American Telephone and Telegraph Company

BELL SYSTEM PRACTICES
Teletypewriter and Manual
Telegraph Station and PBX
Installation and Maintenance

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Long Lines Department
Dist. Class. 600AC

TELETYPEWRITER SERVICE

60 BP SELECTOR

AS USED WITH THE 64C1 SELECTOR SYSTEM

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1. GENERAL

1.01 This section describes and gives maintenance information for the 60 BP Selector as used with the 64C1 Selector System.

1.02 This section supersedes Issue A and Addendum, Issue A. It is reissued to include the changes in apparatus requirements and adjustment procedures found desirable as a result of experience with the system and to make corrections and additions including adoption of the name "64C1 Selector System."

2. DESCRIPTION

2.01 The selector is known as a "step-by-step" multiple contact selector. It is mounted on a bakelite base and is equipped with a glass cover. It has two polarized magnet coils located parallel to each other. An armature is arranged to pivot between the two poles on receipt of reverse current impulses through the windings. Motion of the armature in either direction is transmitted to a feed pawl in such a manner that the feed pawl steps a ratchet one tooth for each movement of the armature.

2.02 A code wheel is fastened to the ratchet shaft, and a coil spring tends to return both to their stopped position. As long as the magnets are energized or are receiving reverse current impulses, the ratchet is prevented from returning either by the feed pawl or a holding pawl. If pulses cease, the ratchet and code wheel will return to their normal stopped position unless restrained by the holding spring resting on a code pin.

2.03 The terminal designated as No. 1 on the selector base is connected to a spring contact mounted on the code wheel. Four fixed contacts, which are brought out to base terminals numbered 2, 3, 4 and 5 respectively, are located in the selector in such positions that they can each be brought to close in turn with the contact on the code wheel when the code wheel is stepped up to the proper positions. When the code wheel is stepped up to any one of the fixed contact positions, it will be held in such position by the holding spring engaging with a corresponding fixed code pin on the periphery of the code wheel until the code wheel is stepped along again by impulses through the selector windings.

2.04 The selector as received from the manufacturer is adjusted so that Contacts No. 1 and No. 2 will close upon receipt of 17 successive reverse current impulses through the selector windings. Likewise, in each instance beginning with the code wheel at the normal stopped position, Contact No. 1 will close with Contact No. 3, No. 4 or No. 5 respectively, upon the receipt of 19, 21 or 23 successive reverse current impulses through the selector windings.

2.05 When the selector is used with the 64C1 Selector System, the Telephone Company must change the position of the code wheel on its shaft, so that it will require 20, 22, 24 and 26 impulses, respectively, through the selector windings to cause the No. 1 contact on the code wheel to close with the No. 2, No. 3, No. 4 or No. 5 fixed contact. The method of positioning the code wheel on its shaft to meet this requirement is covered in Part 3 of this section.

2.06 In the case of the 64C1 Selector System, the impulses required to step the code wheel so that its contact will close with any one of the fixed contacts are not successive but are in three or four groups of impulses depending on whether a five or a six digit code is being used. Selectivity is obtained by varying the number of impulses in each of the groups.

2.07 The first and last digits of both the five and six digit code used in the 64C1 Selector System are the digit "one." As explained in other Practices covering the description of this system, the first digit "one" serves to connect the selector so it can receive impulses from the TTY circuit and the last digit "one" serves to make the selector code wheel advance one step to a position which has no code pin, thus causing the wheel to return to its starting position. The intervening digits in the code which hereinafter will be referred to as the "selecting digits" of the code, are the ones that step the code wheel to the desired contact position. The "selecting digits" add up to a total of 20, 22, 24 or 26 which will step the selector code wheel so that Contact No. 1 on the wheel will close with Contacts No. 2, No. 3, No. 4 or No. 5, respectively. The code wheel will be held at each of these positions by fixed code pins in the wheel until the impulse caused by dialing of the last digit "one" is received which will cause the wheel to return to its starting position as explained above.

2.08 Using the five digit codes 1-7-9-4-1, 1-7-9-6-1, 1-7-9-8-1 and 1-7-9-0-1 for illustration, the impulses required to select the four fixed contact positions will be the "selecting digits" 7-9-4 for the No. 2 contact, 7-9-6 for the No. 3 contact, 7-9-8 for the No. 4 contact and 7-9-0 for the No. 5 contact.

2.09 Movable code pins are mounted in holes around the periphery of the code wheel by the Telephone Company in the proper positions for the code or codes to which it is desired that the selector shall respond. In a particular selector set up for a five digit code, two movable pins will be so located that when the "selecting digits" of its particular signal code are received, the first group of impulses will advance the wheel so that the holding spring will engage with the first movable code pin, the second group of impulses will further advance the wheel so that the holding spring will engage with the second movable code pin, and the third group of impulses will again advance the wheel so that the holding spring will engage with the No. 2, No. 3, No. 4 or No. 5 contact position fixed code pin.

2.10 When a selector is set up to respond to a six digit code with this selector system, it is necessary to have three movable pins located in holes around the periphery of the code wheel, positioned as required by the particular code used, as in such a case the selector will receive four groups of impulses from the "selecting digits" of the code to advance the wheel to a point where the holding spring will engage with the fixed code pin of a selected contact position.

2.11 The d-c resistance of each of the selector coils is approximately 11,000 ohms.

3. MAINTENANCE

3.01 General

3.101 List of Tools, Gauges and Materials

Code No.	Description
Tools	
144	Combined Screwdriver and Wrench
145	Adjusting Hook

Code No.	Description
Tools	
417A	1/4" and 3/8" Hex Open Double End Flat Wrench
485A	Smooth Jaw Pliers
KS-6320	Orange Stick
KS-6854	3-1/2" Screwdriver
R1575	Artist's Show Card Brush
-	3" H Cabinet Screwdriver
R2217	4-3/4" Bent Tweezers
Gauges	
70F	10-0-10 Gram Gauge
Materials	
D-98063	Cloth
KS-6232	Oil
CP	Carbon Tetrachloride

3.102 One Dip of KS-6232 Oil for the purpose of this section is the amount of oil retained on an R1575 artist's show card brush after being dipped 3/8" into the oil and then scraped twice on the side of the container to remove surplus oil. There shall not be sufficient oil adhering to the brush to form a drop on the end of the bristles.

3.103 Before checking or readjusting to meet the requirements the equipment should be taken out of service in accordance with established procedures.

3.2 Requirements and Procedures

3.201 Cleaning. The parts of the selector shall be cleaned when necessary by applying CP carbon tetrachloride to the parts with the R1575 brush and allowing to dry thoroughly. Take care in this operation to avoid injury to the delicate mechanism and springs associated with the armature arm, the rocker arm and code wheel. After cleaning, relubricate as covered herein.

3.202 Lubrication

(a) Lubricate the various points litsted by applying

KS-6232 oil very sparingly with the R1575 artist show card brush (one dip distributed over four or five points). To lubricate the ratchet wheel shaft bearing apply the brush under the code wheel bearing and lubricate the shaft with the end of the brush. After applying the oil operate the selector manually a few times to work the oil into the bearings. Take care to keep the oil away from the contacts and the selector windings. Wipe off any excess oil from the parts using a clean dry D-98063 cloth. Wrapping the cloth around one end of the KS-6320 orange stick will facilitate removal of excess oil from points which may not otherwise be accessible.

