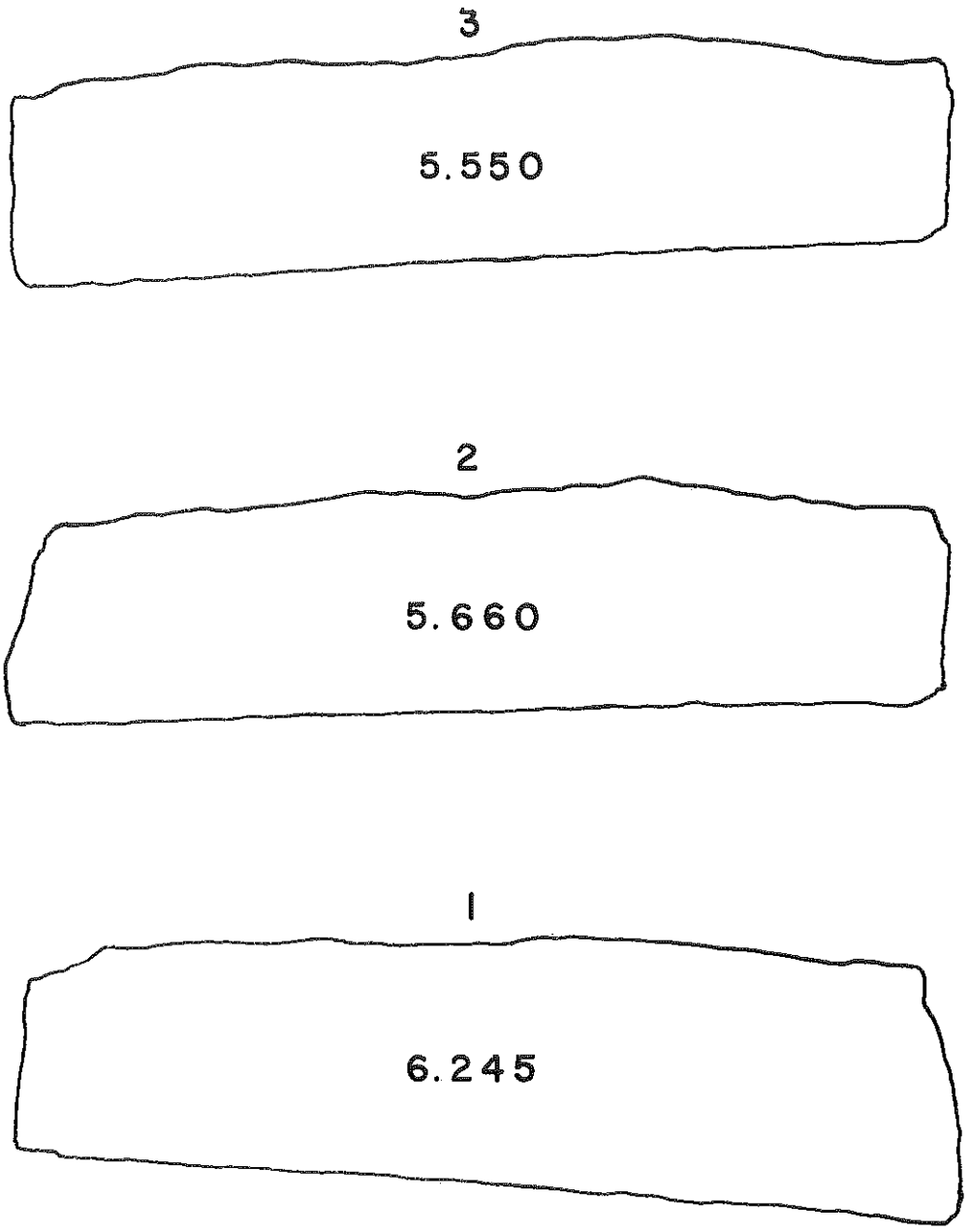


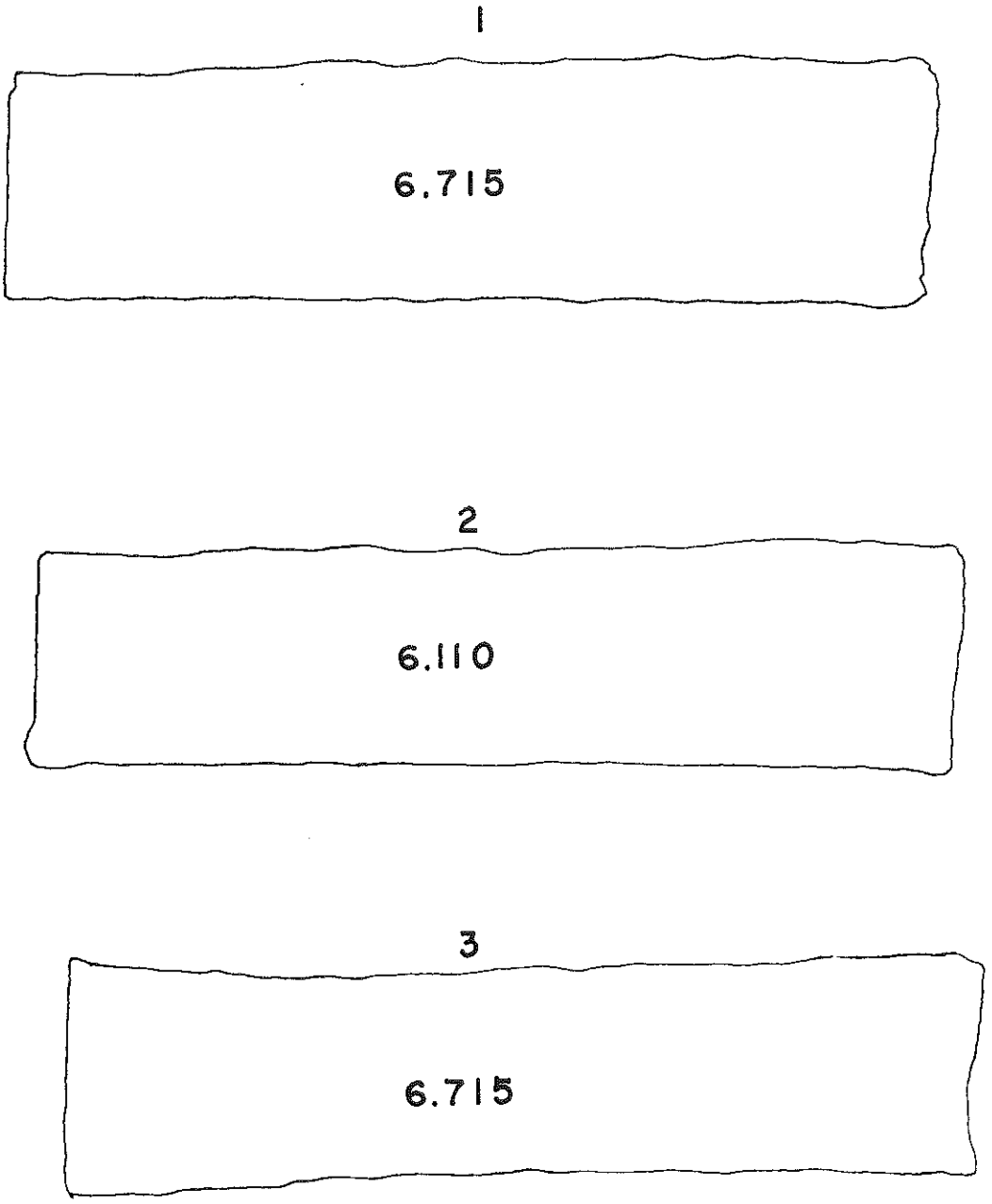
(U·15 - L'·5 L'·4 - 2)

