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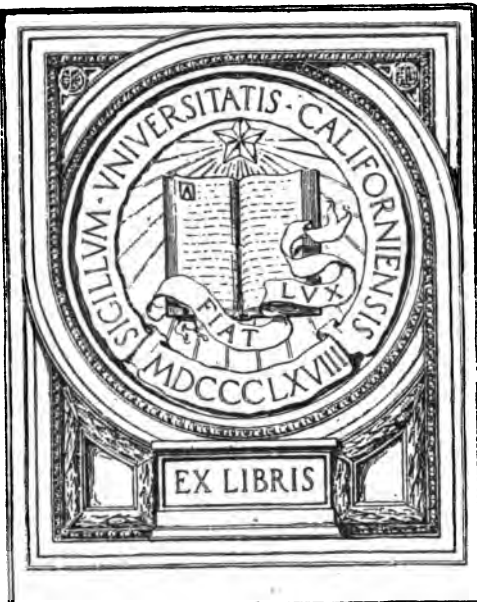
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DESCRIPTION  
OF THE  
**MORTAR RANGE BOARD**

MODEL OF 1914

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WITH INSTRUCTIONS FOR CARE  
AND OPERATION

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(TWO PLATES)



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This Manual is published for the information and government of the Regular Army  
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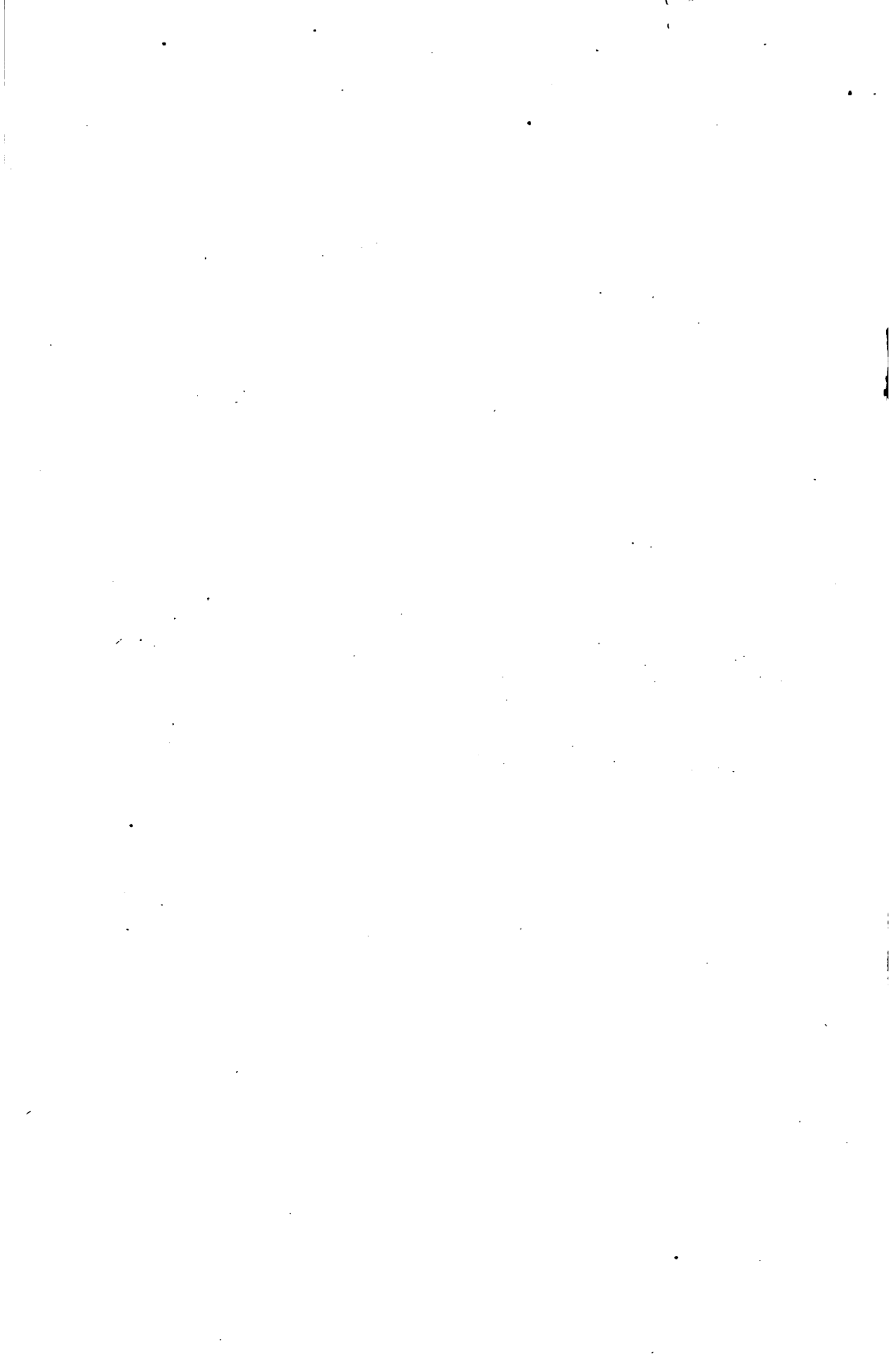
By order of the Secretary of War:

