Report on the air of Glasgow : with tables of wind, temperature, and rain-fall, for the six months, November, 1877, to April, 1878 / by E.M. Dixon in co-operation with the Medical Officer of Health ; with explanatory remarks by Wm. J. Dunnachie.

Sanitary Department—Glasgow.

REPORT

ON THE

AIR OF GLASGOW,

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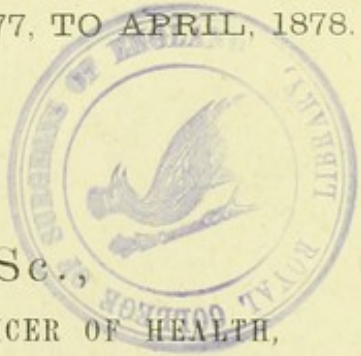
FOR THE SIX MONTHS, NOVEMBER, 1877, TO APRIL, 1878.



BY

E. M. DIXON, B.Sc.,

IN CO-OPERATION WITH THE MEDICAL OFFICER OF HEALTH,

WITH

EXPLANATORY REMARKS BY WM. J. DUNNACHIE.

PRESENTED TO THE COMMITTEE OF HEALTH OF THE MAGISTRATES AND COUNCIL OF GLASGOW, 29th JULY, 1878.

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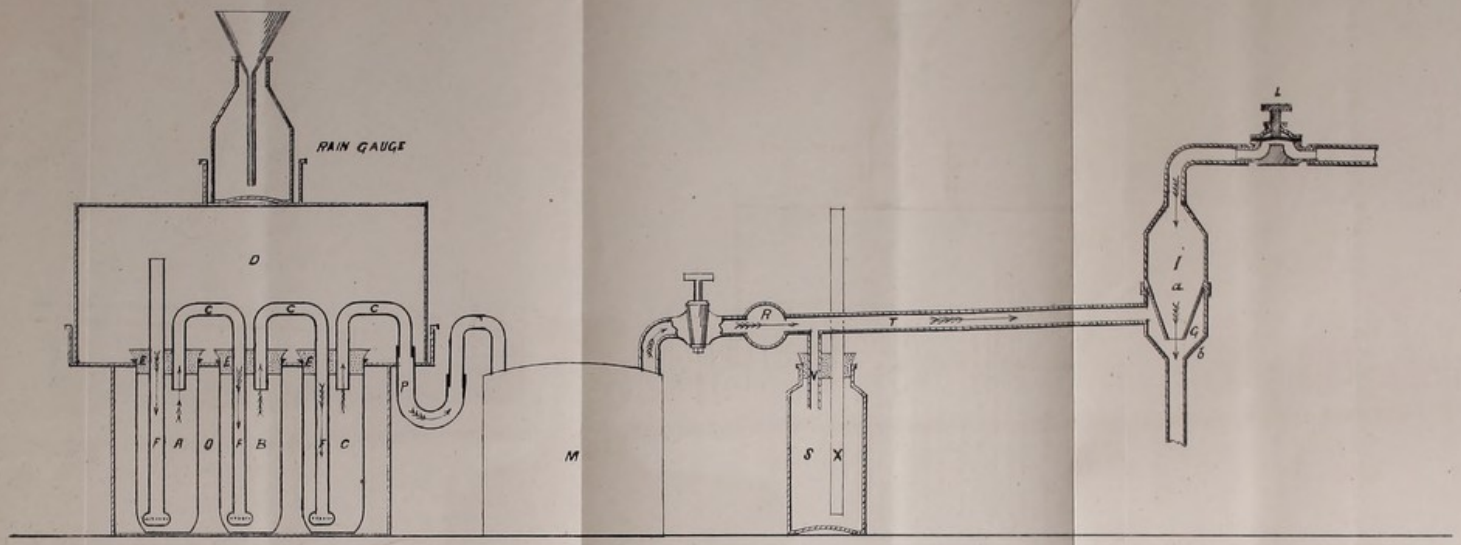


APPARATUS USED IN AIR ANALYSIS — SANITARY DEPARTMENT GLASGOW.

MR. DIXON'S EXPLANATORY REMARKS.[1]

The accompanying Tables fall under two classes, one of them containing the Tables which state the average amounts of certain substances existing in 100 cubic feet of air at the places and during the times specified, and the other containing Tables explanatory of the former, and referring either to the results of special investigations or to meteorological conditions existing during the times and at the places in question.

Regarding the results of analysis contained in the Tables of the first class, it is sufficient to state here that at each of the stations therein mentioned the air is drawn by aspiration, and continuously for two or three days in several distinct currents through as many distinct solutions, each of which is adapted to withdraw a special substance from the current of air which passes through it; that the amount of air which passes in each current is measured by means of a special gas meter, through which that current subsequently passes; and that the amount of the substance which is specially absorbed from each of the air currents is finally determined by a method sufficiently delicate for the estimation of quantities that in most cases would be called "traces."[2]

The object of the Tables of the second class is, as already stated, to supply all the information that may be available, or that may appear to be necessary, for correctly interpreting the analytical results in the Tables of the first class. The portion of these Tables relating to changes in the direction and velocity of the wind, and also that relating to the average temperature during the days to which each of the analytical results refers, will continue to be supplied by Professor Grant of the Glasgow Observatory, from the results obtained there by self-recording apparatus.[3] * * * * * * * *

The Tables of the first class are numbered, and show the results obtained with respect to the following substances, viz.:—

Table I.—Carbonic Acid.
,, II.—Sulphur in combination.
,, III.—Chlorine free and combined.
,, IV.—Nitrogen in the form of Ammonia.
,, V.—Nitrogen in the form of "Albumenoid Ammonia."