Original Section = 7.1875 Sq. In.
Percent Loss = 6.57%



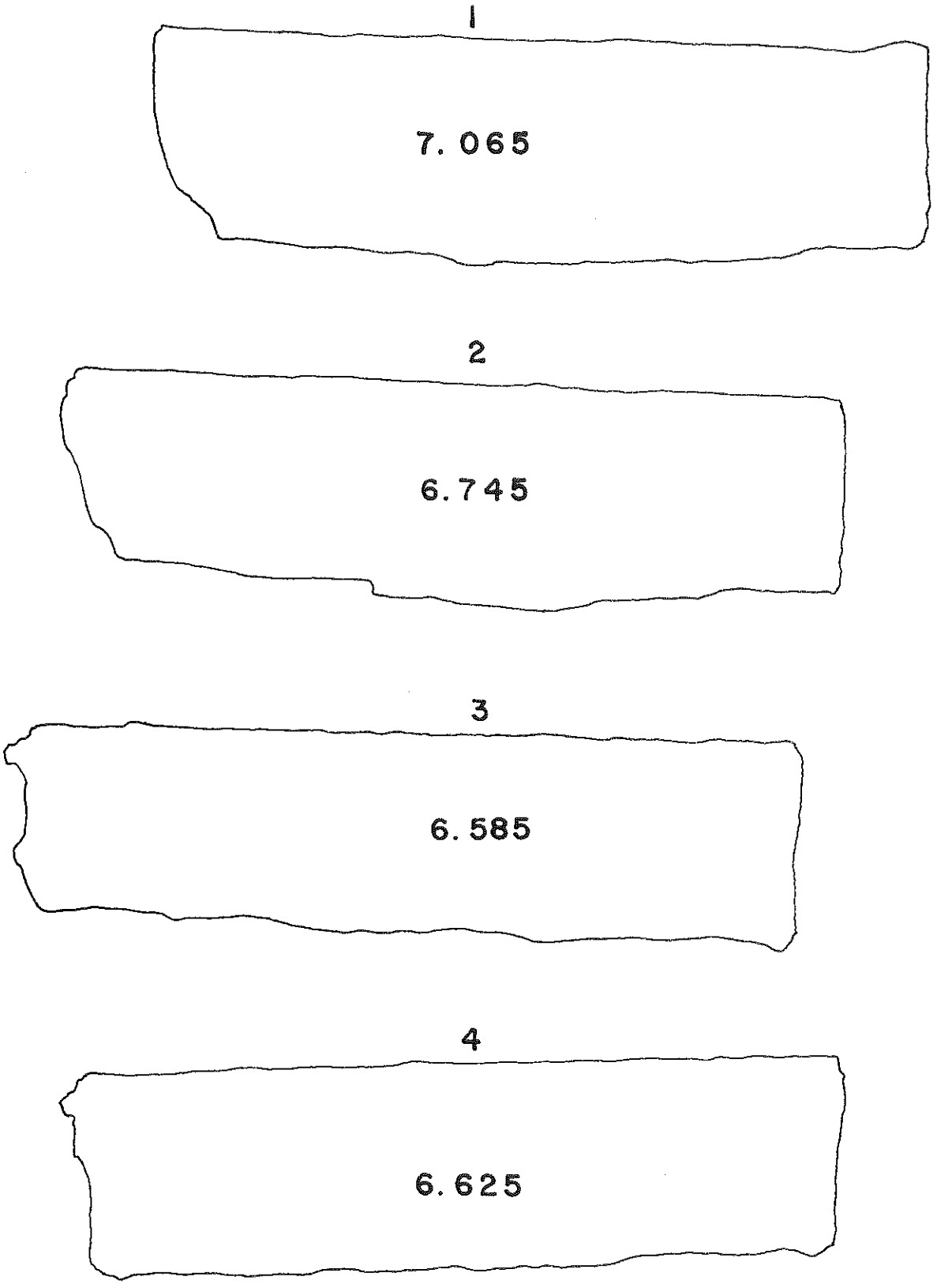
(U .15 - L1.5 L1.4 - 3)

Original Section = 7.1875 Sq. In.
Percent Loss = 22.78%



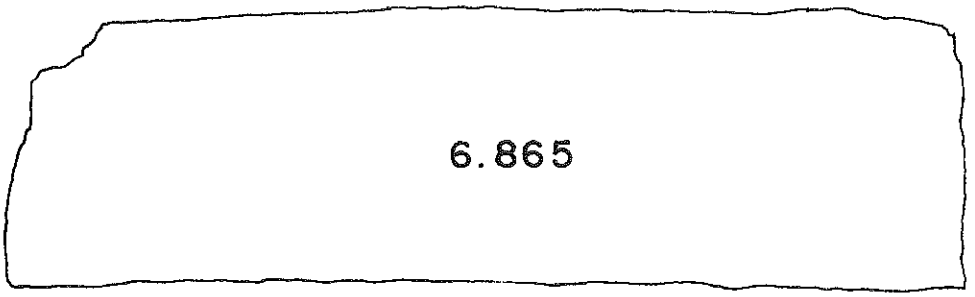
(U·15 - L'·5 L'·4 - 4)

Original Section 7.1875 Sq. In.
Percent Loss = 15%



(U·14 L·6 L·5 - 1)
Original Section = 7.1875 Sq. in.
Percent Loss = 8.38

1



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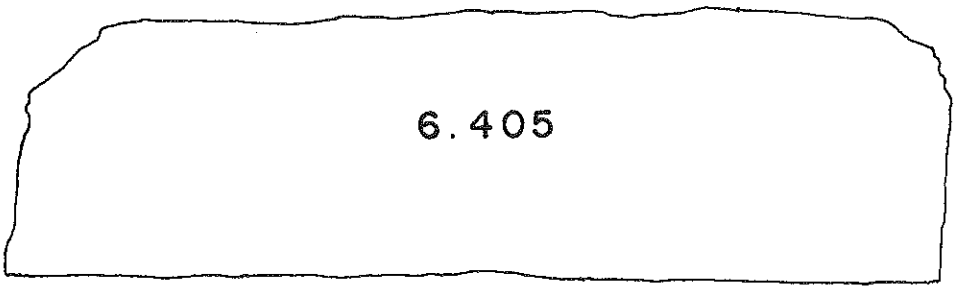

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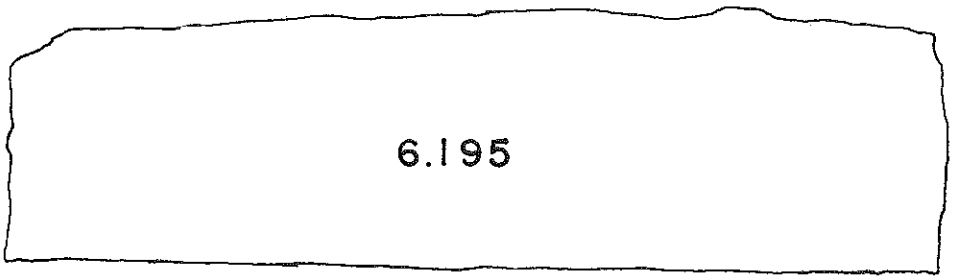

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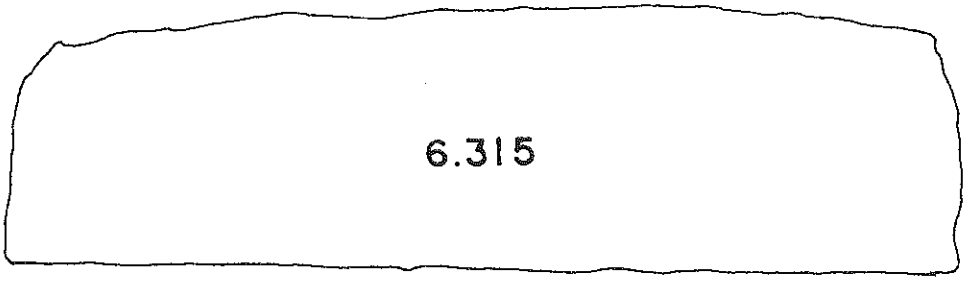
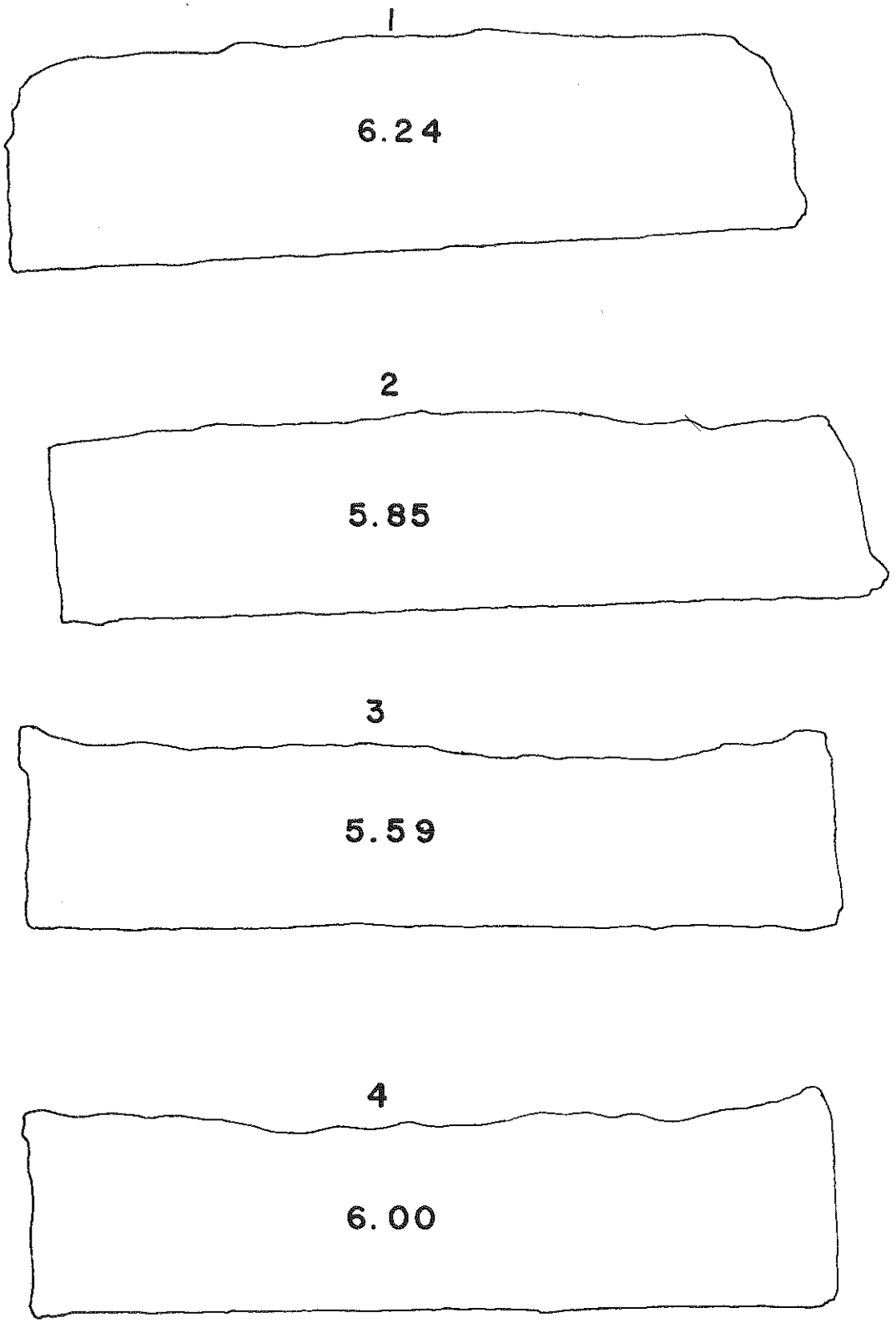