WILLIAM CROZIER,  
*Brigadier General, Chief of Ordnance.*

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## MORTAR RANGE BOARD, MODEL OF 1914.

### DESCRIPTION.

The mortar range board is 40 inches long,  $12\frac{1}{2}$  inches wide, and  $1\frac{1}{2}$  inches deep, and weighs about  $32\frac{1}{2}$  pounds complete. The frame is an aluminum alloy casting. It is designed to lay flat on a table.

The board has three grooves. In the upper groove slides two zone to zone correction scales. The left zone to zone scale is used for determining percentage corrections below normal for the different zones, while the right scale solves the same problem for percentage corrections above normal. Each zone to zone correction scale is graduated with the zone numbers, to which is attached a sliding pointer to indicate the working zone.

The second and third grooves with their slides are designed to serve the same purpose, but are divided into two parts called upper and lower, to keep within the limits of the board. To permit overlapping, graduated ranges 6,450 to 8,100 are repeated on the upper and lower range scales; the zone scales are correspondingly repeated. In the second and third grooves slide the upper and lower range slides. To each slide is attached by screws an upper and lower range scale correction scale. Integral with each upper and lower range scale correction scale, and extending downward, is an arm on which slides the elevation index slide, carrying with it a transparent piece of celluloid marked "elevation and time." The index on this transparent piece of celluloid is the fiducial line. Immediately above and adjacent to the upper and lower range slides are screwed to the board the upper and lower range scales, graduated in yards. Sliding in grooves in the upper and lower range slides are the range and correction scale indices. On each of these indices is engraved a line, one end of which registers with the graduations on the upper and lower range scales and the lower end with graduations on the upper and lower range scale correction scales. On the lower edge of each of the range scale correction scales is attached a correction scale marking strip, made of white celluloid, for convenience in tabulating data. Set in the board below the second and third grooves are the zone scales. The scales for the eighth and ninth zones, using the 700-pound projectile, and the eighth zone, using the 824-pound projectile, are detachable from the board. These

zone scales not in use are assembled to the upper and lower edges of the board in slide recesses provided.

On the frame is an assembling index which must coincide with a corresponding index on each of the detachable zone scales.

All slides are designed to be clamped in any position by means of a knurled nut projecting upward from the face of the board.

#### OPERATION.

The range board requires one man to operate. The arm setters set their respective arms to the data given by the base end stations and the plotter marks the intersection of the arms. Prediction is made in the usual manner. The time of flight for the first two predictions is obtained by the range correction slide-rule operator setting the slide to an approximate range to the set forward point estimated by the plotter. After that the slide-rule operator can predict the time of flight of the set forward point. The mortar arm is brought up to the set forward point and the range of this point is read off by the plotter. The slide is then set and the elevation read off for use in elevating the mortars, and also for use of the primary arm setter who sets the drift slide pointer to the elevation given and reads off the corrected azimuth of the set forward point. The plotter then sets the mortar arm to the predicted point and the primary arm setter reads off the azimuth of that point.