(b) The following parts shall be adequately lubricated with KS-6232 oil. When lubrication is necessary, one dip of oil shall be divided between each four or five of the following points:

(1) Fig. 1 (A) - The surfaces of the rocker arm which come in contact with the phosphor bronze pins.

(2) Fig. 1 (B) - The side of the rounded end of the holding pawl which makes contact with the stud.

(3) Fig. 1 (C) - The teeth of the ratchet wheel.

(4) Fig. 1 (D) - The armature bearings.

(5) Fig. 1 (E) - The rocker arm bearings.

(6) Fig. 1 (F) - The ratchet wheel shaft bearings.

(7) Fig. 1 (G) - The stepping pawl bearing pin.

(8) Fig. 1 (H) - The holding pawl bearing.

(c) Recommended Lubrication Intervals - After installation it is recommended that the parts listed in (b) be lubricated at intervals of three months. This interval may be extended if periodic inspections have indicated that local conditions are such as to insure that requirement (b) is met during the extended interval.

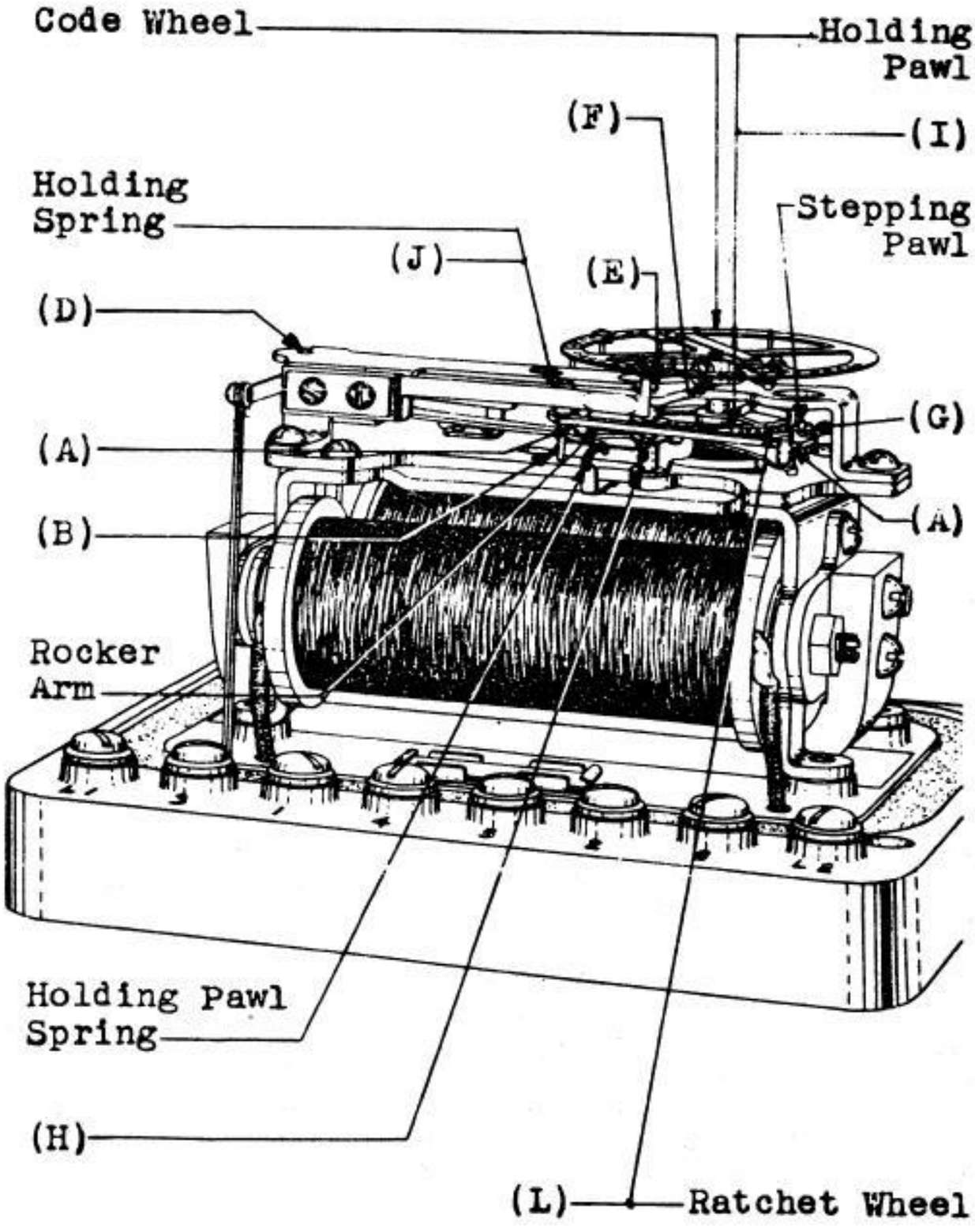

Fig. 1 - 60 BP Selector

3.203 Setting of Code Pins

(a) Code pins shall be set in the code wheel by the Telephone Company for the code or codes as assigned in the Private Line Service Orders. Movable pin positions for the various code combinations are shown in Tables A and B below. Table A covers five digit individual station codes with corresponding five digit master codes, while Table B covers six digit individual station codes with corresponding five digit master codes.

(1) Using Figure 2 as a guide, place pins in the movable pin positions corresponding to the assigned code or codes. The 145 tool may be used for inserting the pins and the 144 tool may be used for tightening the nuts. There shall be no movable pins in any positions other than those specified for the code or codes assigned.

(2) Figure 2 illustrates a selector code wheel with movable pins in the proper code positions corresponding to the five digit Station Code 16041 and Master Code 10821.

Table A

Five Digit Individual Station Codes with Corresponding Five Digit Master Codes

Station	Individual Station Code 1st Function	2nd Function	3rd Function	4th Function	Movable Pin Positions
1	16041	16061	16081	16001	4,14
2	17941	17961	17981	17901	4,13
3	18841	18861	18881	18801	4,12
4	14061	14081	14001	-	6,16
5	15961	15981	15901	-	6,15
6	16861	16881	16801	-	6,14
7	17761	17781	17701	-	6,13
8	18661	18681	18601	-	6,12
9	15051	15071	15091	-	5,15
10	16951	16971	16991	-	5,14
11	17851	17871	17891	-	5,13
12	18751	18771	18791	-	5,12
13	12081	12001	-	-	8,18
14	13981	13901	-	-	8,17
15	14881	14801	-	-	8,16
16	15781	15701	-	-	8,15
17	16681	16601	-	-	8,14
18	17581	17501	-	-	8,13
19	18481	18401	-	-	8,12
20	13071	13091	-	-	7,17
21	14971	14991	-	-	7,16
22	15871	15891	-	-	7,15
23	16771	16791	-	-	7,14
24	17671	17691	-	-	7,13
25	18571	18591	-	-	7,12
Total	25	25	12	3	
Master	10821	10841	10861	10881	2,10

