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The Hysteresis Loop

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THE HYSTERESIS LOOP.

BY D. W. MOREHOUSE AND HARRY RAY WOODROW.

It is not proposed to introduce a new method for the determination of the hysteresis loop, but to introduce some advantageous modifications.

The method is similar to the ring ballistic method outlined by Dr. R. A. Millikan. This method has the advantage over the old magnetometer method in that the lines of force are continuous through the iron. It cannot be used however if the iron is hard and causes any creeping.

The revolving commutator is a plain application of the mercury cup commutator with which we are all familiar. The variable resistance is an application of the common resistance box, using knife edge switches in place of the plugs. This gives a continuous current which can be increased or diminished by the throw of the switches.

The current was increased by small steps and the value of the current taken by a potentiometer as the most accurate ammeter will not detect the small changes. The induced current was measured by the throw of a ballistic galvanometer and the throw evaluated by means of the earth inductor.

The value of the magnetizing field increased more rapidly than the inductance until (H) reached the value of about two gauses, then the inductance increased much faster than (H), until (H) reached the value 5.068 gauses and from this point the ratio of (B) to (H) became smaller and smaller and approached zero as a limit making the curve approach a straight line parallel to the X axis. As the current decreased the curve crossed the Y axis at (B) = 10,486 lines, giving 73.3 per cent for the retentivity. When the current was reversed the curve crossed the X axis at -3.03 gauses which is the coercive force.

DATA FOR THE HYSTERESIS LOOP.

I	d	Sum. d.			
			Y equals .570747.		
			Radius of ring, 4. 75 cm.		
			Coil, 500. turns.		
			Test coil 75. turns.		
			Earth inductor 1000 turns.		
			Radius of E. In. 7.7 cm.		
			Radius of teste. .717 cm.		
			Mean d was 8.36 cm.		
			H	B	u
			3.553	7230.5	2036.6 max.
			5.068	9453.0	1865.5
			17.61	13920.0	790.3
I	d	Sum. d.	I	d	Sum. d.
+ .621	+3.58	+ 3.58	-.608	+ .80	-74.80
.063	1.05	4.63	.467	1.30	73.50
.072	2.00	6.63	63.09	2.45	71.05
.085	5.08	11.71	61.54	1.40	69.65
.095	4.30	16.01	60.19	1.30	68.35
.108	6.00	22.01	69.09	1.02	67.33
.124	6.68	28.69	58.21	.80	66.53
.143	5.80	31.49	57.51	.70	65.83
.170	5.30	39.79	56.91	.60	65.23
.204	5.28	45.07	53.36	.55	64.68
.266	5.70	50.77	55.86	.49	64.19
.353	5.69	56.46	55.36	.90	63.29
.472	4.68	61.14	54.66	.62	62.67
.620	3.60	64.74	54.21	.42	62.25
.718	1.95	66.69	49.11	.000	57.05
.621			-40.11	+9.42	-47.63
+ .621	-.08	+65.84	38.51	1.70	45.98
.472	1.30	64.59	35.51	3.18	42.75
.350	1.50	63.09	29.11	6.50	36.25
.264	1.55	61.54	23.43	5.67	30.58
.204	1.75	60.19	13.10	10.40	20.18
.171	1.10	69.09	- 2.80	124	+41.28
.143	.88	58.21	20.10	142	13.17
.124	.70	57.51	33.36	169	26.17
.108	.60	56.91	44.05	204	36.44
.097	.55	53.36	53.89	262	45.74
.086	.50	55.86	61.47	350	53.76
.072	.50	55.36	67.97	466	59.86
.062	.70	54.66	73.47	606	64.16
.055	.45	54.21	75.60	709	66.36
.000	5.10	49.11			
-.055	-9.00	-40.11			
.062	1.60	38.51			
.073	3.00	35.51			
.087	6.40	29.11			
.098	5.68	23.43			
.109	10.33	13.10			
.125	15.90	- 2.80			
.142	17.30	20.10			
.167	13.25	33.36			
.205	10.70	44.05			
.260	9.84	53.89			
.350	7.58	61.47			
.463	6.50	67.97			
.609	5.50	73.47			
.714	2.13	75.60			