Range errors due to velocity errors are compensated for by displacing the range and correction scale indices a distance corresponding to the range correction to be made. All scale graduations being logarithmic, the correction applied operates as a percentage correction, and pertains only to a single zone. For obtaining the correction factor for a different zone, the zone to zone scale is set so that the zone number is opposite the given correction factor on the zone correction scale and the new correction factor is read off on the zone correction scale opposite the new zone number. The range and correction scale index is then set for the new correction factor.

#### TEST FOR ACCURACY.

For testing the accuracy of the board, test-settings are indicated by "A," "B," "C," etc. To test, set the range-correction factor "A" at the range "A." The corresponding calculated elevation and time of flight are indicated by the lightly engraved reference line "A." Proceed in a similar manner for other test-settings.

The accuracy of the board can also be tested by assuming a zone correction factor of 1,000 and setting to any range. The angle of elevation and time of flight obtained can then be compared with the calculated angle of elevation and time of flight taken from the range table.



## CARE AND PRESERVATION.

The scales and slides and the recesses for them should be kept free from sand or dirt.

The scales and other movable parts should be cleaned and oiled occasionally with sperm oil.

When not in use the instrument should be covered.

Spare parts should be ordered from the nomenclature given below:

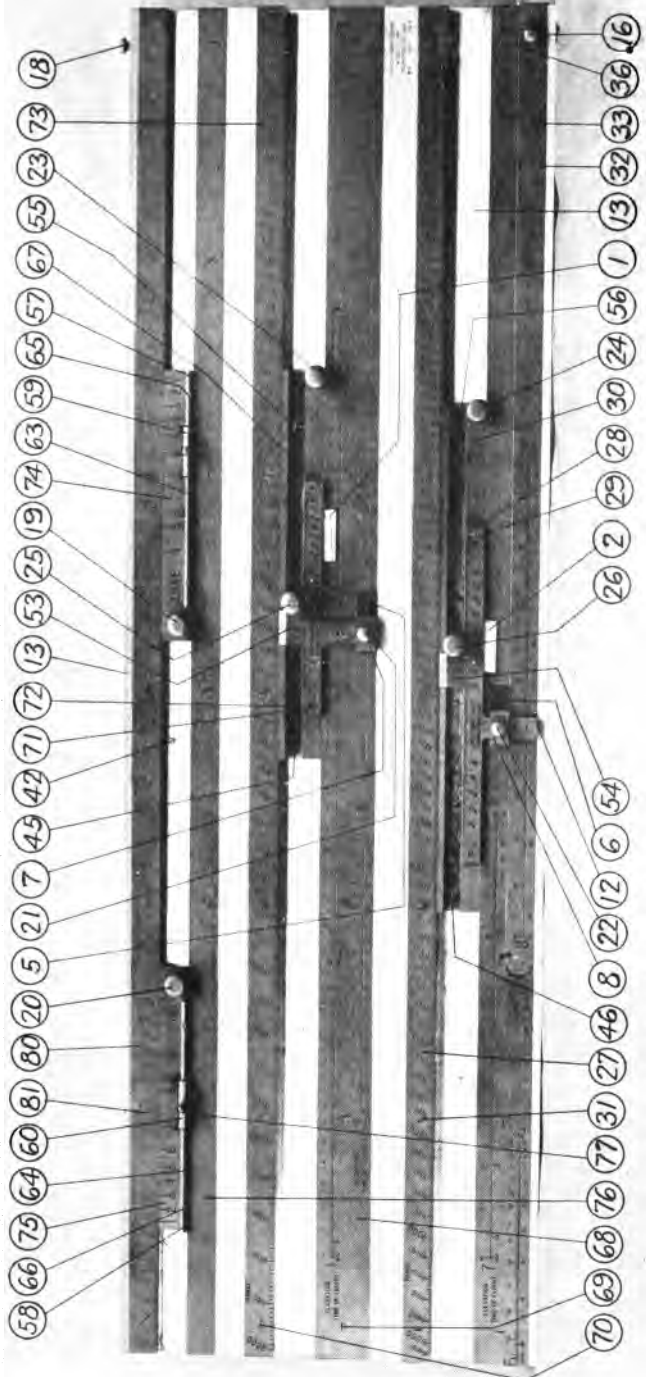
Illustration number.	Piece mark.	Name of part.
1	5K	Correction scale marking strip (upper).
2	5K	Correction scale marking strip (lower).
3	6G	Correction scale marking strip upper screws.
4	6G	Correction scale marking strip lower screws.
5	5C	Elevation index (upper).
6	5C	Elevation index (lower).
7	5E	Elevation index slide (upper).
8	5E	Elevation index slide (lower).
9	6D	Elevation index screws (upper).
10	6D	Elevation index screws (lower).
11	6L	Elevation index slide stop screws (upper).
12	6L	Elevation index slide stop screws (lower).
13	2B	Frame.
14	5P	Index clamp screw (upper).
15	5P	Index clamp screw (lower).
16	5A	Knob lower zone scale (8-700 lb.).
17	5A	Knob lower zone scale (8-824 lb.).
18	5A	Knob lower zone scale (9-700 lb.).
19	5U	Knob zone to zone correction scale (right).
20	5U	Knob zone to zone correction scale (left).
21	5D	Knob elevation index slide (upper).
22	5D	Knob elevation index slide (lower).
23	5U	Knob for range slide (upper).
24	5U	Knob for range slide (lower).
25	5N	Knob for index clamp screw (upper).
26	5N	Knob for index clamp screw (lower).
27	4E	Lower range scale.
28	5B	Lower range scale correction scale.
29	6J	Lower range scale correction scale screws.
30	5M	Lower range slide.
31	6H	Lower range scale screws.
32	3A	Lower zone scale.
33	3C	Lower zone scale (8-700 lb.).
34	3B	Lower zone scale (8-824 lb.).
35	3D	Lower zone scale (9-700 lb.).
36	6H	Lower zone scale screws.
37	5H	Pin for elevation index slide (upper).
38	5H	Pin for elevation index slide (lower).
39	6A	Pin for zone to zone correction scale (right).
40	6A	Pin for zone to zone correction scale (left).
41	2A	Pin stop for zone to zone correction scale (right).
42	2A	Pin stop for zone to zone correction scale (left).
43	5V	Pin for index clamp-screw knob (upper).
44	5V	Pin for index clamp-screw knob (lower).
45	5W	Pin stop for range and correction scale index (upper).
46	5W	Pin stop for range and correction scale index (lower).
47	5X	Pin for zone to zone correction-scale clamp screw (right).
48	5X	Pin for zone to zone correction-scale clamp screw (left).
49	5X	Pin for upper range slide clamp screw.
50	5X	Pin for lower range slide clamp screw.

