

CONTENTS.

INTRODUCTION BY THE EDITOR.

	PAGES
Biographical data—Lord Charles Cavendish's experiments—Henry Cavendish lived with his father during his electrical researches—His laboratory in Great Marlborough Street—His apparatus—His attendant—Committee of the Royal Society on lightning conductors—Cavendish's researches on the electric current—Papers on the Torpedo by Walsh, Hunter, &c.—Experiment on the formation of nitric acid before the Royal Society—Cavendish's artificial Torpedo	xxvii to xxxviii

Account of Cavendish's Writings on Electricity.

The two papers in the <i>Philosophical Transactions</i>	xxxix
The manuscripts—Sir W. Snow Harris' account of them	xl
List of the manuscripts	xli
Order of the manuscripts determined	xliii
Why Cavendish did not publish them	xlvi
State of electrical science—Lord Mahon's experiments—Estimate of Cavendish by Dr Thomas Young	xlvi
Coulomb's researches	xlvi
Cavendish's method	xlix
Comparison of charges	l
Proof of the law of force	li
Experiments on coated plates—spreading of electricity	lii
Specific inductive capacity	liii
Plates of air	liv
“Whether the charge of a coated plate bears the same proportion to that of a simple conductor whether the electrification is strong or weak”	liv
Effect of temperature	lv
Effect of floor, walls, and ceiling of room	lvi
Experiments on resistance	lvi
Reference to these experiments in the paper on the Torpedo	lvi
Method of the experiments	lvii
Determination of the “power of the velocity to which the resistance is proportional”	lix

vi	CONTENTS.	
		PAGES
Resistance of salt solution at different temperatures		lx
Resistance of pure water		lx
Resistance of solutions of different salts		lxii
Chemical equivalents of different substances as given by Cavendish		lxii

FIRST PUBLISHED PAPER ON ELECTRICITY.

“AN ATTEMPT TO EXPLAIN SOME OF THE PRINCIPAL PHENOMENA OF ELECTRICITY,
BY MEANS OF AN ELASTIC FLUID.” From the *Philosophical Transactions*
for 1771 (p. 1—50).

PART I.

	ARTICLES
Hypothesis	1—6
Repulsion of a cone on a particle at the vertex	7—11
Force between two bodies over or under charged	13—15
Equilibrium of the electric fluid	16, 17
Repulsion of a spherical shell	18, 19
Equilibrium of electricity in a globe	20—27
Two plane parallel plates	28—38
Canals of incompressible fluid	39—53
Pressure of electric fluid against a surface	54
Circular disk	55—66
Charges of similar bodies as the $n - 1$ power of their corresponding diame- ters, and independent of the material of which they are made	67—72
Charge of a thin flat plate independent of its thickness	73
Two parallel circular plates	74—83
Equilibrium of electricity in bodies communicating by a canal is in- dependent of the form of the canal	84—93
Whether the conditions of equilibrium are the same for two bodies com- municating by a conducting wire as if they communicated by a canal of incompressible fluid	94—96
Molecular constitution of air	97

PART II.

Containing a comparison of the foregoing theory with Experiment.

§ 1. Conductors and non-conductors	98
Electric properties of air and vacuum	99, 100
Positive and negative electrification	101—105
§ 2. Attraction and repulsion	106—117
Electrometer in electrified air	117
§ 3. On the cases in which bodies receive electricity from, or part with it to the air	118—126
§ 5. Canton’s and Franklin’s experiments	127
§ 6. On the Leyden vial	
§ 7. Wilcke and Æpinus’s experiment of electrifying a plate of air (<i>Mém. Berl.</i> 1756, p. 119)	134
§ 8. Electric spark	135—139

PRELIMINARY PROPOSITIONS.

From the MS. in the possession of the Duke of Devonshire, No. 4.