(U·14 L·6 L'5 - 2)

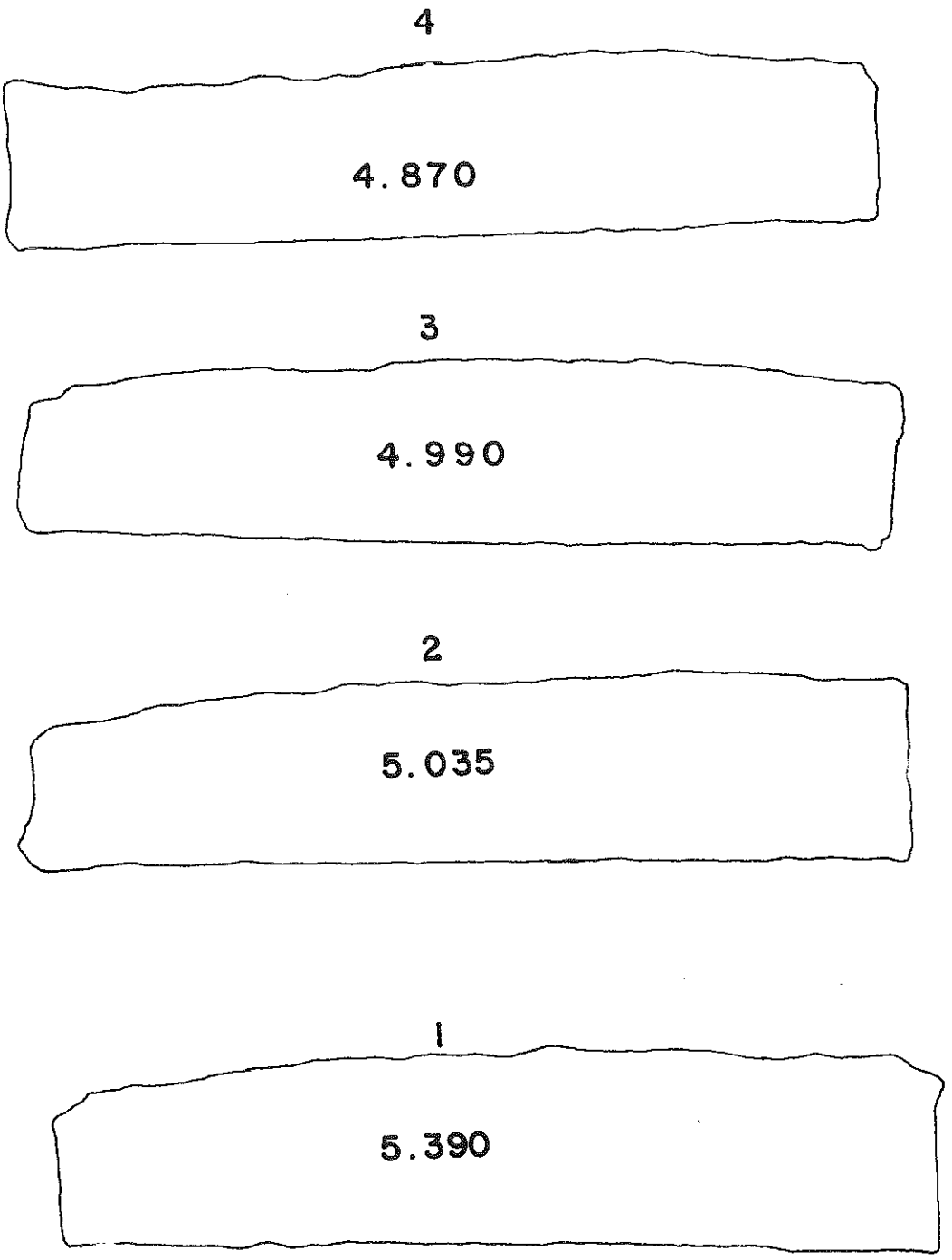
Original Section = 7.1875 Sq. in.
Percent Loss = 13.81



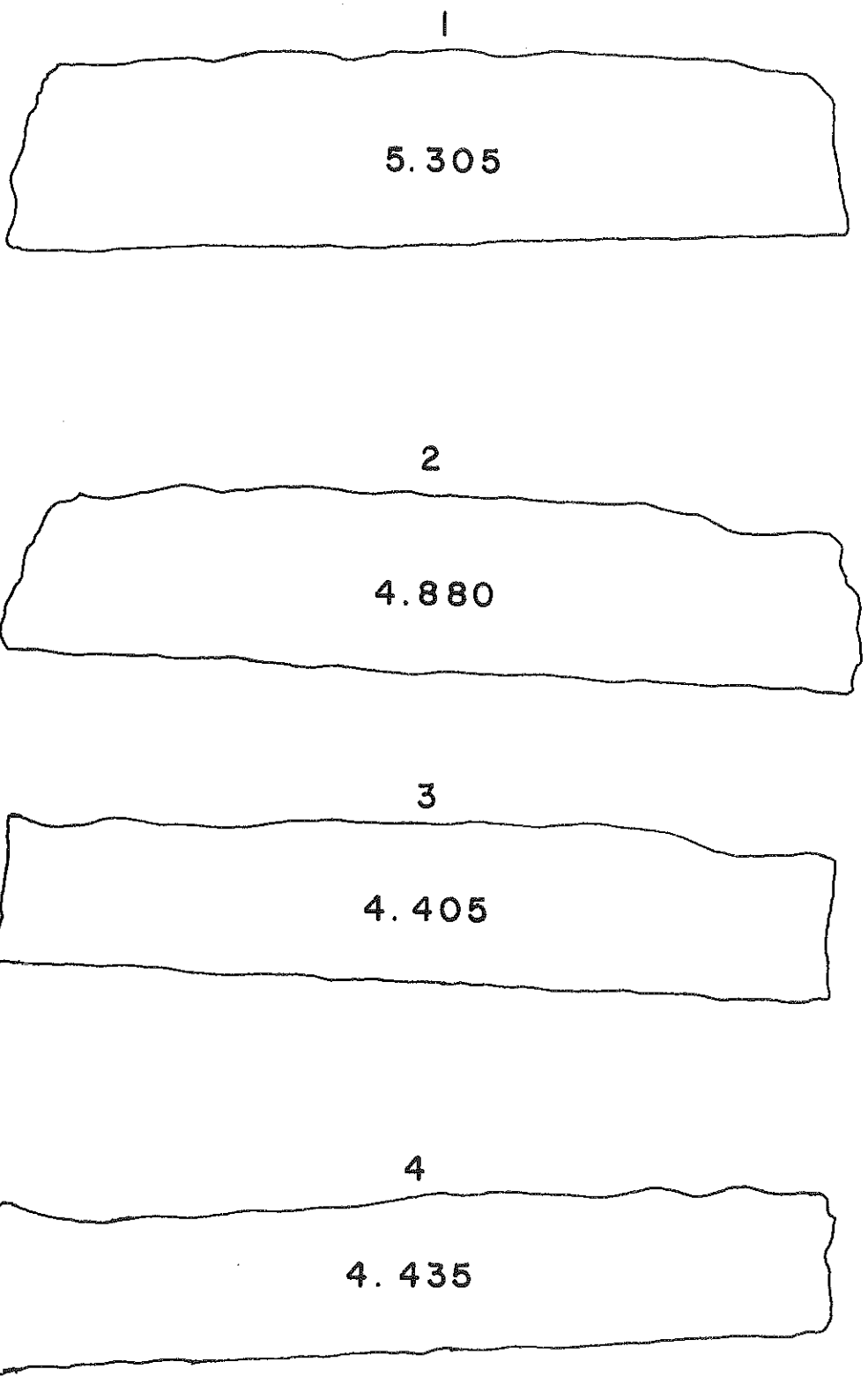
(U·14 L·6 L'5 - 3)

Original Section = 7.1875 Sq. In.