Illustration number.	Piece mark.	Name of part.
51	5Q	Range slide upper clamp screw.
52	5Q	Range slide lower clamp screw.
53	5G	Range and correction scale index (upper).
54	5G	Range and correction scale index (lower).
55	6K	Range and correction scale index upper stop screw.
56	6K	Range and correction scale index lower stop screw.
57	6E	Scale-index bar right stop screw.
58	6E	Scale-index bar left stop screw.
59	5S	Scale index (right).
60	5T	Scale index (left).
61	5J	Spring for elevation index slide (upper).
62	5J	Spring for elevation index slide (lower).
63	6M	Scale-index bar (right).
64	6M	Scale-index bar (left).
65	6F	Scale-index bar right screw.
66	6F	Scale-index bar left screw.
67	5F	Upper range-scale correction scale.
68	4D	Upper zone scale.
69	6A	Upper zone-scale screws.
70	6H	Upper range-scale screws.
71	6J	Upper range-scale correction-scale screws.
72	5L	Upper range slide.
73	4C	Upper range scale.
74	6C	Zone to zone correction scale (right).
75	6B	Zone to zone correction scale (left).
76	4B	Zone to zone correction-scale guide.
77	6H	Zone to zone correction-scale guide screws.
78	5R	Zone to zone correction-scale right clamp screw.
79	5R	Zone to zone correction-scale left clamp screw.
80	4A	Zone correction scale.
81	6H	Zone correction-scale screws.