	ARTICLES
Prop. xxix (Fig. 1). If the fluid uniformly spread on a circular plate is to that collected in the circumference as $p + 1$ to $2p + 1$	140
Prop. xxx. Capacity of two disks at a finite distance	141
Cor. 1. Capacity in terms of p	142
Cor. 2. Capacity when the density is supposed uniform	143
Cor. 3. The place in which the canal meets the disk is indifferent only when the fluid is in equilibrium	144
Lemma xii (Fig. 2). Repulsion of a particle on a column	145
Lemma xiii. Repulsion of two columns	146
Lemma xiv.	147
Lemma xv (Fig. 3). Action of a uniform cylinder on an external point	148
Cor. Potential of middle and end	149
Prop. xxxi (Fig. 3). Charge of cylinder compared with that of globe	150
Cor. Upper and lower limits of charge	151
Prop. xxxii (Fig. 4). Charge of two equal cylinders at a finite distance	152
Prop. xxxiii. Ratio of charges of B and b may be deduced from the ratios of B and b to C	153
Lemma xv (Fig. 5). Repulsion on a short column close to an electrified plate	154
Lemma xvi (Fig. 6). Two equidistant concave plates	155
Cor. 1. Definition of corresponding points, &c.	156
Cor. 2. Density increasing towards the circumference	157
Lemma xvii (Fig. 7). Concave plate compared with flat one	158
Cor.	159
Prop. xxxiv (Fig. 8). Theory of a coated plate	160
Cor. 1. Flat coated plate of any form	161
Cor. 2. Flat circular plate	162
Cor. 3. Plate not flat but of uniform thickness	163
Cor. 4. Density increasing towards the circumference	164
Cor. 5. General conclusion	165
Cor. 6. Comparison with globe	166
Cor. 7. Form of plate indifferent	167
Cor. 8. Charge directly as surface and inversely as thickness	168
Prop. xxxv (Fig. 9). Theory of conducting strata in the glass plate	169
Prop. xxxvi (Fig. 10). Penetration of glass by fluid	170
Cor. 1. Equivalent thickness of plate if there were no penetration	171
Cor. 2. Thickness of coatings indifferent	172
Prop. xxxvii. Density more nearly uniform than if there had been no penetration	173
Cor. Distribution probably nearly the same as in plate of air of equivalent thickness	174

viii CONTENTS.

APPENDIX.

From MS. No. 5.

	ARTICLES
Prop. i. Charge of a condenser little affected by the presence of an over-charged body	175
Cor.	176
Prop. ii.	177
Part i. A stricter demonstration, applicable to case of penetration	178
Part ii.	179
Cor. 1	180
Cor. 2	181
Cor. 3	182
Cor. 4. Effect of an overcharged body	183
Cor. 5.	184
Cor. 6 (Fig. 11). Two coated plates in communication little affected by an overcharged body	185
Cor. 7. Canals may be curved as well as straight	186
Lemma. Potential of two equal particles compared with that of their sum at their centre of mass	187
Applied to case of two parallel disks	188
Mutual action of large circle and trial plate in Experiment v.	189
Mutual action of small circles and trial plate in Experiment v.	190
Effect of floor and walls of the room	192
Effect of earth connexion the same as if it were infinitely long	193
	194

THOUGHTS CONCERNING ELECTRICITY.

From MS. No. 18. (Probably an early draft of the theory.)

Hypothesis of an electric fluid	195
The fluid acts at a distance but does not itself extend to any perceptible distance from electrified bodies	196
Proof of this, and objections to the hypothesis of electric atmospheres	197
On the hypothesis of electric atmospheres	198
Condition of electric equilibrium between conductors in electric communication	199
Illustration from the equilibrium of air	200
Definitions of positive and negative electrification, and of over and under charge	201
Four hypotheses	202
Cor. 1, 2. Effect of two overcharged bodies approaching each other	203
Cor. 3, 4. Equally electrified bodies repel	204
Cor. 5. Electrification by induction	205
Theory of condensers	206
Shock of the Leyden vial	207
Fifth hypothesis, on the communication of electricity between conductor and the surrounding air	208

CONTENTS.	ix
	ARTICLES
Effect of an overcharged body	209
Attraction and repulsion of electrified bodies	210
Electrification by induction	211
The electric spark	212
Vacuum formed by the spark	213
Statement of the theory of one electric fluid	214—216

ACCOUNT OF THE EXPERIMENTS.

(1) INVESTIGATION OF THE LAW OF FORCE.

From the MS. No. 7 (apparently prepared for publication).

The electricity of glass is here taken to be positive	217
First experiment. A globe within a hollow globe and in communication with it does not become over or undercharged when the whole is electrified (Fig. 12).	218
General description of the apparatus	219
General plan of the experiment	220
The apparatus actually used	221
Mechanism for performing the required operations	222
The charging jar	223
The gauge electrometer	224
Reason for using the jar	225
Theory of the experiment	226
Result of the experiment	227
Second method of trying the experiment	228
Advantages of the second method	229
Estimation of the degree of accuracy of the result	230
The charge of the inner globe is less than $\frac{1}{25}$ of that of the outer globe	231
Hence the electric force is inversely as the square of the distance	232
Demonstration of this by Lemma 4 (Fig. 13)	233
Limits between which the law of force must lie, $n = 2 \pm \frac{1}{25}$	234
Second experiment—A piece of wood within a vessel formed of two wooden drawers	235

(2) EXPERIMENTS ON THE COMPARISON OF CHARGES.

From the MS. Nos. 9 and 10 (apparently prepared for publication).