Percent Loss = 22.23%

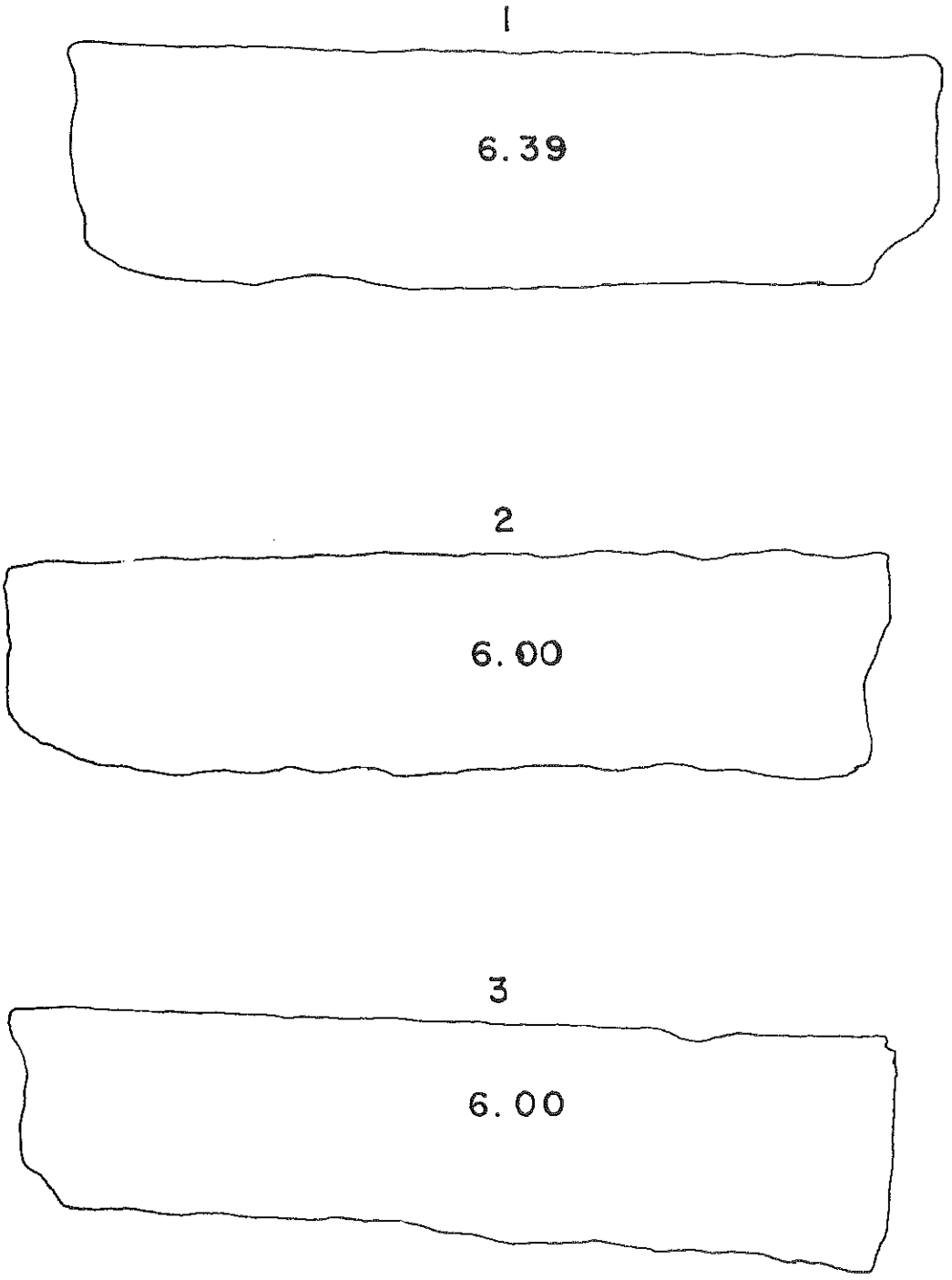


(D·15 L·3 L·2 - 3)
Original Section = 5.625 Sq. In.
Percent Loss = 13.42



(D·15-L·3 L·2-4)

Original Section = 5.625 Sq. In.
Percent Loss = 21.68

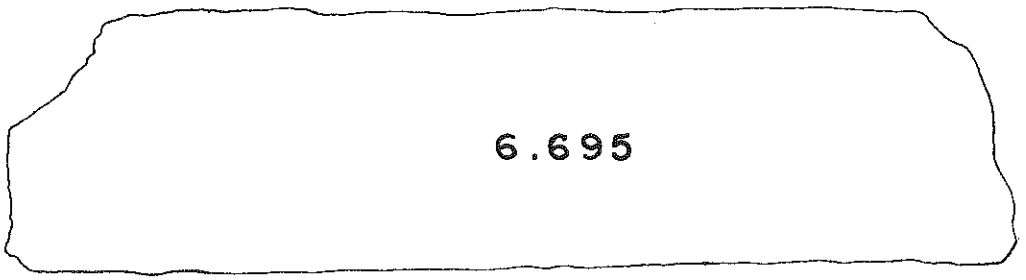


(D·15 L·6 L'5 - 3)

Original Section = 7.1875 Sq. In.

Percent Loss = 16.52

1



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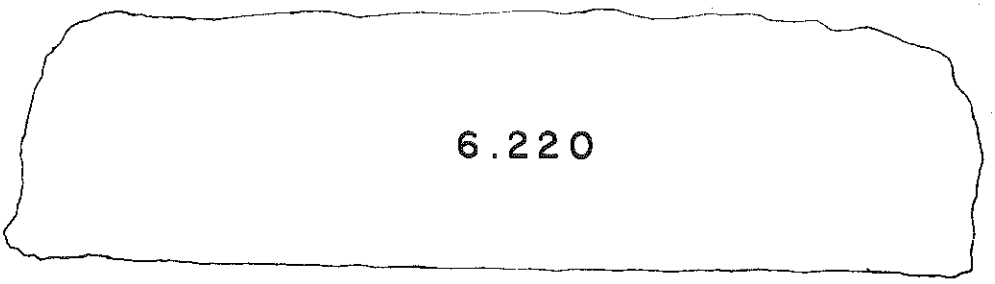

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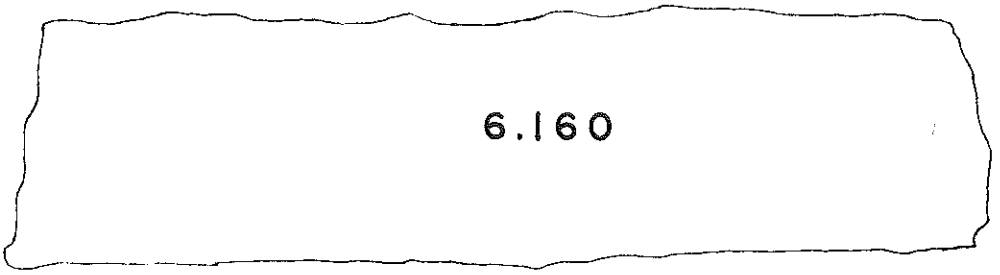
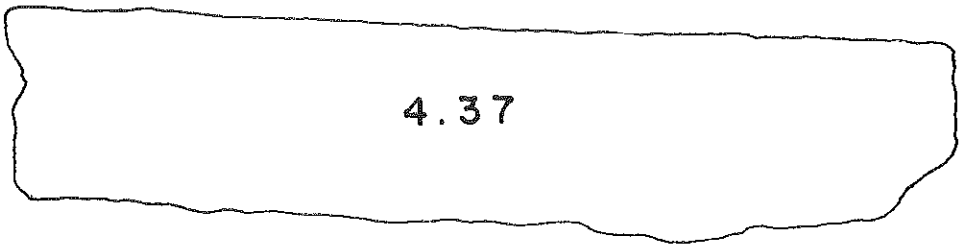


(D·15 - L·6 L'·5 - 4)

Original Section = 7.1875 Sq. In.
Percent Loss = 14.3

1



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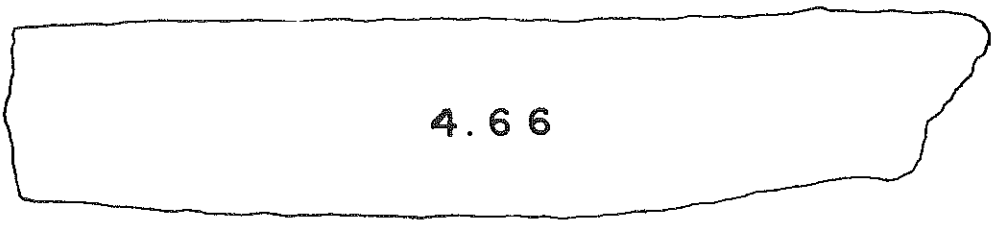

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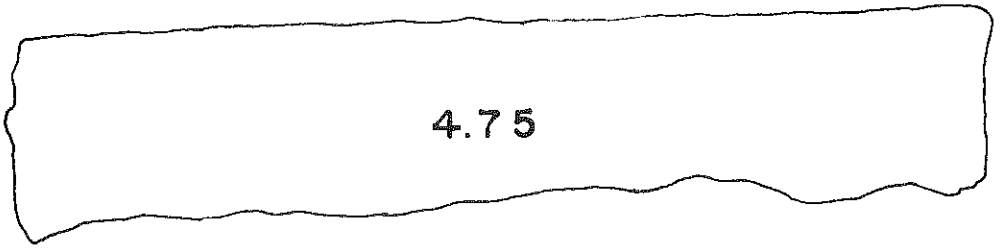
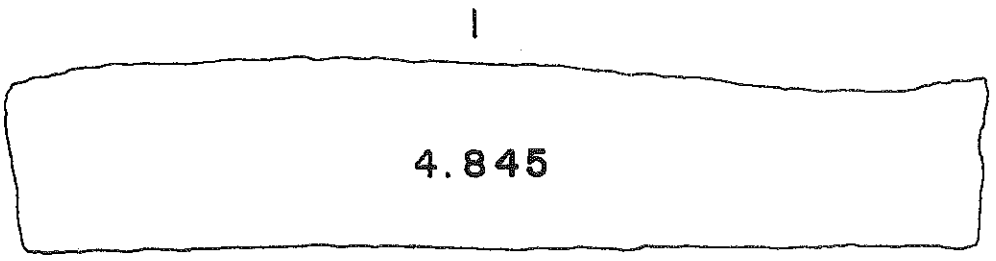
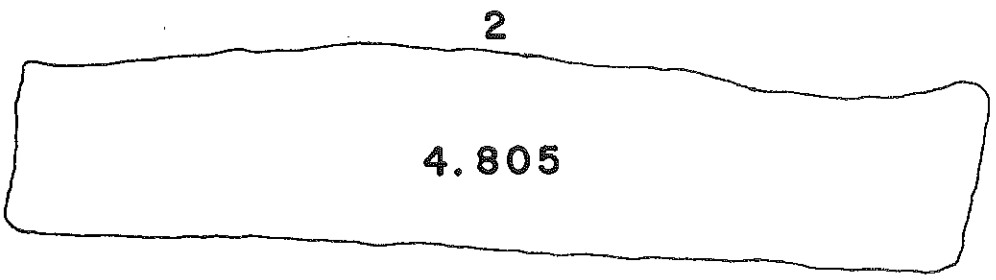
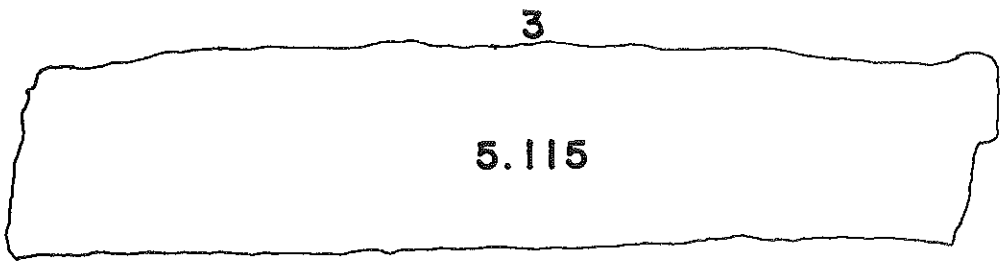