Unless the opposite is expressly mentioned, all the numerical and other statements in the Tables must be understood to refer, not exclusively to the day indicated by the corresponding date, but to the interval between noon of that day and noon of the day indicated by the date immediately preceding.

[1 Certain portions which are explanatory of work projected but not carried out are omitted.]

[2 See Mr. Dunnachie's Explanatory Remarks.]

[3 The Rain-fall and Temperature observations have been obtained from the Scottish Meteorologicoal Society's Station, 442 Sauchiehall Street.]

The amounts of the various substances estimated in 100 cubic feet of air are in all cases, except that of carbonic acid, expressed in units of weight. The unit employed is the milligramme. In the case of carbonic acid the usual method of expressing the amount as so many volumes in 10,000 volumes of air has been followed.

The "dashes" in the Tables indicate experiments lost through known causes. The "marks of interrogation," on the other hand, indicate results departing so far from the normal character as to be clearly erroneous, while it is impossible to state with certainty the cause of error.

Rain-fall is expressed in inches, the velocity of the wind in miles per hour, and temperature in Fahrenheit degrees.

The accompanying Map of Glasgow will, it is hoped, also contribute materially to the interpretation of the results of analysis. In it the relative density of shading corresponds approximately with the density of the population, and the black patches indicate the sites of manufacturing establishments, from which proceed large quantities of smoke or of noxious vapours. The positions of the Stations referred to in the Tables are indicated upon the Map by special marks, and the localities in which these Stations are situated are named below. These names are employed in the Tables to designate the respective Stations.

* * * * * * * * * * * * *

GLASGOW, 25*th July*, 1877.

MR. DUNNACHIE'S EXPLANATORY REMARKS.

Mr. Dixon having found it necessary, from his engagements in connection with the Head-Mastership of Glen's Institution, to withdraw from active participation in this investigation,[1] it devolves upon me, as his Assistant during the last twelve months, in presenting the results for the six months ending 30th April, to make a few observations explanatory of the mechanical and chemical processes whereby those results have been obtained, and thereby, to the best of my ability, to fulfil a promise made by Mr. Dixon in his remarks prefixed to the results for May, 1877.

The mechanical operations connected with the taking of the samples of air are conducted at the various "Stations," and the chemical operations, connected with the analysis of these samples, are carried on in the Laboratory, 1 Montrose Street.

All the mechanical methods hitherto adopted for collecting foreign matters from the air for analysis, with the exception of that in use at the Observatory of Montsouris, near Paris, proceed upon the principle of agitating successive measured volumes of air in contact with pure distilled water, or with chemical solutions.

One of the most common, and, if thoroughly carried out, the most perfect of these is that of introducing known volumes of air into large bottles containing a quantity of pure distilled water or a chemical solution, and agitating briskly for some time. This process is, however, obviously slow, and very laborious, and consequently *continuous* observations at even one station could only be obtained by it at great cost, and after all by trusting implicitly to the uniformity and honesty of manual labour of the most irksome and purely mechanical sort.

The force of this last objection will at once appear when it is considered that results obtained from samples taken at different points of a town are incapable of comparison unless taken simultaneously—a fact depending upon the circumstance that the character of the atmosphere existing at any given time, in any point of a town, is very materially influenced by the velocity and direction of the wind at the time.

[1] This is also the explanation of the great irregularity and delay in the publication of these results, which were intended to appear monthly.

It, therefore, became evident, at a very early stage of the present investigation, after adopting only to reject other methods, such as improved washing bottles, aspiration by a double air-pump, &c., that the chemical examination of the atmosphere generally prevailing in a few selected points in Glasgow could only be effected by an *automatic* process of air-washing that would allow of the simultaneous manipulation of tolerably large volumes of air, and over considerable periods of time.

For this purpose Mr. Dixon took advantage of water pressure, which is abundant within the area of the Loch Katrine water supply, and by its means caused the air to pass through the absorbing medium, while its volume was measured by an ordinary Gas Meter.[1]

One of the weak points of this method lies in the difficulty of maintaining a steady and constant flow of air through the solutions, owing to the inevitable irregularity of the water pressure, a difficulty which has been palliated, but not removed, by the arrangement hereafter to be described. Another, but not very serious, source of error is the irregularity in the registration of the gas meters. The results obtained by this method are, therefore, not to be regarded as absolutely accurate, but as they have all been obtained by the same process, and that an approximately accurate one, they enable us to make trustworthy comparisons as to the general character of the air at the various stations where observations have been carried on during the last twelve months.