Intention of the experiments	236
Definition of the ratio of the charges of two bodies, illustrated by the comparison of a disk with a sphere	237
Method of the experiment	238
The Trial-plate. (Fig. 13)	239
Arrangement of the apparatus	240
Method of operation. (Fig. 14)	241
Theory of the experiment	242
Interpretation of the result	243
The testing electrometer	244

X		CONTENTS.	ARTICLES
Method of testing			245
Advantages of the method			246
Capacity of the trial plate			247
The gauge electrometer			248
Form of electrometer used in the later experiments. (Fig. 30)			249
Estimation of error arising from unequal electrification in the two trials			250
Comparison of the capacities of two bodies			251
Demonstration			252
Why the electrification is tested by the gauge electrometer			253
The bodies to be tested were chosen of nearly equal capacity			254
Measurements of the apparatus			255
The insulating supports of waxed glass. (Fig. 16)			255
Electrification of air			256
Effects of the electrification of the air			257
The earth-connexions			258
The electrometer threads salted			259
Leakage of the Leyden vials			260
Estimate of the accuracy of the experiments			261
Probable cause of error			262
Weak charges always used			263
Reason for this			264
Third experiment. On the effect of variations in the arrangement of the apparatus in testing capacities. (Fig. 17)			265
Six different arrangements			266
Results of the six arrangements			267
Conclusion			268
Fourth experiment. Capacities of bodies of different substances, but of the same shape and size			269
Glass coated with various substances			270
Method of the experiment			271
Effect of the thickness of a plate on its capacity			272
Fifth experiment. Charge of two small circles compared with that of a large one. (Fig. 18)			273
Results of the experiment			274
The experiment repeated in a different manner			275
Comparison with theory			276
Remarks on the calculation			277
Bearing on the theory			278
Sixth experiment. Charge of two short wires compared with that of one long one			279
Comparison with theory			280
Seventh experiment. Comparison of the capacities of several bodies			281
Comparison of disk with sphere			282
Comparison of square plate with disk			283
Oblong plate			284
Cylinder			285
Comparison of different cylinders			286
Disturbing cause			287
Eighth experiment. Comparison of the charge of the middle plate of three parallel plates with that of the outer ones. (Fig. 19)			288

CONTENTS.	xi
	ARTICLES
Comparison with theory	289
Distribution on the middle plate	290
<i>General Conclusions.</i>	
First experiment	291
Second experiment	292
Fourth experiment	293
Remaining experiments	294
(3) COMPARISON OF THE CHARGES OF COATED PLATES.	
New apparatus for the comparison of capacities (Fig. 20)	295
Method of making the experiment	296
The trial plate	297
Second method	298
Advantage of the second method	299
Spreading of electricity on the surface of the glass. (Fig. 21)	300
Difference between different kinds of glass in this respect	301
Determination of the velocity of spreading	302
Attempt to check the spreading of electricity by means of cement. (Fig. 22)	303
Results with cement and varnish	304
These methods abandoned	305
Earth-connexion	306
Instantaneous spreading of electricity on the surface; electric light around the edge	307
Fringe of dirt	308
Extent of this spreading	309
Spreading greatest at first time of charging	310
Recapitulation of the theory of coated plates	311
Correction of the area for spreading of electricity	312
Computed charge of cylindric vials	313
Experiments on 10 pieces of glass from the same piece	314
Table of their dimensions	315
Adjustment of size of coatings	316
Comparison of D + E + F when close together and when six inches apart	317
Comparison of the plates with each other	318
Discrepancy probably due to spreading	319
Experimental investigation of spreading	320
Slit coatings. (Fig. 23, Fig. 24)	321
Effect of thickness of glass	322
Spreading=0.07 on thick plates and 0.09 on thin plates	323
Table of plates with circular coatings	324
Table of the same plates with other coatings	325
Verification of the theory of spreading	326
Effect of thickness of glass	327
Spreading not uniform throughout its extent	328
Effect of different strengths of electrification	329
Comparison of crown glass with Nairne's plates	330
Effect of accumulation near the edge insensible	331