TABLE B

Six Digit Individual Station Codes with Corresponding Five Digit Master Codes

Station	Individual Station Code				Movable Pin Positions
	1st Function	2nd Function	3rd Function	4th Function	
1	120441	120461	120481	120401	4,8,18
2	139441	139461	139481	139401	4,8,17
3	148441	148461	148481	148401	4,8,16
4	157441	157461	157481	157401	4,8,15
5	166441	166461	166481	166401	4,8,14
6	175441	175461	175481	175401	4,8,13
7	129541	129561	129581	129501	4,9,18
8	138541	138561	138581	138501	4,9,17
9	147541	147561	147581	147501	4,9,16
10	156541	156561	156581	156501	4,9,15
11	165541	165561	165581	165501	4,9,14
12	174541	174561	174581	174501	4,9,13
13	125941	125961	125981	125901	4,13,18
14	134941	134961	134981	134901	4,13,17
15	143941	143961	143981	143901	4,13,16
16	152941	152961	152981	152901	4,13,15
17	124041	124061	124081	124001	4,14,18
18	133041	133061	133081	133001	4,14,17
19	142041	142061	142081	142001	4,14,16
20	140241	140261	140281	140201	4,6,16
21	159241	159261	159281	159201	4,6,15
22	168241	168261	168281	168201	4,6,14
23	177241	177261	177281	177201	4,6,13
24	130341	130361	130381	130301	4,7,17
25	149341	149361	149381	149301	4,7,16
26	158341	158361	158381	158301	4,7,15
27	167341	167361	167381	167301	4,7,14
28	176341	176361	176381	176301	4,7,13
29	120351	120371	120391	-	5,8,18
30	139351	139371	139391	-	5,8,17
31	148351	148371	148391	-	5,8,16
32	157351	157371	157391	-	5,8,15

TABLE B (Cont'd)

Station	Individual Station Code 1st Function	2nd Function	3rd Function	4th Function	Movable Pin Positions
33	166351	166371	166391	-	5,8,14
34	175351	175371	175391	-	5,8,13
35	130251	130271	130291	-	5,7,17
36	149251	149271	149291	-	5,7,16
37	158251	158271	158291	-	5,7,15
38	167251	167271	167291	-	5,7,14
39	176251	176271	176291	-	5,7,13
40	123961	123981	123901	-	6,15,18
41	132961	132981	132901	-	6,15,17
42	123051	123071	123091	-	5,15,18
43	132051	132071	132091	-	5,15,17
44	122061	122081	122001	-	6,16,18
45	120261	120281	120201	-	6,8,18
46	139261	139281	139201	-	6,8,17
47	148261	148281	148201	-	6,8,16
48	157261	157281	157201	-	6,8,15
49	166261	166281	166201	-	6,8,14
50	175261	175281	175201	-	6,8,13
51	124861	124881	124801	-	6,14,18
52	133861	133881	133801	-	6,14,17
53	142861	142881	142801	-	6,14,16
54	124951	124971	124991	-	5,14,18
55	133951	133971	133991	-	5,14,17
56	142951	142971	142991	-	5,14,16
57	165451	165471	165491	-	5,9,14
58	174451	174471	174491	-	5,9,13
59	129361	129381	129301	-	6,9,18
60	138361	138381	138301	-	6,9,17
61	147361	147381	147301	-	6,9,16
62	156361	156381	156301	-	6,9,15
63	165361	165381	165301	-	6,9,14
64	174361	174381	174301	-	6,9,13
65	125761	125781	125701	-	6,13,18
66	134761	134781	134701	-	6,13,17
67	143761	143781	143701	-	6,13,16
68	152761	152781	152701	-	6,13,15
69	125851	125871	125891	-	5,13,18
70	134851	134871	134891	-	5,13,17

TABLE B (Cont'd)

Station	Individual Station Code 1st Function	2nd Function	3rd Function	4th Function	Movable Pin Positions
71	143851	143871	143891	-	5,13,16
72	152851	152871	152891	-	5,13,15
73	129451	129471	129491	-	5,9,18
74	138451	138471	138491	-	5,9,17
75	147451	147471	147491	-	5,9,16
76	156451	156471	156491	-	5,9,15
77	123781	123701	-	-	8,15,18
78	132781	132701	-	-	8,15,17
79	123871	123891	-	-	7,15,18
80	132871	132891	-	-	7,15,17
81	122881	122801	-	-	8,16,18
82	122971	122991	-	-	7,16,18
83	124681	124601	-	-	8,14,18
84	133681	133601	-	-	8,14,17
85	142681	142601	-	-	8,14,16
86	124771	124791	-	-	7,14,18
87	133771	133791	-	-	7,14,17
88	142771	142791	-	-	7,14,16
89	125581	125501	-	-	8,13,18
90	134581	134501	-	-	8,13,17
91	143581	143501	-	-	8,13,16
92	152581	152501	-	-	8,13,15
93	125671	125691	-	-	7,13,18
94	134671	134691	-	-	7,13,17
95	143671	143691	-	-	7,13,16
96	152671	152691	-	-	7,13,15
97	129271	129291	-	-	7,9,18
98	138271	138291	-	-	7,9,17
99	147271	147291	-	-	7,9,16
100	156271	156291	-	-	7,9,15
101	165271	165291	-	-	7,9,14
102	174271	174291	-	-	7,9,13
103	123691	-	-	-	9,15,18
104	132691	-	-	-	9,15,17
105	122791	-	-	-	9,16,18
106	124591	-	-	-	9,14,18
107	133591	-	-	-	9,14,17
108	142591	-	-	-	9,14,16
109	134491	-	-	-	9,13,17
110	143491	-	-	-	9,13,16
111	152491	-	-	-	9,13,15
112	125491	-	-	-	9,13,18
Total	112	102	76	28	
Master	19921	19941	19961	19981	2,11