The accompanying diagram gives a very clear idea of the apparatus used. A, B, and C are strong glass vessels ("Absorbers") about 7 inches long and 2 inches diameter, each of which is fitted with an india-rubber cork (E) having two perforations for the insertion of the glass tubes (F) and (C). The tubes (F) pass nearly to the bottoms of the Absorbers, and terminate in a flattened bulb, round the outer edge of which a row of minute holes is drilled by a lapidary.[2] The bent tubes (C) pierce the cork, terminate in open bore, and form the connecting links between the different Absorbers. To the last of the series of bent tubes an india-rubber pipe (P) is attached, which communicates with the "Inlet" of an ordinary gas meter (M), registering from ·01 to 1000 cubic feet. The "outlet" of this meter opens into a cylindrical receiver (R), with which all the other meters of the Station in like manner communicate. A $\frac{3}{8}$-inch lead pipe (T) passes from the receiver, and is attached to the Aspirator (*i*) which is in connection with the water main.

When the tap (L) is opened, the water, rushing through the constriction at (*a*) into (*b*), tends to produce a vacuum in the intervening space (G), and suction is thereby produced, which, operating along the line of the tube T, causes a current of air to pass through the Absorbers in the direction indicated by the arrows—the volume of which is registered by the meter. This current is divided into numerous fine streams in its passage through the perforations of the "roses." (D) is a tin case fitted with a movable hood, and constructed to hold four sets of Absorbers, forming a very safe and convenient means of carrying the Absorbers between the Laboratory and the Stations. Provision is made for free access of air through apertures beneath the projecting ledge.

The atmospheric impurities dealt with are—Carbonic Acid, Sulphur in combination, Chlorine free and combined, Nitrogen in the form of Ammonia, and Nitrogen in the form of Albumenoid Ammonia.

The Carbonic Acid, Sulphur, and Chlorine are each collected in a separate series of Absorbers, while the Ammonia and Albumenoid Ammonia are collected in the same series. The charging of the Absorbers is conducted as follows:—Into each glass, which has been previously washed with distilled water,[3] a measured quantity of perfectly clean glass beads is placed for the more complete subdivision of the air, the cork containing the tubes is now inserted, and the "roses" placed in position amongst the beads. Through the open

[1] The method adopted at Montsouris, which has been in operation there since 1876, is the same in principle as Mr. Dixon's, although inferior in mechanical power. For a full account of the whole arrangements, see the Montsouris Annual for 1877.

[2] We have called these tubes "roses," from their resemblance to the rose of a watering-can. The "roses" in use at Montsouris are made of platinum.

[3] For the preparation of distilled water we have a large Copper Still, with Condensing Worm and Tank. This Still holds five Winchester quarts of water. The first distillations, amounting to about one Winchester quart, are thrown away, and the subsequent bottles, marked I., II., and III., are retained. The water in I. is used for the washing of apparatus, &c., that in II. for all operations connected with the estimation of Sulphur, while that in III. for the Chlorine and Ammonia estimations, and for the preparation of Standard and other Solutions. The Still is thoroughly cleansed once a week, and about five hundred grammes of Carbonate of Soda added with the first charge of water.

ends of the "roses" the various reagents are introduced, which are all sufficiently concentrated to permit of dilution with distilled water, thus providing a means of washing down those portions of the strong solutions which may have lodged in the interior of the "roses."

The absorbing materials used are:—for the Carbonic Acid, a strong solution of Caustic Potash, 320 Grammes per Litre (this series contains no beads); for Ammonia and Albumenoid Ammonia, dilute Sulphuric Acid; for Sulphur, a dilute solution of Permanganate of Potash; and for Chlorine dilute Ammonia.

The volume of fluid in each series is the same, to ensure that the flow of air through each may be as nearly as possible uniform. To avert the evil consequences arising from the varying water-pressure, it was found necessary to improvise a simple and an efficient safety valve. (S) represents the form adopted. It consists of a Winchester quart bottle, fitted with india-rubber cork, through which two tubes pass, that marked (X) passes nearly to the bottom of the bottle, having its upper extremity open to the atmosphere, the other tube (V) merely pierces the cork, and communicates by its upper extremity with the air pipe (T). Water is placed in the bottle (S), the quantity of which is determined by the pressure on the water mains of the district for which the gauge is destined. A duplicate of the gauges used at the various stations is kept in the Laboratory, and before the cases of Absorbers are sent out the flow of air is adjusted to the duplicate gauge. The dip of the tube (X) is so arranged that, when the required flow of air through the Absorbers is attained the quantity of water in (X) will be nil, so that any extra pressure of water will not materially affect the current through the Absorbers, but be equalized by the rush of air through (X). Each set is kept out twice for a period of forty-eight hours, and once for one of seventy-two hours in each week. When returned, the tubes and absorbers are disconnected in rotation, emptied, and thoroughly washed with distilled water.

The Potash solution is made up to one litre, and the Carbonic Acid precipitated as Carbonate of Baryta, allowed to subside in well stoppered bottles, and the amount of Carbonic Acid estimated by the Sp. Gr. Process.[1]

In the case of the Ammonia and Albumenoid Ammonia, the beads and solutions are washed into Copper Retorts and distilled off in the usual way; the quantities estimated by the Nessler Test.