xii	CONTENTS.	
		ARTICLES
Charge of glass plates is many times greater than it ought to be by the theory		332
Comparison with the globe		333
Consideration of the effects of external bodies on the globe and the plates		334
Effect of the floor and walls of the room on the charge of the globe .		335
Experimental investigation of this effect		336
Comparison of the charges of four rosin plates with those of circles 9·3, 18·5, and 36 inches diameter		337
Hypothesis about the relative effect of surrounding bodies on the capacities of different bodies		338
Application of this hypothesis to the three circles and the globe . .		339
Charge of a plate of air		340
Plate of air between glass plates with tinfoil coatings		341
Experiments with plates of air		342
Table of Results with plates of air		343
Experiment to determine whether the air between the plates is charged		344
The air is not charged		345
Comparison with computed charge		346
The table agrees with the theory nearly but not quite		347
Suggested explanation		348
Three hypotheses to explain why the charge of glass plates is rather more than eight times what it ought to be by the theory . .		349
First hypothesis. Electricity penetrates into the glass to a certain depth		
Second hypothesis. A conducting stratum within the glass. (Fig. 25)		350
Third hypothesis. A great number of strata alternately conducting and non-conducting. (Fig. 26)		351
Conduction only normal to the surface of the plate		352
Reasons for preferring the third hypothesis		353
Another reason—analogy of Newton's fits		354
Effect of different degrees of electrification on the charge of a plate .		355
Comparison of the plate D with the circle of 36 inches diameter with two different degrees of electrification. No apparent alteration in capacity		356
Correction for greater amount of spreading with the stronger degree of electrification		357
Comparison with a very weak degree of electrification. Large cylinder and wire. (Fig. 27)		358
Method of the experiment		359
Result with weak electrification		360
Comparison with the usual strength of electrification		361
Comparison of the results		362
Discussion of the results		363
Comparison with positive and negative electrification		364
Accumulation at the edge is greater in plates of air than in glass plates of the same thickness		365
Charge of coated glass at different temperatures. (Fig. 28)		366
The edges of the coatings kept at constant temperature		367
Table of results at different temperatures		368
Glass conducts electricity better as the temperature rises		369
Table of the charges of glass plates		370

CONTENTS.	xiii
	ARTICLES
Table of the charges of plates of other substances	371
Explanation of the tables	372
Method of making plates of wax, &c.	373
Difficulty of making a plate of shellac	374
Dephlegmated bees wax	375
The charge of a coated plate depends on the substance of which it is made	376
Difference between thick plates and thin ones	377
The thick plate of crown glass	378
Theory of compound plates	379
Experiments with compound plates of glass	380
Experiments with glass and rosin	381
Charge of hollow cylinders of glass	382
Table of results with cylindric vials	383
Discussion of the results	384
Appearance of the three green cylinders	385

(4) REPULSION AS SQUARE OF REDUNDANT FLUID.
From MS. No. 8.

The repulsion between two bodies electrified to the same degree ought, by the theory, to be proportional to the square of the quantity of redundant fluid	386
Experiment to test the theory. (Fig. 31)	387
Comparison of the force required to produce an equal divergence of the two electrometers	388
The Leyden jars	389
Method of the experiment	390
Discussion of the experiment	391
Method of preventing the vibration of the straws	392
No sensible error due to leakage	393
Effect of want of conductivity of the straws	394

SECOND PUBLISHED PAPER ON ELECTRICITY.

"AN ACCOUNT OF SOME ATTEMPTS TO IMITATE THE EFFECTS OF THE TORPEDO BY ELECTRICITY." <i>From the Phil. Trans. for 1776 (pp. 196 to 225).</i>	
Walsh's experiments on the Torpedo	395, 396
Shock given by the Torpedo under water	397
Electric resistance of salt and fresh water, and of iron wire	398
Lines of flow of the discharge of the Torpedo	399, 400
Conditions requisite for a spark and for attraction and repulsion	401—408
Artificial Torpedo	409
The battery and its charge	411—413
Mode of charging the battery	414
Shocks in air and under salt water. Law of divided currents	415—420
Torpedo in a basket; in sand; shock through wet shoes and through net	421—424
Why the Torpedo gives no spark	425—435
Structure of the electric organ	436
Shock through a chain without any light	437

EXPERIMENTS IN 1771.	
<i>From MS. No. 12.</i>	
	ARTICLES
1st Night	438
2nd Night	439
3rd Night	440
Two pairs of large corks made, one four times as heavy as the other. Measurement of capacity of vial by touching eight or nine times with coated plate and wire	441
Thickness, C .36031	
Three coated plates . D .05908	442
F .05914	
C, D, F close together and far asunder	443
Three coated plates, 1·8 diam., ·18 thick	444
Globe and circle, 19·4 of pasteboard. Sliding plates $\frac{14 \times 9 \cdot 4}{19 \times 13}$	
Circle of $1 \cdot 8 \times 18 = \frac{20 \cdot 2}{12 \cdot 4} = \frac{10}{6}$ globe	445
Double plate, $1 \cdot 75 \times 285$, tried with small sliding trial plate; Double plate $\frac{11}{\text{globe}} = 18$	
Thick plate, $1 \cdot 45 \times 168 = \frac{14}{13}$ globe	446
Trials of wires. Single wire, 96×19 . Two wires, 48×1 at 36 and 18 .	447
Two wires, 1×24 , at 18, 36	448
Results of wires	449
Large circle on waxed glass and on silk	450
Coated glass compared with non-electric body with strong and weak electricity	451
Two tin circles of 9·3, compared with one of 18·5	452
Brass wire, 72×19	453
Results. Best formula for cylinder	454
Coated trial plate of two plates of glass with rosin between	455
Trial plate, Double plate A, Double plate B, Large circle (18·5 ?), $\frac{17 \frac{1}{2}}{18 \cdot 4} \quad \frac{18 \cdot 4}{18 \cdot 3} \quad \frac{18 \cdot 5}{18 \cdot 5}$	
Globe, $\frac{\text{Globe}}{18 \cdot 8} = 1 \cdot 56$ circle	456
Double plates A and B, and plate air, $\cdot 39 \times 7 \cdot 95$	457
Real power of plate air = computed $\times \cdot 243$ [computed is 8 times too great]	458
N, O, P, Q	459
B [2·79], D [2·73], white [2·85]. B, D, N, W tried	460
A [2·16], 1st rosin 2·51, trial plates, Art. 457	461
Results for D, W, B, P, N, O, Q	462
Coated plate compared with non-electric body with strong and weak + and - electricity	463
Rosin, $3 \cdot 41 \times 3 \cdot 45$, compared with double B, by sliding coated plate	464
Side of square equivalent to trial plates	465