(D·14 L·3 L·2-3)

Original Section = 5.625 Sq. In.
Percent Loss = 22.31

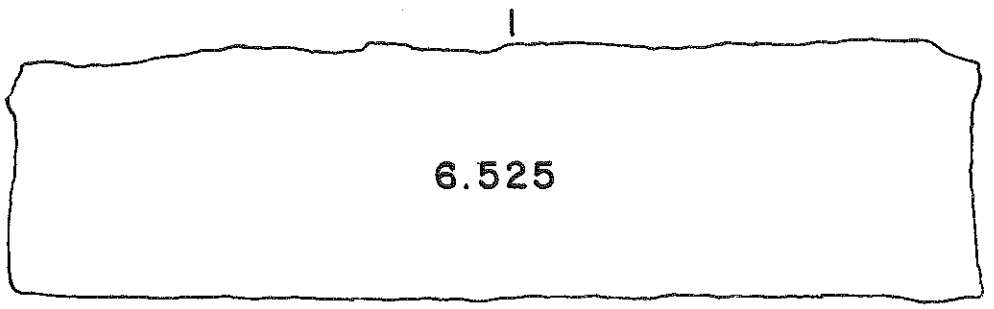


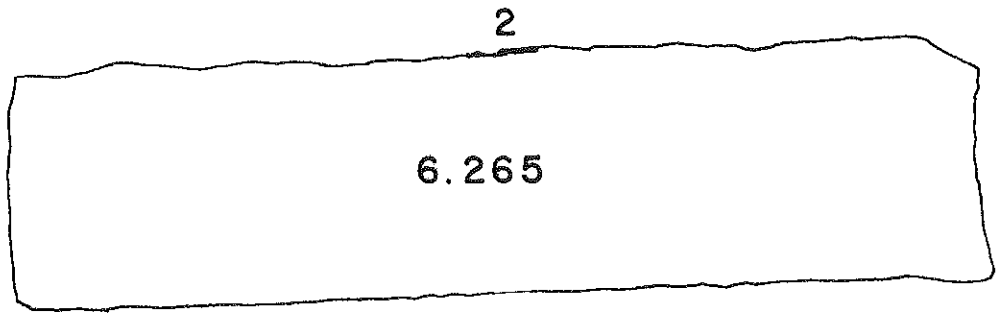


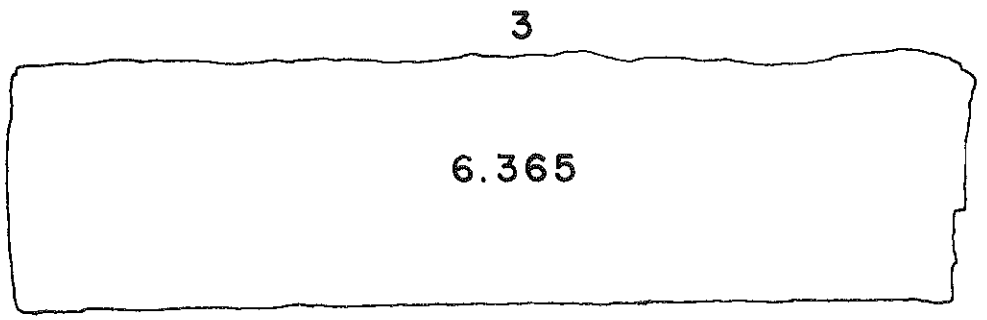


(D·14 L·3 L·2 - 4)

Original Section = 5.625 Sq. In.
Percent Loss = 14.58







(D·14 L'5 L'4 - 3)