The beads and solutions containing the Sulphur are washed into ¼-litre stoppered bottles containing 10^{cc} dilute Nitric Acid, and digested at steam heat for a few hours; three drops of Methylated Spirit are added and again digested for twelve hours. The beads are now separated out, and the solutions are digested for about an hour with a small quantity of specially prepared Carbonate of Lime, transferred to porcelain basins and evaporated almost to dryness at a steam heat; 18^{cc} of a Nitrate of Baryta solution of known strength are added, and again evaporated nearly to dryness; the residual matter washed into 100^{cc} flasks with distilled water, three drops of Ammonia (free from Carbonic Acid) added, then 18^{cc} of a solution of Bichromate of Potash of strength equivalent to the Nitrate of Baryta solution, agitated briskly, and permitted to subside for twenty-four hours, at the end of which time they are filtered into 100^{cc} flasks, containing 10 drops of Nitric Acid, made up to the mark, and the amount of Bichrome estimated by depth of colour. This, of course, will exactly correspond to the quantity of Sulphur present.

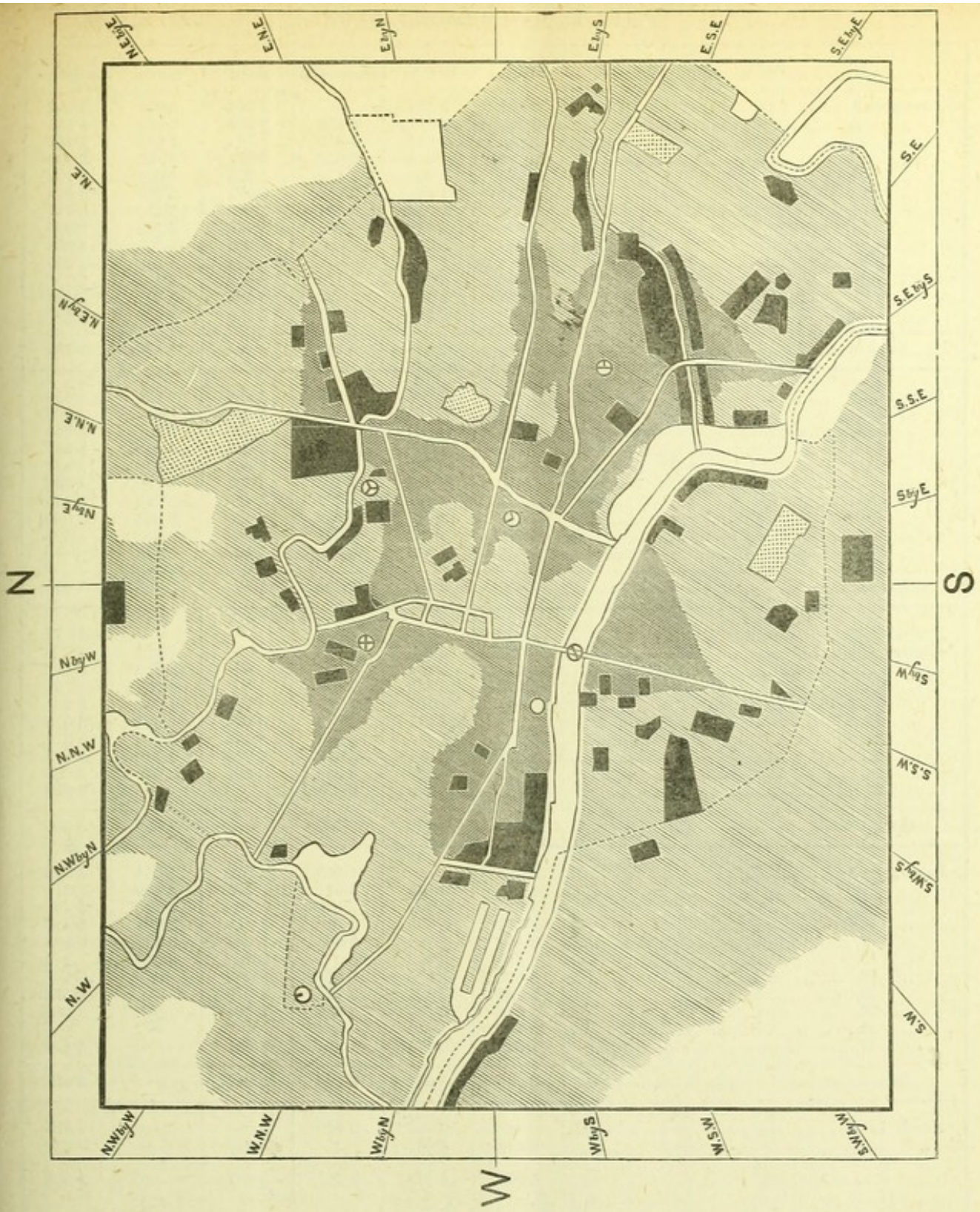
The beads are separated from the solution containing the Chlorine, the quantity of which is estimated as in Water Analysis, viz., with a standard solution of Nitrate of Silver, using Chromate of Potash as the indicator.

As the quantities of impurities dealt with are so very small, and the liability to error from the introduction of foreign matters with the reagents, &c., is so very great, it is absolutely necessary to carry out blank experiments with each set of estimations, which, from being subjected to the same conditions as the actual experiments, form a very valuable means of correction, and act as indices of the accuracy with which the analyses have been conducted.

WILLIAM J. DUNNACHIE.