CONTENTS. xv

EXPERIMENTS IN 1772.

From MS. No. 13.

	ARTICLES
Plan of usual disposition of vials and bodies to be tried	466
Exp. iii	467
Do. Dec. 14, 1771	468
Dec. 16, 1771. Conductivity of stone squares	469
Dec. 17, 1771. Exp. iii	470
Dec. 18. Exp. iv	471
„ Exp. v, circles 9·3 and 18·5	472
Dec. 30. Exp. v, observations	473
„ Exp. v, 2nd arrangement	474
Dec. 31. Observations	475
Two wires, 36 × ·1, and 1 of 72 × ·185, Exp. vi	476
Jan. 3, 1772. Observations	477
Exp. vii :	
Large tin circle Double plate B, Tin cylinder, 35·9, 2·53	
Globe, Tin plate square, 15·5 „ 54·2, ·73	478
Double plate A. „ oblong, 17·9 × 13·4 wire 72 ·185	
Results : comparison with Art. 455	479
Exp. iv	480
Table omitted	481
Ten plates from Nairne, A to M	482
D, E, F, G compared with double A and B	483
Trial plates of Nuremberg glass, H, I, K, L. Art. 303. H, I, K, L cased with cement. E, F, G and I, K, L of Nairne cased in cement.	
Plate of cement	484
Spreading of electricity on cemented plates. Art. 302	485
Rate of spreading	486
Trial of spreading by machine. (Fig. 20)	487
Three sliding coated plates with brass sliders. Six trial plates	488
Feb. 4, 1772, D, E, F, G. Two double plates	489
E + F + G, with I, K, L, M	490
Closing of balls	491
Feb. 5, 1772, I + K + L, with A + B + C + H, crown glass trial plates	492
„ A + B + C, with H	493

THE FOLLOWING INDEX IS BY CAVENDISH HIMSELF.

From MS. No. 14.

The pages refer to the MS., the numbers of the Articles to the present edition.

INDEX TO ELECTRICAL EXPERIMENTS, 1773.

PAGE OF MS.	ARTICLES
1—10. Spreading of electricity on the surface of glass	494
11. List of thickness and coatings of some plates, see p. 27	500
12. Quantity of electricity in thick rosin compared with double plate B, and in 2nd rosin with D, E and G of Nairne	501

xvi	CONTENTS.
PAGE OF MS.	ARTICLES
13. Q and P compared with M and K of Nairne, also green cylinder 4, and white cylinder compared with plates of Nairne by means of sliding trial plates	502
14. 1st and 2nd green and white cylinder and white jar, compared with H of Nairne in usual manner	503
15. The same in the same way, except with addition of plate M on the negative side in some experiments	504
16. Quantity of electricity in the two coated globes, and in the two jars used in the machine for trying plain plates	505
17. Quantity of electricity in the 4 jars, and in the 5th and 6th sliding trial plates	506
18. Thick rosin compared with double plate A and B, and thick white and 2nd rosin with D, E, F and G of Nairne	507
19. Thick white, 2nd rosin, D and F of Nairne and the two double plates together, compared together; also thin white with D and E, and D and F	508
20. Whitish plate, P, Q, O, old G and thin rosin compared with M	509
21. Crown A and C compared with A, B and C of Nairne	510
23. Whether the shock from the plate [of] air was diminished by changing the air between them ¹ by moving them horizontally	511
25. Whether globe included within hollow globe is overcharged by electrifying outer globe	512
26. The same thing tried by a better machine	513
27. Note to list of plates in p. 11	514
28. 1st and 2nd sliding plates compared with double plate B; also Q, P, O and thin rosin; old G and whitish plate compared with D, E, F and M	515
30. Whether the charge of plate air is diminished by changing the air between them by lifting up the upper plate	516
31. Trials of plate air 1, 2, 3 and 4	517
35. Lac plate and 4th rosin compared with D + E + F, also thin wax with E + F, also thick wax and plate air 5 with D	518
36. Lac and 4th rosin with D + E + F, also thin wax with D + E, also thick wax, 2nd rosin and first made rosin and plate air 5 with F	519
38. Breaking of electricity through thin plates of lac, experimental rosin, and dephlegmated bees wax	520
39. The quantity of electricity in a Florence flask tried with and without a magazine	521
41. Computed power of above flask	522
42. As it appeared by the foregoing experiment that the Florence flask contained more electricity when it continued	

¹ The two flat conductors between which the plate of air lies, or, in modern language, the electrodes.