Original Section = 7.1875 Sq. In.
Percent Loss = 12.83

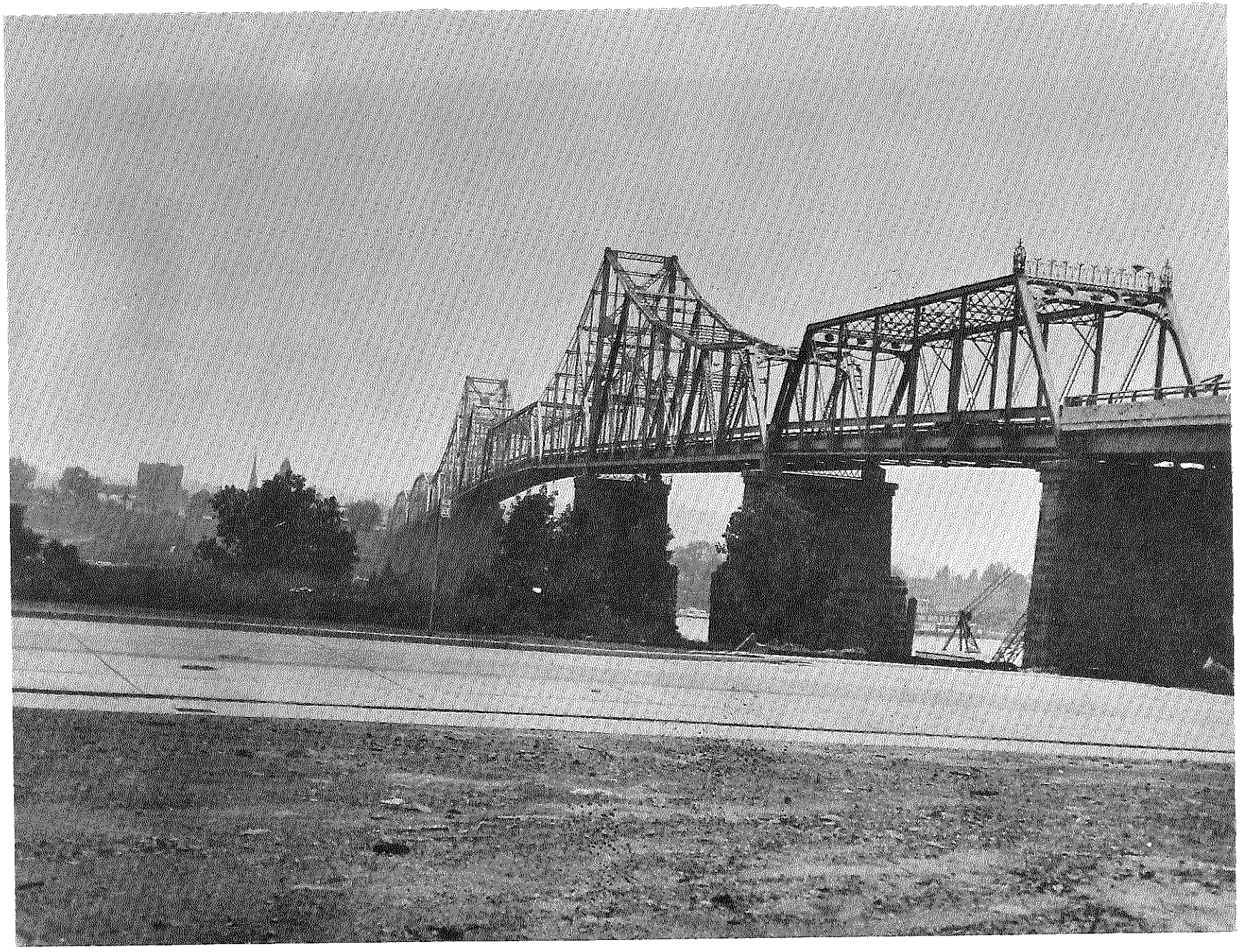


Figure 1. An overall view of Central Bridge

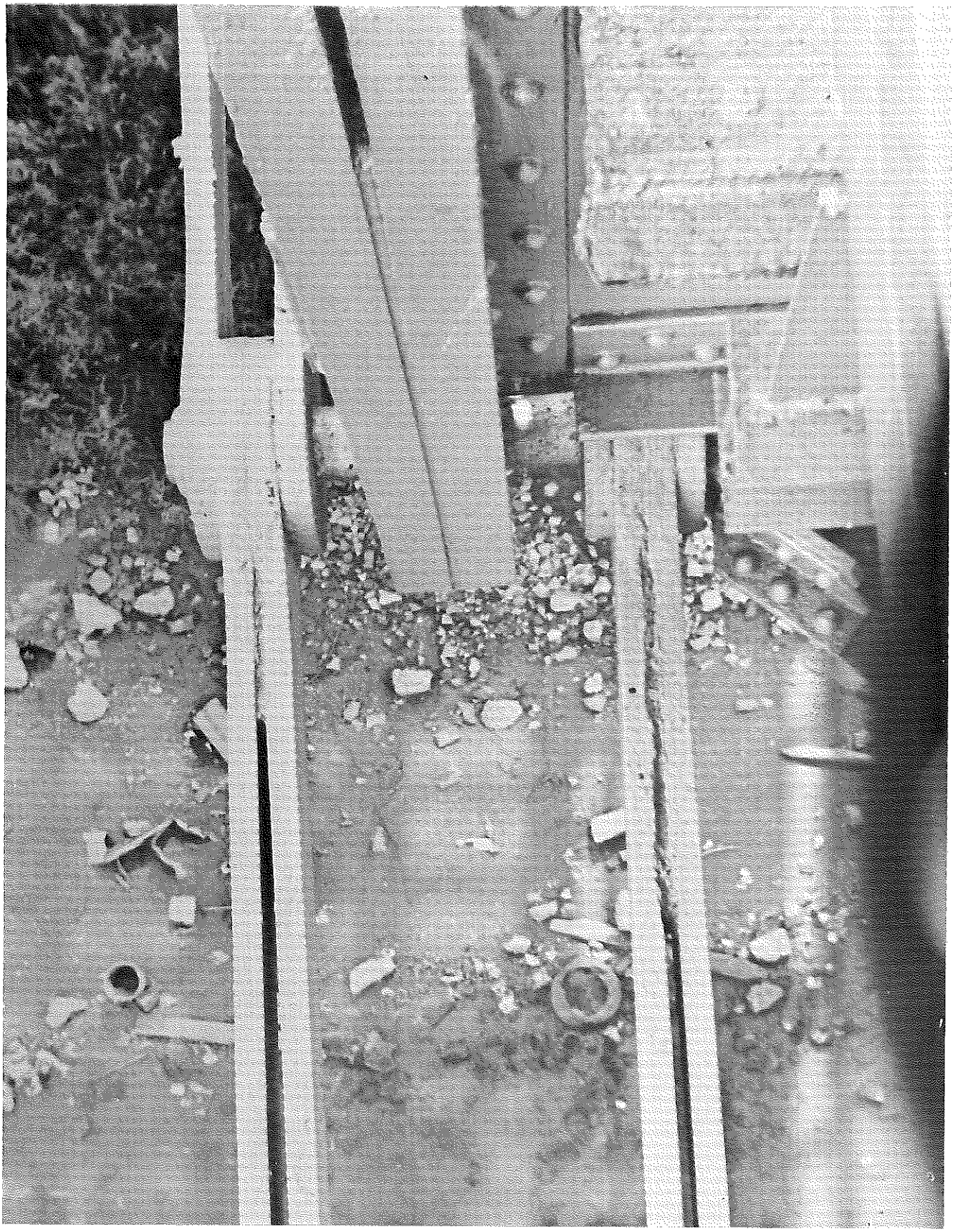


Figure 2. An eye-bar group before cleaning

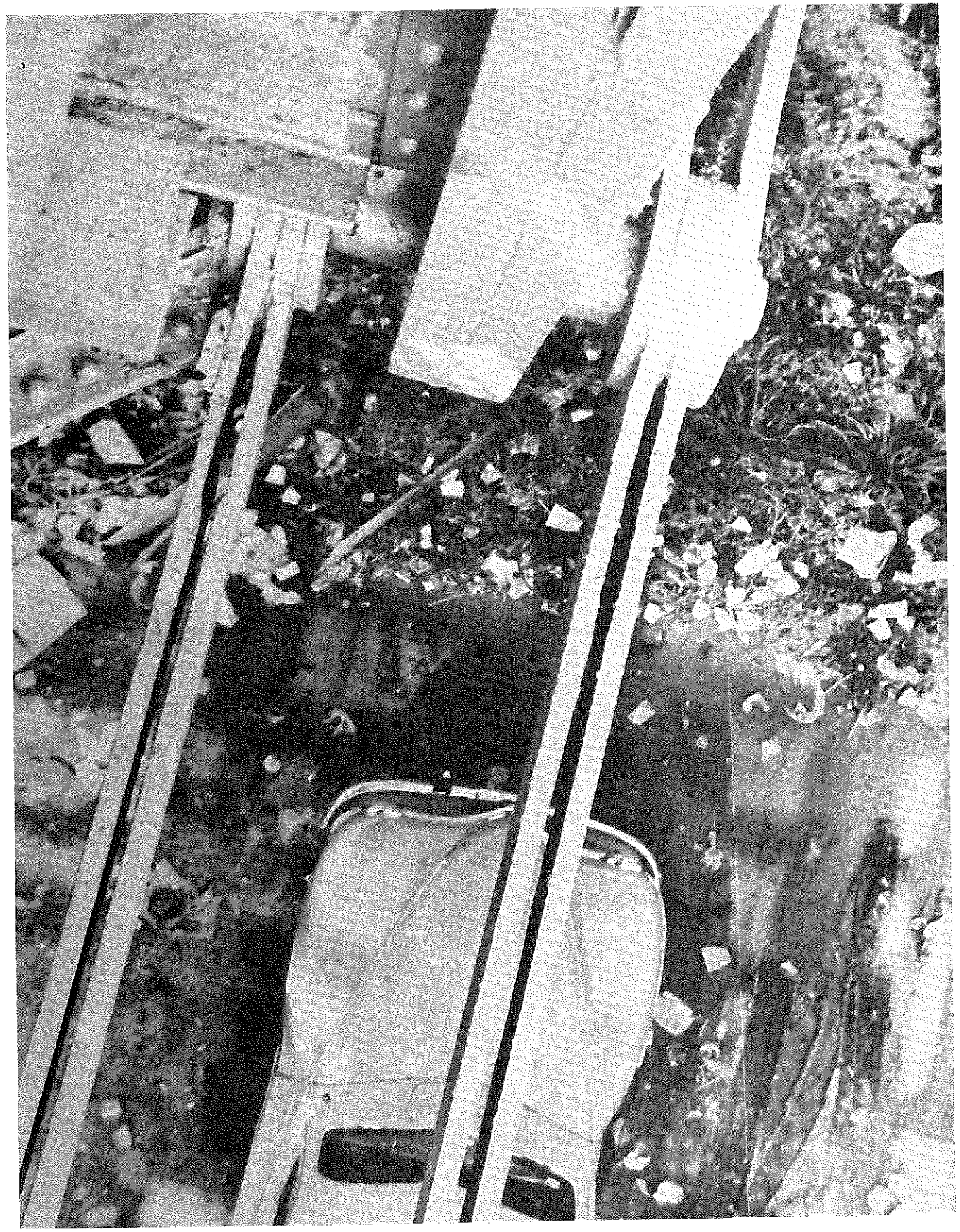