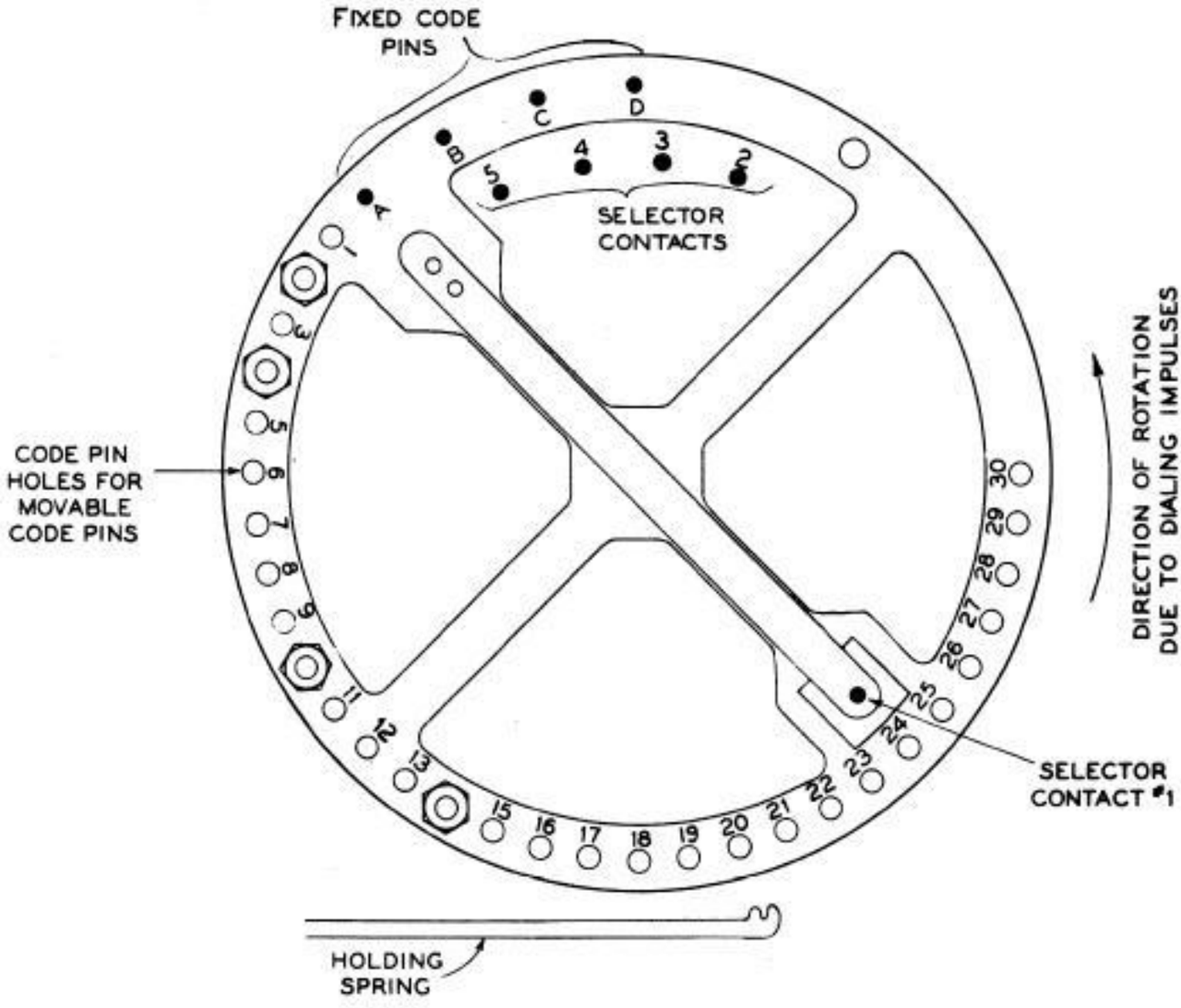

Fig. 2 - Code Wheel

3.204 Clearance Between Stepping Pawl and Ratchet Wheel-Fig. 3 (A)

(a) With the stepping pawl in the normal position, there shall be a clearance between the stepping pawl and the ratchet wheel of Min. .005".

Gauge by eye.

(b) Rotate the ratchet wheel manually and check that the requirement is met in all positions.

(1) To adjust the clearance between the stepping pawl and the ratchet wheel, place the KS-6854 screwdriver through the hole in the frame against the stepping pawl guide post and adjust the guide posts slightly in the direction to increase or reduce the clearance as required. Take care not to bend the guide posts more than is absolutely necessary to provide the proper clearance.

3.205 Stepping Pawl Position-Fig. 3 (B)

(a) With the armature in the normal position, the stepping pawl shall rest against the guide post.

Gauge by eye.

(b) With the armature operated, the stepping pawl shall fully engage with the teeth on the ratchet wheel.

(1) If the stepping pawl does not rest against the guide post, lubricate the stepping pawl bearing pin as outlined in 3.202. If the stepping pawl still does not rest against the guide post, it is an indication that the tension of the stepping pawl retractile spring is insufficient. In this case it will be necessary to replace the retractile spring. To do this remove the old spring using the tweezers. Hook one end of the new spring (P-247901 spring) in the hole of the stepping pawl and the other end into the hole of the rocker arm provided for this purpose. In installing the spring avoid stretching the spring excessively thus reducing its initial tension.

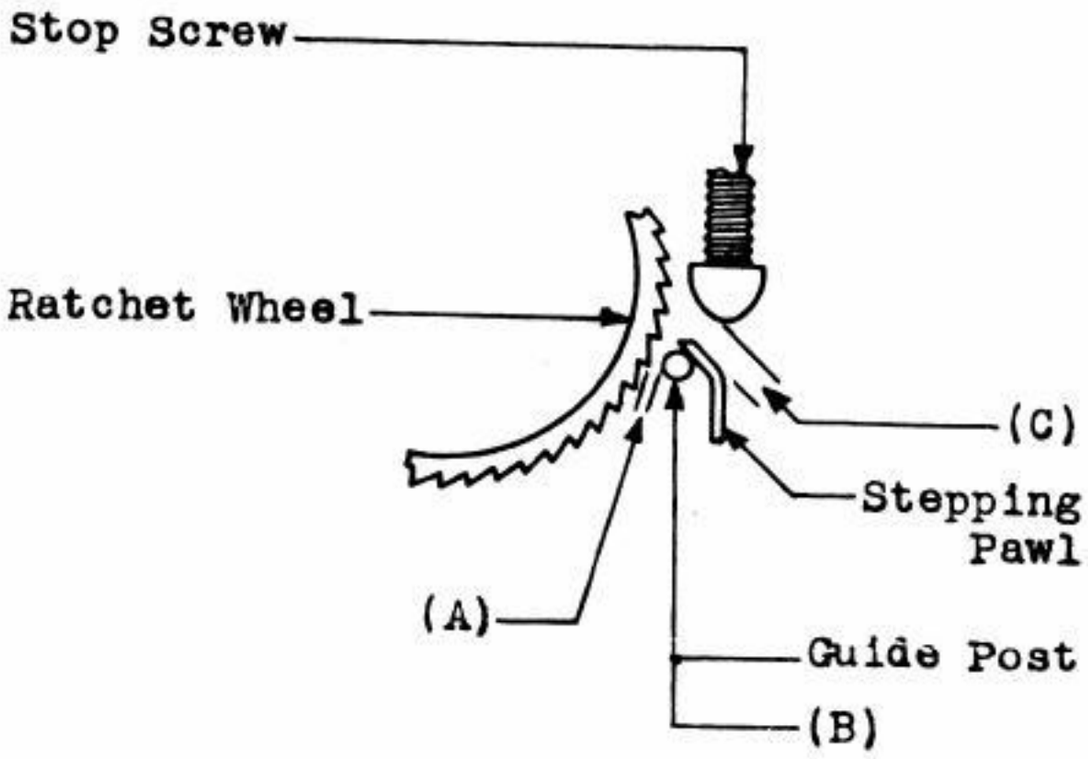

Fig. 3 - Clearance Between Stepping Pawl and Ratchet Wheel

3.206 Stepping Pawl Travel - Fig. 3 (C)

(a) The total travel of the stepping pawl (travel from the guide post to the stop screw) shall be

Min. 1-3/4 teeth of the ratchet wheel
Max. 2 teeth of the ratchet wheel

Gauge by eye.