CONTENTS.		xvii
PAGE OF MS.	ARTICLES	
	charged a good while than when charged and discharged immediately, it was tried whether the case was the same with the coated globes	523
43.	Diminution of shock by passing through different liquors	524
47.	Whether force with which bodies repel is as square of redundant fluid tried by pith balls hung by threads	525
51.	Whether the charge of plate E bears the same proportion to that of another body, whether the electrification is strong or weak, tried by machine for Leyden vials	526
53.	Plain wax and 3rd dephlegmated wax with E + F, and 5th rosin with double plate A and B. Also small ground crown with D + E + F, and large do. with C	527
54.	K, L and M, compared with D + E + F at distance and close together; also large ground crown with C and small one with D + E + F; also 3rd dephlegmated wax and plain wax with E + F; also 5th rosin with double B	528
55.	K + L + M compared with A, B and C; also A + B + C with H	529
56.	K + L + M compared with B, with electrification of different strength	530
57.	K + L + M with A, B, and C; also D + E + F with K, L and M; also small ground crown with K, L and M, and D + E + F, and large ground crown with A, B and C, and K + L + M	531
58.	On the light visible round the edges of coated plates on charging them	532
59.	Crown A and C and large ground crown with C; also 3rd dephlegmated wax, plain wax and sliding plate 3 with E + F; also 2 double plates with E, F and D	533
60.	Charge of the triple plate, the three plates A, B and C placed over each other with bits of lead between coatings	534
61.	Whether the charge of plate D bears the same proportion to that of another body whether the charge is strong or weak, tried with machine for Leyden vials	535
62.	H with slits and a crown glass with oblong coating, compared with white cylinder, also A and C with slits compared with B	536
65.	Crown with slits and H with do. compared with white cylinder, and A and C with oblongs compared with B	537
67.	Experiment of p. 61, tried with small ball blown to the end of a thermometer tube; also fringed rings on plate of crown glass, &c.	538
69.	Whether charge of Leyden vial bears the same proportion to that of another body when the electrification is very weak as when it is strong; tried by communicating the electricity of small pieces of wire to tin cylinder and to D and E	539

PAGE OF MS.	ARTICLES
70.	Lane's electrometer compared with straw and paper electro-meter 540
71.	Crown and H with slits compared with white cylinder; also on the excitation of electricity by separating a brass plate from a glass one 541
73.	Whether the middle of three parallel plates communicating together is much overcharged on electrifying the plates 542
74.	Charge of A, B and C laid on each other without any coatings between; also charge of 1st thermometer tube 543
75.	Lane's electrometer compared with straw and paper electro-meter; also charge of plate rosin with brass coating made to prevent spreading of electricity 544
76.	Second thermometer tube; also comparison of charge of cylinder used in p. 69 with D + E 545
77.	Charge of second thermometer tube; also that of rosin plate with brass coating; also that of A, B and C laid on each other without coatings between 546
78.	Quantity of electricity in plate D compared with that of tin circle of 36" and one of 30", by machine for trying simple plates 547
79.	Charge of plate of experimental rosin designed for comparing plate of glass and rosin, tried both when warm and when cold 548
80.	Whether charge of glass plate is the same when warm as when cold 549
81.	Crown with slit coatings and H with oblong compared with white cylinder; also second thermometer tube with D + E + F 550
82.	Quantity of electricity in plate D, and rosin with brass coatings, compared with that of tin circle of 36", and one of 30" by machine for trying simple plates with different degrees of electrification 551
83.	Charge of compound plate of glass and rosin 552
85.	Circle of 18½" compared with double plates; also plate D, plate air, and the two double plates compared with circles of 36" and 30" 553
86, 90 & 91.	The same with addit. four small rosin plates 554
87.	Whether the four rosin plates contain same quantity of electricity when close together as when at a distance, tried by machine for Leyden vials 555
89.	Whether charge of white glass thermometer tube is the same when hot as when cold 556
92.	Allowance for connecting wires in p. 86, &c. 557
93.	Whether charge of the four rosin plates is the same when close together as when at a distance. Also on excitation of electricity by separating brass plate from glass one 558
94.	Comparison of Henly's, Lane's, and straw electrometer 559