Figure 3. The eye-bar group in Figure 2 after cleaning

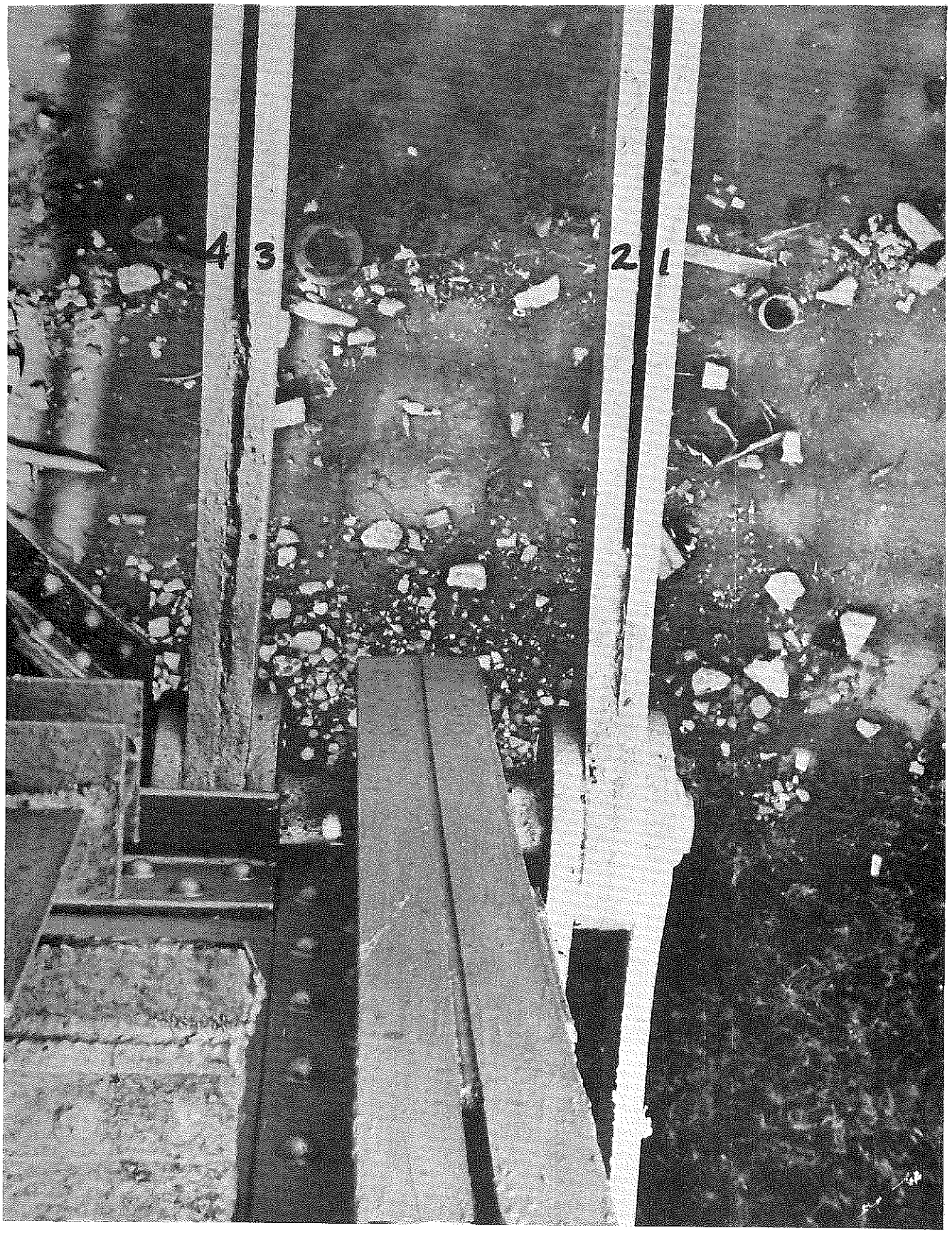


Figure 4. Identification of each eye bar

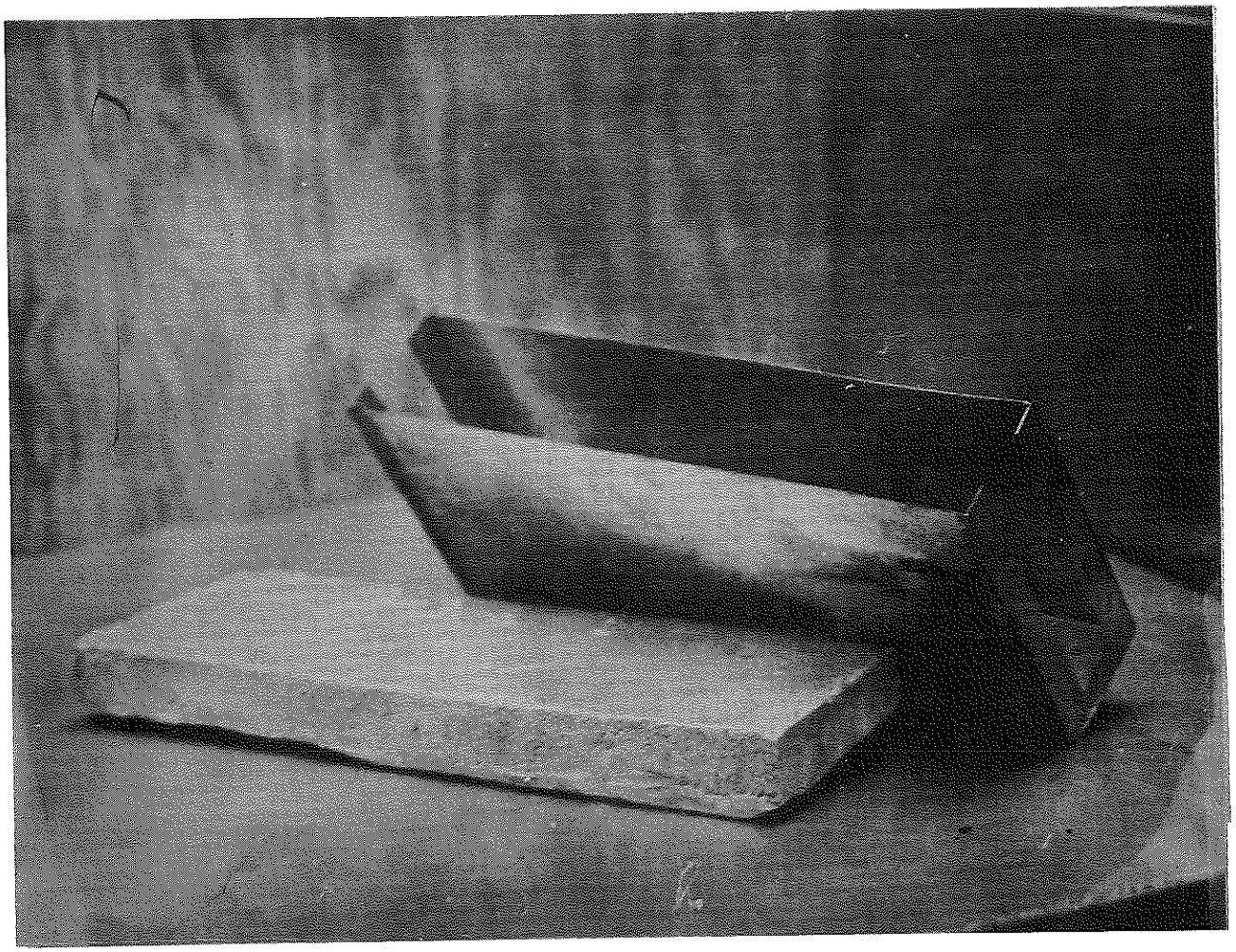


Figure 5. A metal form before installation

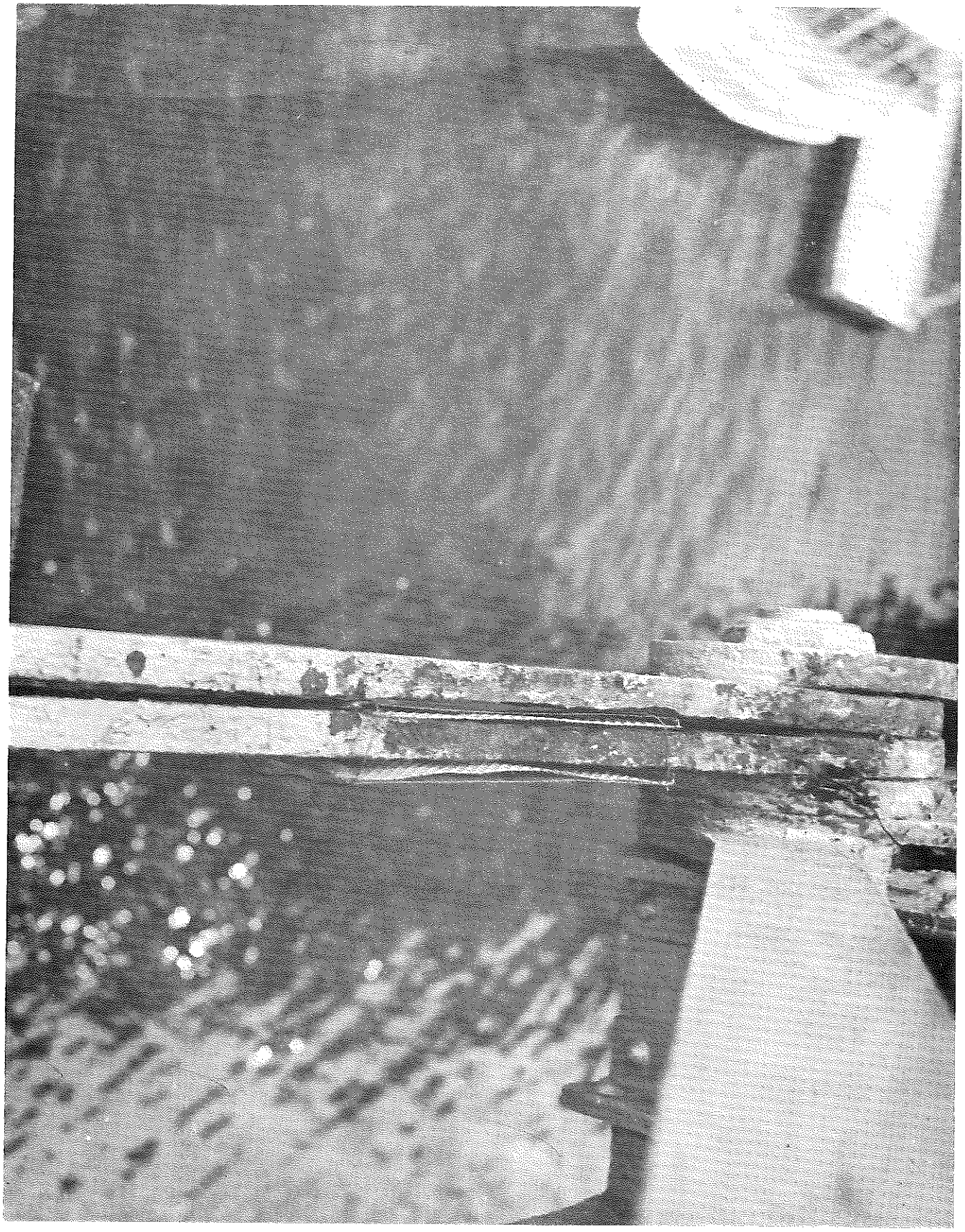