To check, operate the armature manually. With the stepping pawl resting against the stop screw hold the code wheel and release the armature. The stepping pawl will drop back against the guide post. Gauge the distance between the end of the stepping pawl and the position of the tooth on the code wheel which was advanced by the pawl. Release the code wheel. Check the requirement with the armature operated against each pole piece in turn.

(1) If the stepping pawl travel requirement is not met or if the holding pawl does not engage the ratchet wheel properly on steps after the first step, there is an indication that the armature travel is incorrect or that the conical head stop screw is not set properly. To correct this condition loosen the lock nut on the stop screw, using the No. 417A wrench, and then turn the stop screw in or out, as required, with the KS-6854 screwdriver. Tighten the lock nut securely. If the armature travel is not correct, increase or decrease the armature travel as covered in 3.217.

3.207 Engagement of Holding Pawl and Ratchet Wheel-Fig. 4(A)

(a) With the ratchet wheel normal, the holding pawl shall fall reliably in the first tooth of the ratchet wheel with a clearance of maximum .005" as the armature operates. Partially operate the armature by hand slowly and note that the pawl falls in behind the tooth before the ratchet wheel starts to move.

(b) The holding pawl shall engage each succeeding tooth of the ratchet wheel reliably after the wheel is advanced by the operation of the stepping pawl. Gauge by eye.

(1) If with the ratchet wheel in the normal position the holding pawl does not drop reliably into the tooth of the ratchet wheel, adjust the position of the ratchet wheel cam screw with the KS-6854 screwdriver. Step the selector manually the number of steps corresponding to the sum of all the "selecting digits" in the code. Check that the selector stops on the proper contact terminal for the code used. If it does not, reset the cam screw so that the holding pawl will fall properly into the next adjacent tooth.

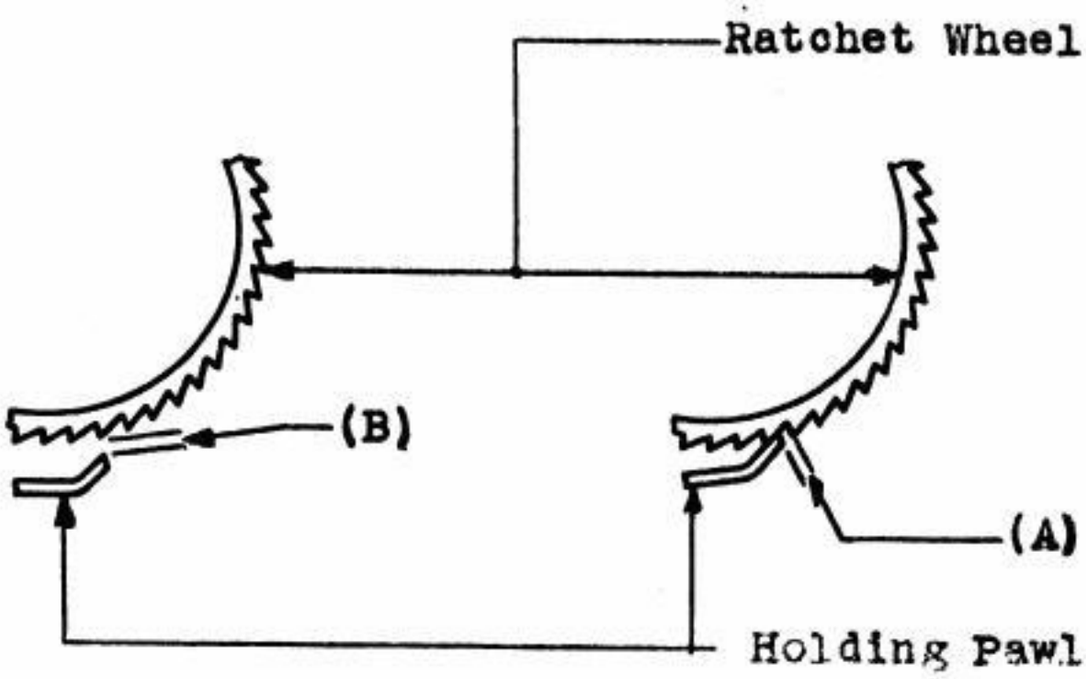

Fig. 4 - Engagement of Holding Pawl and Ratchet Wheel

3.208 Clearance Between the Holding Pawl and Ratchet Wheel-Fig. 4 (B)

(a) With the holding pawl in the normal position, there shall be a clearance between the holding pawl and the ratchet wheel of

Min. .005"

Gauge by eye.

(b) Rotate the ratchet wheel manually and check that the requirement is met in all positions.

(1) If the requirement is not met adjust the post on the rocker arm against which the tail of the pawl rests using the No. 485A pliers. Exercise care not to adjust the post more than is necessary and to avoid damaging the holding pawl retractile spring.

3.209 Holding Pawl Spring Tension - Fig. 1 (I)

(a) The tension of the holding pawl spring shall be sufficient to insure that with the armature operated the holding pawl will rest against the face of each tooth of the ratchet wheel with a very light pressure (approximately 1-1/2 grams). Gauge by eye and feel. (Use the No. 70F gauge as a reference.)

(1) Adjust the tension of the holding pawl retractile spring by applying the No. 485A pliers to the holding pawl spring bracket and adjusting the offset portion of the bracket so as to provide sufficient tension to insure that the holding pawl rests against the face of each tooth as the ratchet wheel is advanced by the armature. In adjusting, take care to keep the tension of the spring as small as practicable consistent with meeting the tension requirement.

3.210 Clearance Between Holding Spring and Code Pins.

(a) Fig. 5 (A): When the code wheel is revolved by hand there shall be a clearance between the curved end of the holding spring and the inside of the code pins of

Min. .005"

Gauge by eye.

(b) Fig. 5 (B): When the code wheel is revolved by hand there shall be clearance between the shoulder portion of the code pins and the holding spring of

Min. .015"

Gauge by eye.

(c) Fig. 5(C): As the code wheel is advanced by the armature the holding spring in its outward movement shall clear the code pins by

Min. .005"

Gauge by eye.

(1) To check, step the selector manually one step less than the first digit of the "selecting digits" of the code for the selector. Hold the code wheel in position manually. Release the armature. Again operate the armature until the stepping pawl just engages with the ratchet wheel. Release the code wheel and continue slowly operating the armature, observing the clearance as the holding spring passes the code pin in its outward movement.

(2) Adjust the holding spring so that it will clear the code pins, by applying the No. 485A pliers to the spring just in front of the roller on the rocker arm. If the cup shaped portion of the holding spring does not clear the shoulder of the code pins, loosen the spring clamping screws with the 3" H cabinet screwdriver and move the holding spring down. Take care that the holding spring is not set so low as to cause it to fail to engage the code pins properly and that it rests against the stop spring. Tighten the clamping screws securely.