CONTENTS.		xix
PAGE OF MS.		ARTICLES
95.	Excess of redundant fluid on the positive side above the deficiency on the negative side in glass plate and plate air, and compound plate of p. 83, compared with charge of simple plate	560
99.	Whether parallelepiped box included in a hollow box of the same shape is overcharged on electrifying the outer box	561
100.	Globe within hollow globe tried again	562
105.	Whether the force with which two bodies repel is as the square of the redundant fluid, tried by straw electrometers	563—7
113.	Separation of Henly's electrometer by different strengths of electrification	568
115.	Separation of Henly's electrometer when fixed in the usual way and on upright rod	569
116.	Result of the comparison of different electrometers in p. 70, 75, and 95	570
118.	Comparison of Lane's electrometer with light straw electrometer in different weather	571
121.	Comparison of strength of shocks by points and blunt bodies	572
122.	Whether shock of one jar is greater or less than that of twice that quantity of fluid spread on four jars	573
123.	Comparison of the diminution which the shock receives by passing through water in tubes of different bores, and whether it is as much diminished in passing through nine small tubes as through the same length of one large tube, the area of whose bore is equal to that of the nine small ones	574
125.	Comparison of the diminution of the shock by passing through iron wire or through salt water	575
126.	Measures of glass tubes used in p. 123 and 124 more accurate, with the computations of those pages over again	576
127.	Comparison of conducting powers of sat. sol. S.S. ¹ and rain water	577
128.	Whether the electricity is resisted in passing out of one medium into another in perfect contact with it	578, 579
129—131.	Comparison made at Nairne's of his Henly on conductor, and on upright rod	580

HERE ENDS CAVENDISH'S INDEX.

M. [MEASURES.]

From MS. No. 19.

Comparison of charges of jars and battery, method of repeated communication	581
Theory of this method	582
Results	583

¹ Sea salt.

xx	CONTENTS.	
		ARTICLES
Charge of 1st battery of Nairne		584
Whether shock is diminished by imperfect conduction of the salt water in the jars		585
Specific gravity of solutions of salt		586
Rule for finding the quantity of salt in water from its specific gravity .		586
Measurement of Lane's second and third electrometer		587
Conductivity of salted wood		588
Dimensions of coatings of glass plates		589
Rules for making trial plates		590
Specifications for coating of plates		591
Measures of thickness of 2nd rosin plate		591
Measures of thickness of crown glass		592
<i>From MS. No. 13.</i>		
List of plates of glass		592
Ten plates from Nairne		593
Green glass cylinders		594
Coatings of jars and cylinders		595
 EXPERIMENTS WITH THE ARTIFICIAL TORPEDO.		
<i>From MS. No. 13.</i>		
Shocks from 1st Torpedo		596
Theory of divided circuits		597
Shock under water		598
First leather Torpedo		599
Second leather Torpedo, Tuesday, April 4 [1775]		600
Second leather Torpedo, Saturday, May 27 [1775]		601
Mr Ronayne, Mr Hunter, Dr Priestley, Mr Lane, Mr N[airne?].		
Same day old Torpedo through bright and dirty links		602
Tried with Lane's electrometer		603
Tuesday, May 30 [1775]. Distance of discharge of Lane the same for great or small number of jars		604
Charge required to force electricity through chain		605
Wednesday, May 31 [1775]. Comparison of rows of battery		606
Results of experiments, May 30		607
Tuesday, June 6 [1775]. Torpedos in wet sand		608
Shock through salted wood		609
Monday, June 12 [1775]. Relation between quantity of electricity and number of jars that the intensity of the shock may be the same .		610
Second leather Torpedo under water		611
Tuesday, July 4 [1775]. Second leather Torpedo touched in various ways		612
Experiments without any Torpedo		613
Anatomy of electric organs of Torpedo		614
Second leather Torpedo new covered		615

CONTENTS. xxi

RESISTANCE TO ELECTRICITY.

From MS. No. 20.

	ARTICLES
Comparison of conducting power of salt and fresh water, in the latter end of March and beginning of April, 1776.	
Method of experiment	616
The experiments	617
Six jars compared with one row. Experiments	618
Examination whether salt in 69 conducts better when warm or when cold	619
Examination whether the proportion which conducting power of sat. sol. and salt in 999 bear to each other is altered by heat	620
Resistance of distilled water	621
Salt in 2,999 and salt in 150,000	622
Resistance of salt solutions	623
Comparison of water purged of air and plain water	624
Comparison of water impregnated with fixed air and plain water	625
Resistance of solutions of other salts	626
Oil of vitriol, spirit of salt and f. alk.	627
Experiments in January, 1781	628
To find what power of the velocity the resistance is proportional to	629
Salt solutions	630
Water and spirits of wine	631

CALIBRATION OF TUBES.

Jan. 1781. From MS. No. 19.

Tube 14	632
Tubes 14, 15, 22, 23, 5, 17	633
Tubes 12, 20	634
Results	635

RESISTANCE OF COPPER WIRE.