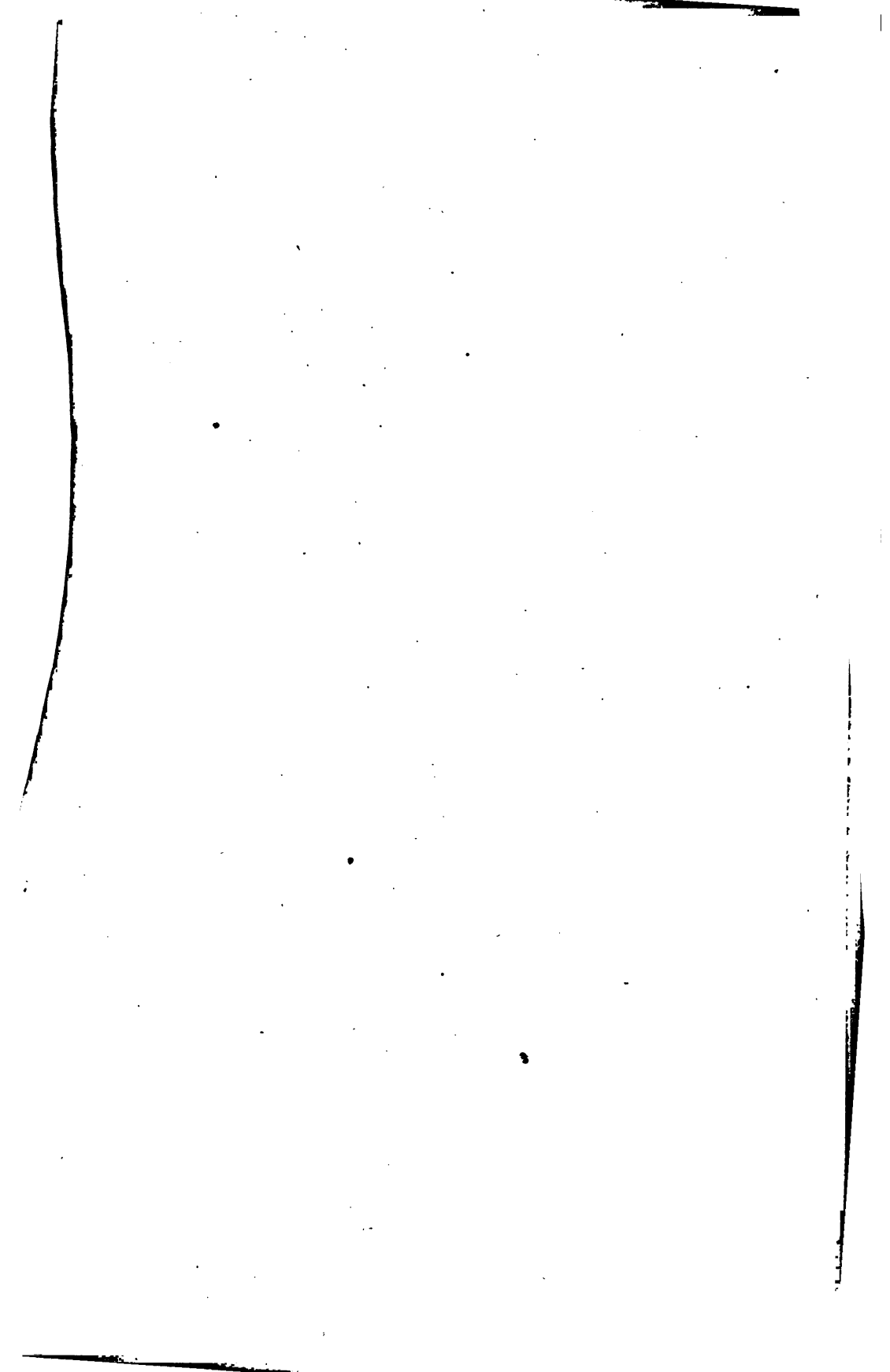
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*Washington, March 5, 1914.*

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