(3) If the holding spring does not clear the code pins in its outward movement, or if it does not engage the code pins as required in 3.211, check requirement 3.213, code wheel position. If necessary reposition the code wheel as outlined in 3.213. If the code wheel is properly adjusted loosen the holding spring clamping screws with the 3" H cabinet screwdriver and move the spring longitudinally. Check that the spring is properly positioned to clear the shoulder of the code pins and to engage the code pins properly and tighten the clamping screws securely.

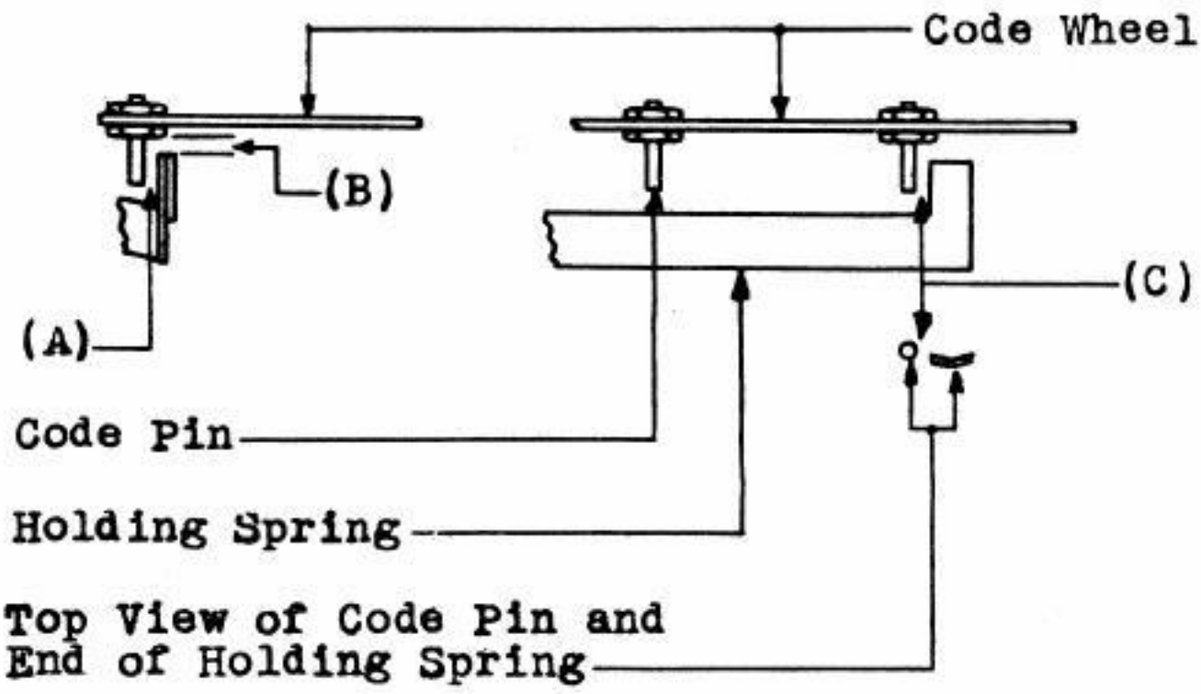

Fig. 5 - Clearance Between Holding Spring and Code Pins

3.211 Engagement of Holding Spring with Code Pins

(a) The code wheel and code pins shall be so located that after the specified group of groups of pulses have been applied the holding spring will, on the release of the armature, engage with the code pin and retain the code wheel in that position until it is advanced by the next group of pulses or released by a releasing pulse.

Gauge by eye.

(1) To adjust proceed as described in 3.210 (3). After adjustment check requirement 3.210 (a), (b), (c).

3.212 Holding Spring Position - Fig. 1 (J)

(a) In its normal position, the holding spring shall rest lightly (with approximately 1-1/2 grams pressure measured just back of the stud) against the rubber stud on the rocker arm. Use the No. 70F gauge.

(1) If the holding spring does not rest against the rubber stud on the rocker arm, adjust the spring near the point where it leaves the clamping plate and insulators, using the No. 485A pliers. In making this adjustment, adjust the holding spring and the stop spring as a unit and take care after the adjustment is completed to see that the holding spring rests against the stop spring especially at the free end of the stop spring. The holding spring should rest on the rubber stud on the rocker arm with a very light pressure.

3.213 Code Wheel Position - Fig. 6 (A)

(a) The code wheel shall be mounted on the shaft so that the heads of the set screws clear the spring washer located under the ratchet cam screw. Gauge by eye.

(b) The code wheel shall be set so that after the wheel has been advanced by the operation of the armature the number of steps indicated by the sum of the "selecting digits" of the code, the contact spring on the code wheel will make contact with the specified contact terminal. Gauge by eye.

(1) To adjust the position of the code wheel on the shaft, loosen the two set screws holding the code wheel of the shaft using the KS-6854 screwdriver. Lift the code wheel from the shaft. Advance the ratchet wheel by stepping the selector manually the number of steps corresponding to the sum of all the "selecting digits" in the code for the selector. Lock the selector operated in this position by inserting a KS-6320 orange stick between the armature and the pole-piece on the side opposite to which the armature is operated. Place the code wheel on the shaft so that the contact spring is adjacent to the particular contact terminal to which the code is intended to step the selector. Adjust the wheel until the contact spring position requirement is met. Tighten the set screws in the hub of the code wheel securely. Remove the orange stick from the armature gap and check that the code wheel restores to normal. Check that the code wheel position and contact spring position requirements are met.