GLASGOW, 1878.

[1] The method by which the Carbonic Acid was estimated, during the months of May and June, was by precipitating as Carbonate of Baryta, using an excess of a standard solution of Chloride of Barium, and afterwards determining that excess (using an aliquot part of the entire solution) by precipitating with Sulphuric Acid. The inaccuracy of the results so obtained was no doubt due to the multiplication of the error of manipulation, and to the solubility of the ~~Sulphate~~ Carbonate of Baryta.



The Stations were selected by Dr. Russell, and the positions of the apparatus may be shortly described. ⊖ Stirling Square—projecting from window in third flat of a common lodging-house, 27 feet above level of street, which runs N. and S., and is 64 feet wide. ⊕ Calton—projecting from window of dwelling-house in third flat of tenement, 23 feet above level of Millroad Street, which runs E. and W., and is 30 feet wide. ○ Sailors' Home—projecting from window in third flat, 30 feet above level of Broomielaw Street, which runs E. and W. along the Clyde, and is 140 feet wide, including the Quay. ✇ Hospital, Kennedy Street—projecting from window of an empty pavilion, into yard, facing E., about 8 feet from the ground, and 450 feet from the nearest point of St. Rollox Chemical Works. ⊛ Broomielaw Bridge—fixed 10 feet above high-water against the North pier of second arch from South end of Broomielaw Bridge, below the arch. The apparatus was changed by boat—a work of difficulty and even danger in floods. ◷ Western Infirmary—projecting from window on South side of building, 38 feet above level of ground. Ample unbuilt space all around.

TABLE I.—Carbonic Acid.

DATE.	Stirling Square.	Calton.	Hospital, Kennedy St.	Sailors' Home.	Broomielaw Bridge.	Western Infirmary.
November 2,	3·455	3·328	—	3·204	3·009	3·153
,, 5,	3·365	3·321	3·212	2·559	3·063	3·134
,, 7,	3·420	3·234	3·333	3·162	3·345	3·181
,, 9,	3·419	3·414	3·362	3·271	3·142	3·098
,, 12,	3·355	3·524	3·174	3·235	3·046	2·792
,, 14,	3·939	3·491	3·378	3·343	2·986	3·338
,, 16,	2·972	3·459	3·424	3·226	3·174	3·117
,, 19,	3·956	3·277	2·984	3·212	3·169	2·699
,, 21,	3·397	3·739	—	3·656	3·399	3·308
,, 23,	3·602	3·272	—	3·676	3·256	3·230
,, 26,	4·048	3·998	3·759	3·812	3·439	3·766
,, 28,	3·687	3·748	3·584	3·494	3·245	3·441
,, 30,	3·460	3·741	3·586	3·105	3·018	3·405
Averages,	3·544	3·503	3·379	3·304	3·176	3·206
December 3,	3·601	3·969	3·393	3·838	3·431	3·435
,, 5,	3·502	3·150	3·207	3·078	2·872	3·825
,, 7,	3·191	3·683	3·836	4·088	3·407	3·261
,, 10,	?	3·682	3·470	3·420	3·442	3·261
,, 12,	3·630	3·630	3·619	3·465	3·273	3·474
,, 14,	3·816	3·446	3·722	3·594	3·150	3·449
,, 17,	—	3·757	3·368	3·493	3·265	3·451
,, 19,	3·761	3·661	3·682	3·409	3·234	3·536
,, 21,	4·005	3·750	3·671	3·352	2·982	3·407
,, 24,	3·614	3·424	3·400	3·107	2·978	—
Averages,	3·721	3·615	3·624	3·483	3·203	3·455
December 30 to January 2, 1878,	3·296	3·787	3·555	—	—	3·377
January 4,	?	3·900	3·605	—	3·378	3·589
,, 7,	3·418	3·183	3·337	—	3·370	3·091
,, 9,	3·624	3·835	3·958	?	3·556	3·762
,, 14 to 16,	3·957	4·420	3·781	3·988	4·092	3·857
,, 18,	?	4·211	3·843	3·695	3·591	2·579
,, 21,	3·330	3·814	3·342	3·198	3·398	3·278
,, 23,	3·291	3·071	3·477	3·734	3·119	3·572
,, 25,	3·143	3·582	3·389	3·357	3·938	3·033
,, 30,	2·731	3·960	3·275	?	—	3·716
Averages,	3·349	3·776	3·556	—	3·555	3·385
February 1 to 4,	4·363	—	4·053	4·538	4·044	4·332
,, 6,	3·288	3·822	3·641	3·585	3·422	3·517
,, 8,	3·097	3·668	3·526	3·323	3·174	3·437
,, 11,	3·416	3·868	3·709	3·515	3·394	3·485
,, 13,	3·153	3·704	3·605	3·907	3·333	3·965
,, 15,	2·816	3·912	?	3·763	3·375	?
,, 18,	3·033	3·875	3·588	3·468	—	3·437
,, 20,	3·535	3·527	3·191	4·310	* —	3·373
,, 22,	3·215	3·860	3·450	3·504	—	3·682
,, 25,	—	—	—	—	—	—
,, 27,	2·662	2·716	?	3·501	—	3·424
Averages,	3·258	3·661	3·595	3·741	—	3·639
March 1,	—	3·562	3·646	3·185	—	3·295
,, 4,	2·495	3·887	?	3·240	—	3·250
,, 6,	—	—	—	—	—	—
,, 8,	3·006	4·297	3·635	3·407	—	3·235
,, 11,	† —	† —	† —	† —	† —	† —
,, 13,	—	—	—	—	—	—
,, 15,	—	—	—	—	—	—
,, 18,	—	—	—	—	—	—
,, 20 to 22,	—	—	—	—	—	—
,, 25 to 28,	—	—	—	—	—	—
Averages,						
April 9 to 12,	—	—	—	—	—	—
,, 16,	—	3·254	3·207	3·332	—	3·044
,, 19,	2·245	2·087	3·442	—	3·159	3·305
,, 23,	4·331	3·424	—	2·809	3·378	2·463
,, 26,	2·955	3·104	3·331	3·249	2·651	3·018
,, 30,	2·699	3·629	3·324	3·309	3·021	3·116
Averages,	3·057	3·099	3·328	3·199	3·052	2·989