Figure 6. A form tied in place

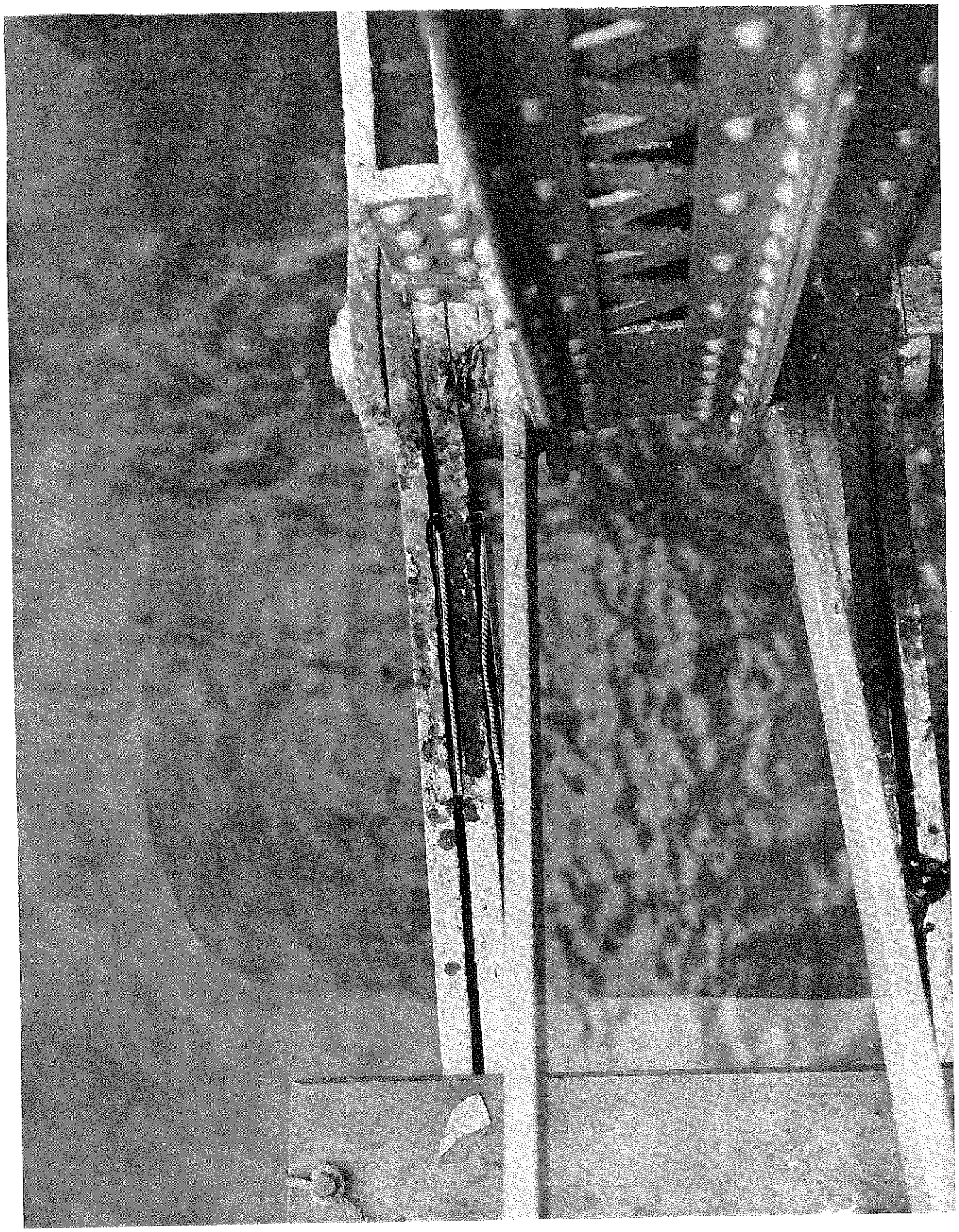


Figure 7. An empty form around the bar

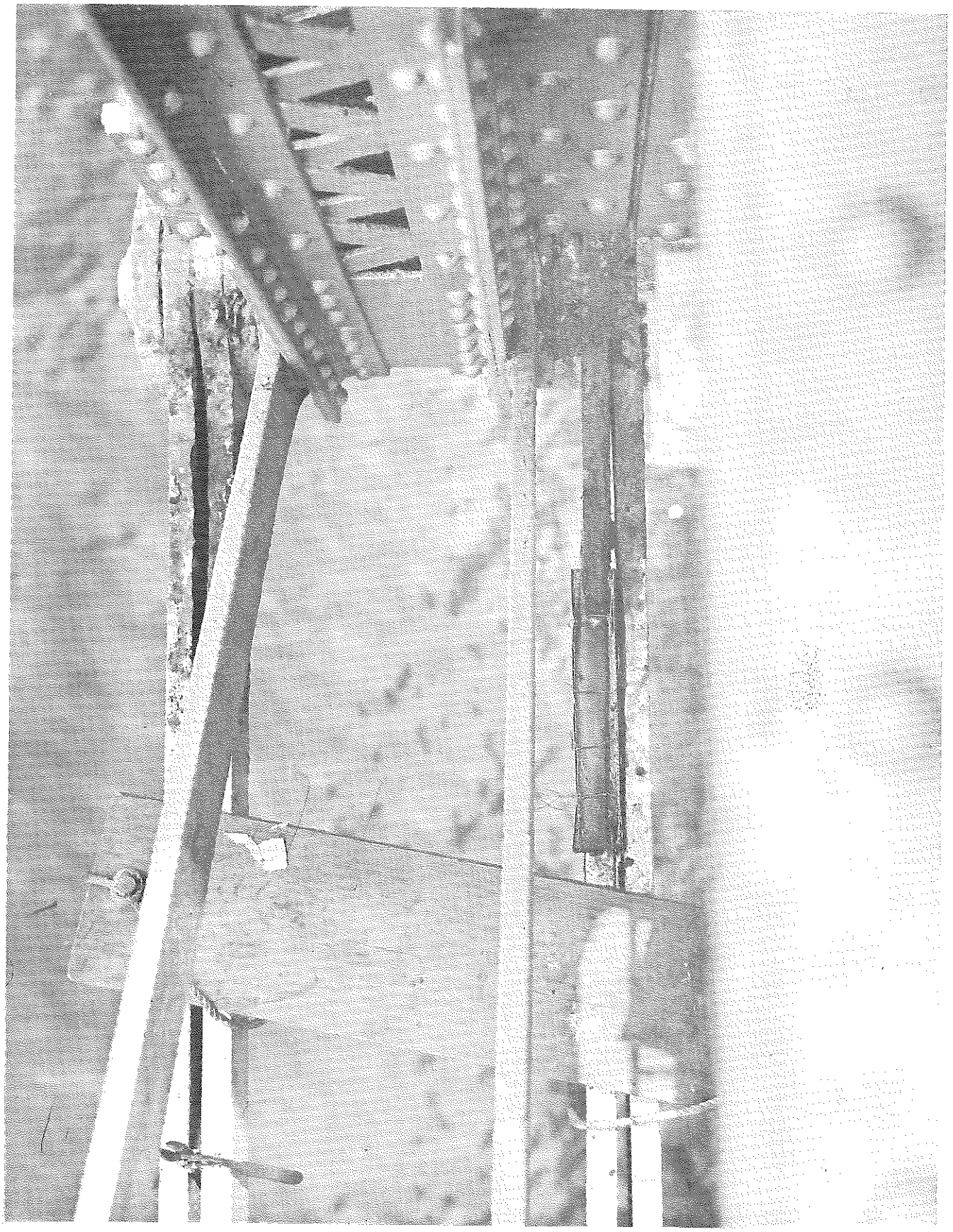


Figure 8. A form containing Sika-Flex

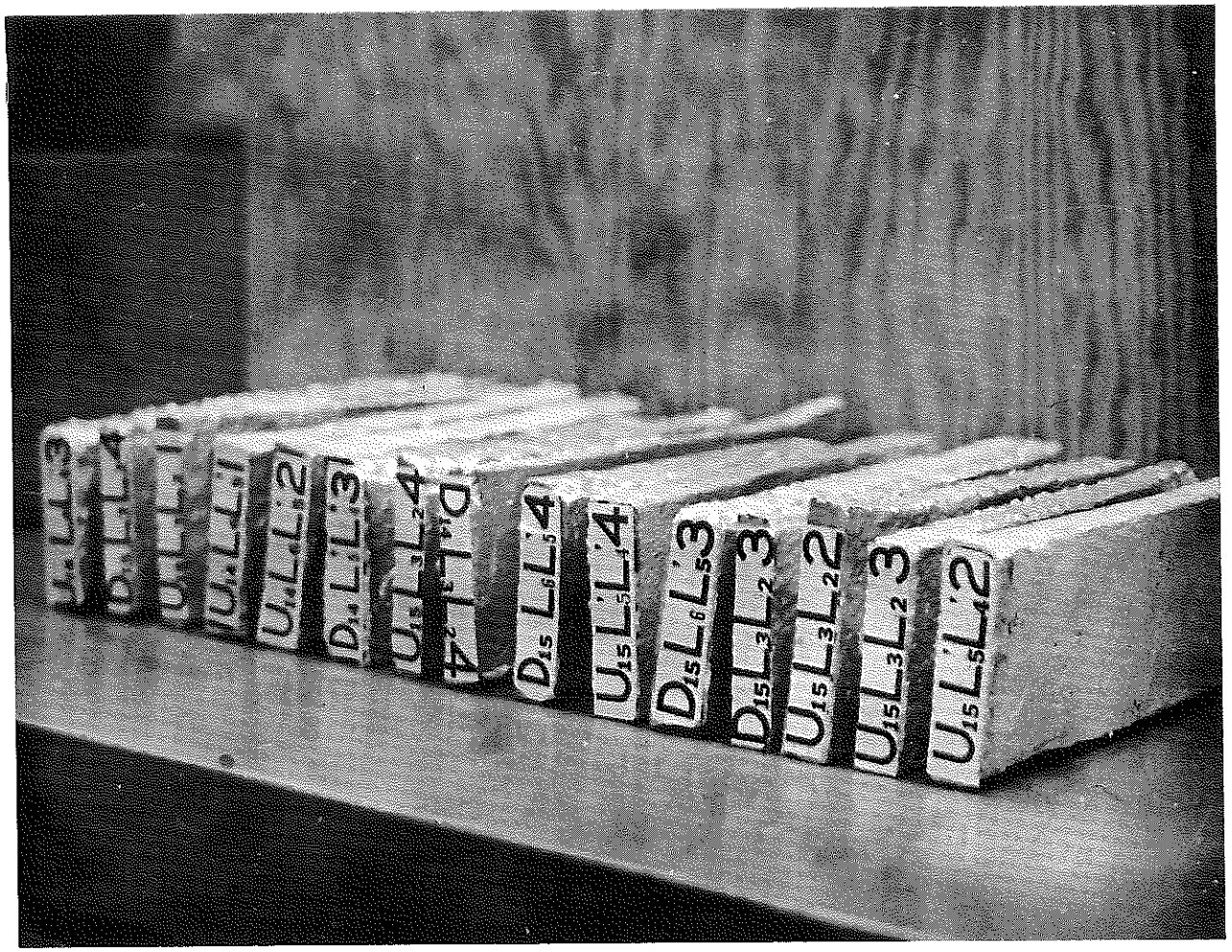


Figure 9. Replicas of the bars