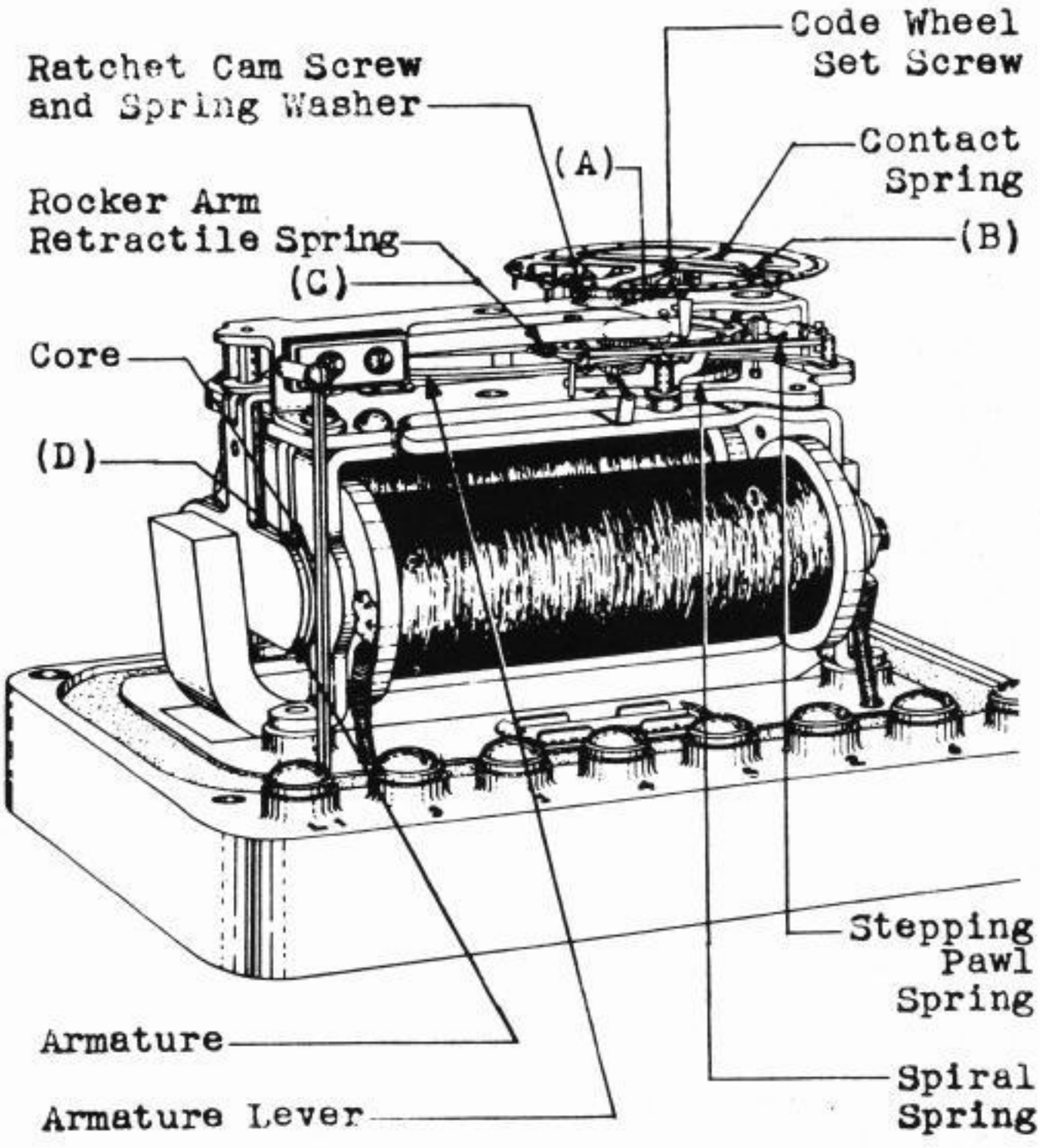

Fig. 6 - 60 BP Selector-Armature
End View

3.214 Contact Spring Position - Fig. 6 (B)

(a) With the selector in the normal position, the flat portion of the contact spring shall rest against the code wheel with a very light pressure (approximately 1/2 gram). Use the No. 70F gauge.

(b) With the contact spring resting on the top of the first contact terminal, and the code wheel held in position by the holding spring engaging the code pin, the contact spring shall be lifted from the point on the code wheel on which it rests on its normal position by

Min. .020"

Gauge by eye.
The thickness of the contact spring is .010".

(c) The contact spring shall not make contact with the contact terminals when advanced to one step before or one step beyond each contact terminal. Gauge by eye.

(d) The offset section on the contact spring into which the contact is fitted shall be approximately parallel to the code wheel. Gauge by eye.

(1) If the flat portion of the contact spring does not rest properly against the code wheel, adjust the contact spring at the point adjacent to the rivets, using the slotted end of the No. 145 spring adjuster.

(2) If the contact spring is not lifted from its position on the code wheel as the spring passes over the contact terminal, adjust the contact end of the spring slightly using the slotted end of the No. 145 spring adjuster. Take care to see that after this adjustment is made, the portion of the contact spring which carries the contact is approximately parallel to the surface of the code wheel. If necessary to adjust the contact spring so that it is not parallel with the code wheel in order to obtain the proper lift as the spring passes over the terminals, it is an indication that the code wheel is set too high or too low on the shaft. In this case loosen the set screws in the code wheel hub and reset the code wheel position as covered in 3.213.

(3) If the contact spring makes contact with the contact terminals when the code wheel is advanced to one step before or one step beyond the terminal, adjust the contact terminals, using the No. 485A pliers. Take care in making this adjustment not to loosen the terminal rivets.

3.215 Spiral Spring Tension

(a) The tension of the spiral spring shall be sufficient to restore the code wheel to normal whenever the rocker is in its normal position and the code wheel is not in such a position that it is held by the holding spring engaging the code pins. Gauge by eye.

(1) To check that this requirement is met, advance the code wheel by operating the armature manually and check that the code wheel restores properly from each of the following positions as the armature is slowly released.

One step beyond the normal position.
One step beyond each contact terminal.

(2) If the spiral spring tension is not sufficient to restore the code wheel to normal when it is one step beyond the normal position, adjust the tension of the spiral spring by moving the supporting arm of the outer end of the spring in a clockwise direction, using the hooked end of the No. 145 spring adjuster. Moving the supporting arm in a counterclockwise direction decreases the tension. Do not increase the tension of the spring sufficiently to cause the spiral spring to be distorted when the code wheel is advanced to the last contact terminal.

(3) If the code wheel does not restore properly from one step beyond the contact terminals, it indicates that the tension of the contact spring is too great or that the code wheel is set so that the spring is lifted too high as it passes over the contact terminals. In this case reduce the tension of the contact spring, using the No. 145 spring adjuster as covered in 3.214 or reposition the code wheel on the shaft as covered in 3.213.

3.216 Rocker Arm Retractile Spring Tension - Fig. 6 (C)

(a) The tension of the rocker arm retractile spring (including the tension of the holding spring) shall be sufficient to restore the rocker arm to normal, when no current is flowing through the selector winding. Gauge by eye.

(1) If the rocker arm does not restore to normal when no current is flowing through the selector, lubricate the rocker arm bearings as outlined in 3.202. If the rocker arm still does not restore to normal, adjust the tension of the rocker arm retractile spring. Use the No. 485A pliers and adjust the bracket of the rocker arm retractile spring as required. The tension of the spring shall not be greatly in excess of the amount required to restore the rocker arm to its normal position, since a higher voltage will be required to operate the selector is the tension of the rocker arm spring is excessive.

3.217 Armature Position - Fig. 6 (D)

(a) With the armature in the normal position, the faces of magnet cores shall lie in as near a parallel plane as possible with the armature. The air gaps between the armatures and the cores shall be approximately equal. Gauge by eye.

(1) To adjust to meet this requirement loosen the core lock nuts, using the No. 417A wrench, and turn the core, using the 3" H cabinet screwdriver. Turn the core in a clockwise direction to decrease the armature gap and in a counterclockwise direction to increase the gap. Tighten the lock nut securely and check that the selector meets the overall operating requirements, 3.220.

3.218 Armature Lever Clearance

(a) The armature lever shall clear all parts, except the rocker arm, throughout its stroke. The vertical or horizontal play in the armature bearings shall not be sufficient to permit the lever to touch adjacent parts. Gauge by eye and feel.

(1) Adjust the armature arm slightly by using the No. 485A pliers. Avoid adjusting the armature lever more than is necessary and take care not to place excessive strain on the armature pivots.