* Water pipe burst. † Results lost through Mr. Dixon's inability to carry out arrangements.

TABLE II.—Sulphur in combination.

DATE.	Stirling Square.	Calton.	Hospital, Kennedy St.	Sailors' Home.	Broomielaw Bridge.	Western Infirmary.
November 2,	0.34	0·36	0·34	0·32	0·29	0·11
,, 5,	0·30	0·23	0·35	0·29	0·29	0·16
,, 7,	0·47	0·56	—	0·28	0·48	0·26
,, 9,	0·42	0·45	0·40	0·30	0·35	0·20
,, 12,	0·26	0·30	0·60	0·28	0·11	—
,, 14,	0·36	0·47	0·27	0·32	0·34	0·12
,, 16,	0·30	0·32	0·20	0·26	0·27	0·15
,, 19,	0·22	0·19	0·26	0·14	0·27	0·11
,, 21,	0·41	0·46	—	?	?	0·40
,, 23,	0·41	0·45	—	0·35	0·51	0·17
,, 26,	0·38	0·48	0·41	0·43	0·30	—
,, 28,	0·64	0·50	0·50	0·32	0·41	0·27
,, 30,	0·67	0·69	0·48	0·48	?	0·48
Averages,	0·39	0·42	0·38	0·31	0·33	0·22
December 3,	?	?	0·31	?	?	0·25
,, 5,	0·61	0·68	0·54	?	0·70	0·83
,, 7,	0·24	0·36	0·39	0·33	0·28	0·25
,, 10,	0·29	0·51	0·28	0·19	?	0·15
,, 12,	0·39	0·44	0·32	0·29	0·52	0·16
,, 14,	0·37	0·40	0·24	0·37	?	0·30
,, 17,	0·56	0·29	0·41	—	0·47	0·23
,, 19,	0·62	0·48	0·51	—	0·37	0·40
,, 21,	0·38	0·37	0·26	0·25	0·39	0·26
,, 24,	0·37	0·38	0·30	?	0·34	0·21
Averages,	0·43	0·43	0·40	—	0·44	0·24
December 30 to January 2, 1878,	0·33	0·21	0·30	—	...	0·25
January 4,	0·44	0·28	0·34	—	0·34	0·15
,, 7,	0·35	0·46	0·24	—	0·42	0·36
,, 9,	0·61	?	0·69	0·32	?	0·27
,, 14 to 16,	0·51	0·52	0·68	0·37	0·34	0·46
,, 18,	0·71	0·52	0·66	0·60	0·43	0·37
,, 21,	0 37	0·27	0·14	0·22	0·19	0·18
,, 23,	0 32	0·21	0·48	?	—	0·32
,, 25,	0·30	0·24	?	?	?	0·02
,, 30,	0·57	0·69	0·67	0·14	—	0·31
Averages,	0·45	0·38	0·47	—	—	0·27
February 1 to 4,	0·73	0·27	0·07	0·70	0·22	0·03
,, 6,	0·34	0·06	0·04	0·12	0·22	0·40
,, 8,	—	0·25	0·22	0·29	0·07	0·20
,, 11,	0·45	0·51	0·33	—	—	—
,, 13,	0·49	0·46	0·52	0·18	0·50	0·24
,, 15,	0·21	0·14	0·35	0·26	—	0·12
,, 18,	0·43	0·32	0·22	0·30	*	0·26
,, 20,	0·16	0·17	0·32	0·29	—	0·25
,, 22,	0·34	0·09	0·26	0·27	—	0·19
,, 25,	0·24	0·22	0·20	0·28	—	0·19
,, 27,	0·62	0·32	0·11	0·31	—	—
Averages,	0·40	0·26	0·24	0·30	—	0·21
March 1,	—	0·30	0·22	0·34	—	0·22
,, 4,	0·25	0·11	0·20	0·11	—	0·25
,, 6,	0·35	0·23	0·80	0·21	—	0·26
,, 8,	—	0·10	—	0·32	—	0·04
,, 11,	0·23	0·28	0·18	0·32	—	0·21
,, 13,	0·36	0·59	0·51	—	—	0·18
,, 15,	0·45	0·59	0·34	0·41	—	0·30
,, 18,	0·45	—	—	0·12	0·30	0·21
,, 20 to 22,	0·36	0·33	0·37	0·46	0·35	0·21
,, 25 to 28,	0·29	0·20	0·22	—	0·38	0·15
Averages,	0·30	0·30	0·35	0·29	—	0·20
April 9 to 12,	0·33	0·07	0·34	0·34	—	0·10
,, 16,	0·13	0·12	0·51	0·40	—	0·08
,, 19,	0·20	0·25	0·25	0·24	—	0·06
,, 23,	0·25	0·22	—	0·19	—	—
,, 26,	0·35	0·06	0·36	0·38	—	0·06
,, 30,	0·19	0·28	0·43	0·18	—	0·12
Averages,	0·24	0·17	0·38	0·29	—	0·08