From MS. No. 19.

Copper wire on glass reel	636
Failure of former method	637
Barometer tubes as Leyden jars	638
Shock through wire plainly greater than shock received direct	639
The same with jars 1, 2 or 4	640
Copper wire stretched by silk; sensation, sound and light of shock	641
Wire wound round a slip of glass	642
Wire from reel stretched 14 times round the garden	643
Copper wire silvered put on reel	644
Comparison by sound	645
Results	646

RESULT [OF COMPARISONS OF CHARGES].	
<i>From MS. No. 16.</i>	
	ARTICLES
Allowance for connecting wire	647
Square : globe : circle :: 1·125 : 1·54 : 1	648
Compared results	649
Ditto.	650
Circles 36, 18·5, 9·5	651
Increase of charge by induction	652
Double A and double B	653
Globe and circle 18½	654
D, E, F, G	655
D, E, F, M, K, L	656
A, B, C. K, L, M	657
H	658
Instantaneous spreading of electricity	659
Trials	660
Results	661
Tables of results	662, 663
Whether charge of coated glass bears the same proportion to that of another body whether electricity is strong or weak	664
Correction for spreading with electricity strong and weak	665
Experiment with tin cylinder	666
Charge corrected for spreading	667
On plate air	668
Table of plates of air	669
Table	670
Table of Nairne's plates	671
Computations of other flat plates of glass, &c.	672
Table of glass plates	673
Table of other substances	674
On the glass cylinders	675
Table of glass cylinders	676
On the compound plates	677
Experimental rosin	678
Rosin placed between glass plates	679
White glass ball at various temperatures	680
Two circles	681
Globe, circle, square, oblong, cylinder	682
Wires	683

RESULTS [ON RESISTANCE].	
<i>From MS. No. 20.</i>	
Pump water, rain water, salt in 1000, sea water	684
Nine tubes compared with one	685
Resistance as 1·03rd power of velocity	686
Resistance of iron wire	687

CONTENTS.	xxiii
	ARTICLES
Sat. sol. in 99 = 39 sat. sol.	688
Experiments in 1776 and 1777 on salt solutions	689
Distilled water	690
Effect of temperature	691
Air in water	692
Fixed air in water	693
Other saline solutions	694
Experiments in January, 1781	695
Water with different quantities of salt in it	696

NOTES BY THE EDITOR.	
NOTE	PAGE
1. On the theory of the electric fluid	362
2. Distribution of hypothetical fluids in spheres, &c.	368
3. Canals of incompressible fluid	375
4. Charges of two parallel disks close together	378
5. Infinite body	379
6. Molecular constitution of air	380
7. Zero of potential	382
8. Cases of Attraction and Repulsion	383
9. Escape of electricity into the air	384
10. Electromotive force required to produce a spark	386
11. Two circular disks	387
12. Capacity of a long narrow cylinder	393
13. Two cylinders	400
14. Lemma xvi	401
15. Glass as a dielectric	402
16. Influence of condensers	404
17. Theory of the experiment with trial plates	406
18. On the "Thoughts concerning Electricity"	409
Early form of Cavendish's Theory of Electricity	411
19. Experiment of the globe and hemispheres	417
20. Capacity of a disk of sensible thickness	423
21. Two circles	425
22. Square	426
23. Three parallel plates	427
24. Capacity as affected by walls of room	429
25. Tin cylinder, &c.	430
26. Charge of glass at different temperatures	430
27. Comparison of measurements of dielectric capacity	432
28. Computed charge of hollow cylinder	432
29. On Electrical Fishes	433
30. Excess of redundant fluid on positive side above deficient fluid on negative side	437
31. Intensity of shocks	437
32. Iron wire and salt water	443
33. Salt and fresh water	444
34. Other saline solutions	445
35. Globe and circle	447

FACSIMILES OF CAVENDISH'S FIGURES.	
FIG.	PAGE
12. Globe and Hemispheres	104
15. Trial Plate	116
14. Machine for trying simple conductors	117
30. Electrometer	121
16. Insulators of waxed glass	124
20. Machine for trying Leyden vials	145
23. Slit coatings	159
24. Ditto	159
28. Effect of heat on glass	To face p. 180
Facsimile of MS. containing the words "shock melter"	To face p. 326
Do. containing Calc. SS.A., &c.	To face p. 329

ERRATUM.

P. 137. Art. 283, line 2, for 1.53 read 1.153.

In the late Dr George Wilson's collection of Cavendish MSS. there is a drawing of which the opposite page is a reduced copy. The words "buried at Derby" are written in pencil on the margin.

Henry Cavendish was buried in the Devonshire Vault, All Saints' Church, Derby, but Mr J. Cooling, Jun., Churchwarden of All Saints, informs me that there is no slab or monument of any kind erected in memory of him there.