3.219 End Play - Figs. 1 (D), 1 (F), 1 (E), and 1 (H)

(a) The armature shaft, ratchet wheel shaft, rocker arm shaft, and the holding pawl shall have end play but the end play shall be

Max. .010"

Gauge by eye and feel.

(1) If this requirement is not met, refer the matter to the supervisor.

3.220 Overall Operating Requirements

(a) Before checking that the operating requirements are met a check shall be made to insure that the selector key or dial and the associated equipment are in proper adjustment and that the circuit is in condition to transmit the series of impulses which will advance the selector to the specified terminal.

(b) When the proper series of impulses is transmitted to the selector under normal operating conditions, the selector shall step to the proper terminal as determined by the code setting of the selector.

(1) If the selector fails to operate properly, it may be due to excessive tension of the rocker arm spring, excessive tension of the spiral spring, excessive tension of the contact spring as it passes over the terminals, or incorrect armature gaps. Adjust for these conditions as covered above, reducing the tensions of the springs toward the specified minimums as covered in the preceding paragraphs. After making these adjustments if the overall operating requirements are still not met, check that the armature air gaps are not excessive. Failure to operate indicates too great an air gap and

failure to release indicates either too small or unequal air gaps. Adjust the armature air gaps until the selector operates properly in the circuit. If proper operation of the selector still cannot be obtained by adjusting the armature gaps, refer the matter to the supervisor.

(c) Test the selector for false operation by sending a group of pulses that should step the selector one step beyond a contact position. The code wheel shall release and return to its stop position.

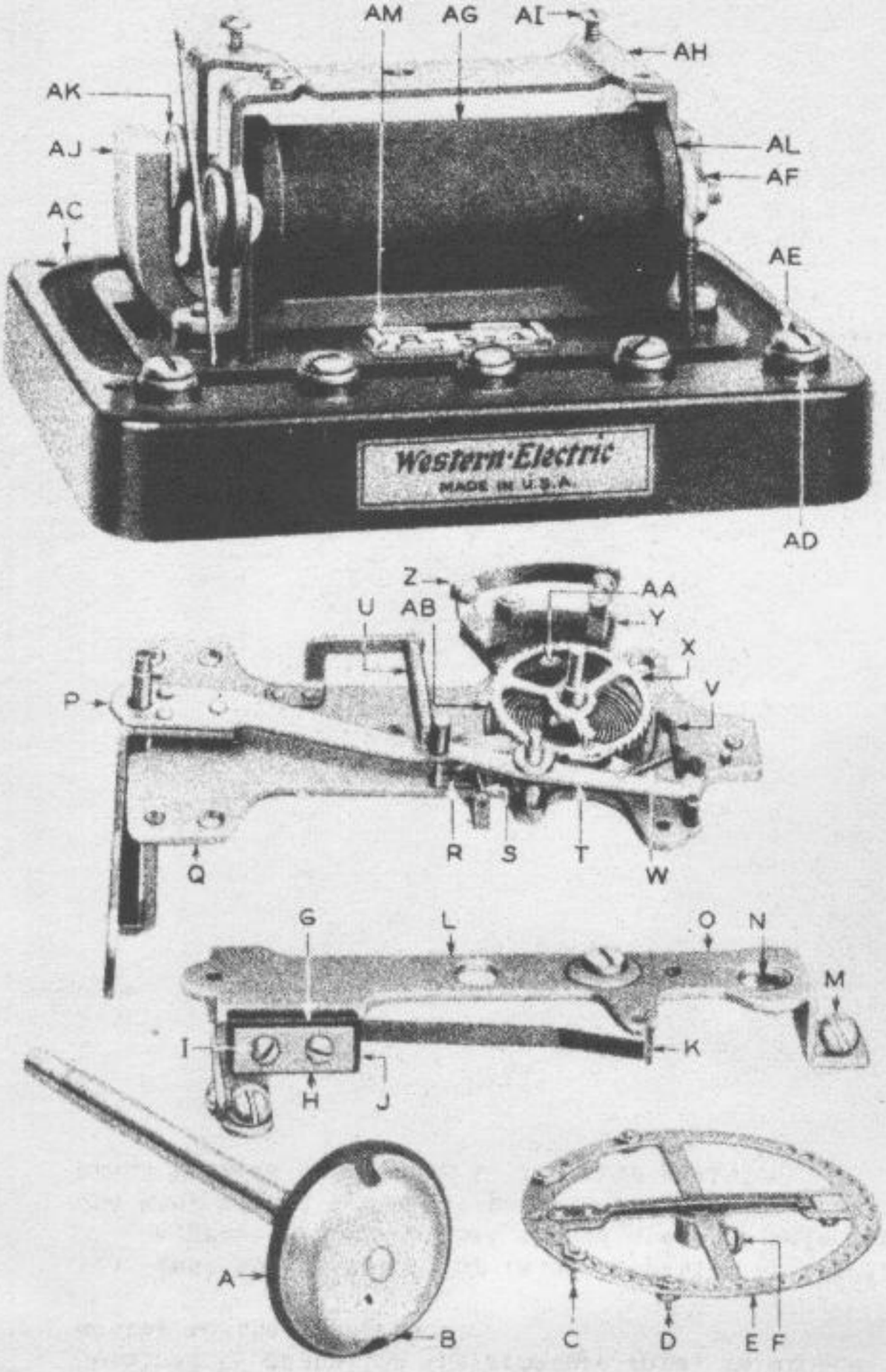

Fig. 7 - 60 BP Selector - Parts

4. PARTS FOR MAINTENANCE

4.01 The following list gives the parts comprising the 60 BP selector, as shown in Figure 7.

No.	Subject	W.E. Co. Piece Part Numbers
A	Felt washer	P-91966
B	Clamping stud	P-207899
C	Code pin	P-137652
D	Code nut	P-137651
E	Code wheel	P-146199
F	Code wheel screw	P-137650
G	Insulator bushing	P-207896
H	Clamping plate	P-146610
I	Clamping plate screw	P-93833
J	Insulator	P-137632
K	Holding spring	P-137636
L	Upper plate	P-146308
M	Upper plate screw	P-147796
N	Adjusting screw	P-92642
O	Hex. nut	P-137686
P	Armature	P-146148
Q	Middle plate	P-146306
R	Holding pawl	P-137643
S	Holding pawl spring	P-247900
T	Rocker arm assembly	P-146152
U	Rocker arm spring	P-247899
V	Stepping pawl	P-146149
W	Stepping pawl spring	P-247901
X	Ratchet assembly	P-137678
Y	Terminal plate	P-143503
Z	Terminal bridge screw	P-94505
AA	Terminal plate screw	P-93836
AB	Spiral spring	P-216750
AC	Base	P-207898
AD	Base terminal	P-137683
AE	Terminal screw	P-137685
AF	Core lock nut	P-121772
AG	Coil	P-228520
AH	Frame	P-146145
AI	Frame screw	P-121770
AJ	Magnet	P-145918
AK	Core	P-147431
AL	End play washer	P-137641
AM	(Card	P-92152
	(Card holder	P-101963
	(Face strip	P-101964
	(Retaining screw	P-223064
	Glass cover	P-162258