* Water pipe burst.

TABLE III.—Chlorine free and combined.

DATE.	Stirling Square.	Calton.	Hospital, Kennedy St.	Sailors' Home.	Broomielaw Bridge.	Western Infirmary.
November 2,	0·02	0·00	0·17	0·00	0·01	0·00
,, 5,	0·00	0·00	0·09	0·00	0·00	0·08
,, 7,	0·13	0·00	0·10	0·00	0·02	0·05
,, 9,	0·00	0·00	0·00	0·00	0·00	0·00
,, 12,	0·00	0·00	0·10	0·01	0·00	0·00
,, 14,	0·00	0·00	0·00	0·01	0·01	0·00
,, 16,	0·07	0·03	0·12	0·02	0·07	0·08
,, 19,	0·00	0·00	0·08	0·00	0·00	0·00
,, 21,	0·00	0·00	—	0·01	0·00	0·03
,, 23,	0·02	0·02	—	0·02	0·05	0·05
,, 26,	0·00	0·00	0·18	0·00	0·00	0·00
,, 28,	—	0·01	—	0·07	0·00	0·00
,, 30,	0·00	0·00	0·02	0·00	0·00	0·00
Averages,	0·02		0·09	0·01	0·01	0·02
December 3,	0·01	0·03	0·19	0·00	0·02	0·00
,, 5,	0·09	0·09	0·10	0·00	0·04	0·00
,, 7,	0·02	0·00	0·04	0·01	0·02	0·00
,, 10,	0·00	0·03	0·00	0·00	0·00	0·00
,, 12,	0·00	0·00	0·00	0·01	0·02	0·02
,, 14,	0·00	0·00	0·02	0·00	0·02	0·00
,, 17,	0·00	0·00	0·03	0·00	0·02	0·00
,, 19,	0·13	0·11	0·10	—	0·16	0·07
,, 21,	0·00	0·00	0·09	0·00	0·02	0·00
,, 24,	0·00	0·00	0·05	0·00	0·02	0·00
Averages,	0·03	0·03	0·07		0·03	0·01
December 30 to January 2, 1878,	0·00	0·02	0·00	—	—	0·00
January 4,	0·00	0·05	0·20	—	0·09	0·06
,, 7,	0·02	0·02	0·20	—	0·02	0·01
,, 9,	0·11	0·00	0·01	0·00	0·02	0·00
,, 14 to 16,	0·02	0·08	0·05	0·00	0·01	0·00
,, 18,	0·03	0·00	0·28	0·06	0·02	0·01
,, 21,	0·01	0·00	0·00	0·01	0·01	0·00
,, 23,	0·00	0·00	0·22	0·00	0·00	0·00
,, 25,	0·11	0·06	0·14	0·06	0·11	0·03
,, 30,	—	0·06	0·00	0·05	—	0·05
Averages,	0·03	0·03	0·11	0·03	0·03	0·02
February 1 to 4,	0·00	0·00	0·00	0·14	0·04	0·00
,, 6,	0·00	0·00	0·06	0·02	0·00	0·00
,, 8,	0·00	0·09	0·02	0·01	0·00	0·00
,, 11,	0·10	0·00	0·06	0·04	0·13	0·05
,, 13,	0·02	0·00	0·45	0·00	0·00	0·00
,, 15,	0·12	0·00	0·28	0·00	0·00	0·00
,, 18,	0·02	0·03	0·10	0·00	*	0·19
,, 20,	0·14	0·26	0·31	0·03	—	0·03
,, 22,	—	—	—	—	—	—
,, 25,	0·09	0·19	0·00	0·10	—	0·05
,, 27,	0·25	0·16	0·32	0·22	—	0·22
Averages,	0·07	0·07	0·16	0·06		0·05
March 1,	—	—	—	—	—	—
,, 4,	0·25	0·16	0·36	0·11	—	1·45
,, 6,	—	0·22	0·06	0·06	—	0·14
,, 8,	0·00	0·87	0·24	0·08	—	0·12
,, 11,	0·46	0·00	0·04	0·05	—	0·05
,, 13,	0·00	0·17	0·37	0·17	—	0·33
,, 15,	0·50	0·36	0·49	0·11	0·26	0·00
,, 18,	0·00	0·00	0·28	0·32	0·07	0·00
,, 20 to 22,	0·16	0·27	0·54	0·16	0·15	0·24
,, 25 to 28,	—	0·18	0·40	—	0·24	0·00
Averages,	0·20	0·25	0·31	0·13		0·26
April 9 to 12,	†	0·17	—	0·16	—	0·00
,, 16,	—	0·00	—	0·13	—	0·00
,, 19,	—	0·14	0·88	0·10	0·00	—
,, 23,	—	0·19	—	0·08	0·00	0·00
,, 26,	—	0·24	0·54	0·07	—	0·08
,, 30,	—	0·06	1·02	—	0·10	0·11
Averages,		0·13		0·11		0·04

* Water pipe burst. † Meter out of repair.

TABLE IV.—Nitrogen in the form of Ammonia.

DATE.	Stirling Square.	Calton.	Hospital, Kennedy St.	Sailors' Home.	Broomielaw Bridge.	Western Infirmary.
November 2,	·063	·107	·042	·037	·060	·083
,, 5,	·143	·193	?	·054	·058	·029
,, 7,	·089	·092	·059	·028	·062	·075
,, 9,	·072	·011	·035	·027	·034	·065
,, 12,	·059	·054	·023	·029	·044	·046
,, 14,	·157	·131	·049	·028	·116	·165
,, 16,	·032	·136	·119	·047	·041	·061
,, 19,	·082	·082	·116	·023	·092	·027
,, 21,	·011	·083	—	·043	·058	·070
,, 23,	·037	·115	—	·030	·041	·060
,, 26,	·137	·064	·051	·063	·063	·049
,, 28,	·112	·170	·054	·034	·060	·090
,, 30,	·203	·135	·049	·061	·057	·065
Averages,	·092	·106	·060	·039	·060	·060
December 3,	·116	·138	·123	·062	·063	·102
,, 5,	·075	·074	·049	·055	·021	·093
,, 7,	·129	·088	·105	·049	·093	·059
,, 10,	·030	·155	·361	·022	?	·068
,, 12,	·039	·051	·112	·045	·082	·083
,, 14,	·041	·082	·026	·032	·053	·041
,, 17,	·100	·055	·063	—	·065	·040
,, 19,	·047	·090	·147	—	·138	·073
,, 21,	·068	·239	·181	·026	·104	·118
,, 24,	·019	·048	·046	·092	·042	·078
Averages,	·066	·102	·121	·084	·073	·075
December 30 to January 2, 1878,	·097	·112	·061	—	—	·043
January 4,	?	·238	·092	—	·050	·269
,, 7,	·060	·128	·019	—	·077	·083
,, 9,	·128	·131	·023	·054	·056	·030
,, 14 to 16,	·068	·078	·045	·126	·064	·057
,, 18,	·108	·038	·045	·059	·063	·042
,, 21,	·057	·070	·041	·046	·054	·119
,, 23,	·123	·072	·101	·060	·063	·023
,, 25,	·102	·179	·093	·056	·186	·053
,, 30,	·108	·148	·153	·142	—	·073
Averages,	·095	·119	·067	·078	·077	·079
February 1 to 4,	?	·147	·152	·091	·167	·155
,, 6,	?	·172	?	?	?	?
,, 8,	·136	·149	?	·072	·086	·053
,, 11,	·059	·173	?	·046	·074	·025
,, 13,	·080	·057	·055	·167	·075	·077
,, 15,	·044	·042	·046	·043	·051	·010
,, 18,	·104	·085	·052	·066	* —	·099
,, 20,	·095	·102	·106	·172	—	·141
,, 22,	·115	·056	·121	·071	—	·054
,, 25,	·050	·053	·065	·059	—	·028
,, 27,	·107	·060	·062	·057	—	·052
Averages,	·088	·100	·082	·084	—	·069
March 1,	·051	·100	·042	·040	—	·013
,, 4,	·084	·081	·137	·040	—	·047
,, 6,	?	·169	·073	·106	—	·057
,, 8,	·141	·121	·091	·039	—	·034
,, 11,	·061	—	·040	·027	—	·011
,, 13,	·037	·062	·113	·046	—	·024
,, 15,	·068	·084	·060	·045	—	·025
,, 18,	·078	·056	·053	·063	—	·059
,, 20 to 22,	·129	·075	·044	·065	·066	·030
,, 25 to 28,	·073	·059	·062	—	·028	·040
Averages,	·080	·090	·072	·052	—	·034
April 9 to 12,	·107	·080	·034	·166	—	·053
,, 16,	·122	·075	·024	·055	·071	·102
,, 19,	·142	·072	·056	·128	·037	·054
,, 23,	—	·212	·120	·100	·033	·019
,, 26,	·289	·062	·275	·034	·024	·027
,, 30,	·156	·095	·044	·053	·063	·164
Averages,	·163	·099	·092	·089	·046	·070

* Water pipe burst.

TABLE V.—Nitrogen in the form of "Albumenoid Ammonia."

DATE.	Stirling Square.	Calton.	Hospital, Kennedy St.	Sailors' Home.	Broomielaw Bridge.	Western Infirmary.
November 2,	·032	·020	·021	·020	·032	·041
,, 5,	·046	·036	·074	·020	·023	·030
,, 7,	·042	·047	·108	·028	·048	·153
,, 9,	·037	·043	·042	·019	·049	·055
,, 12,	·042	·067	·028	·030	·033	·046
,, 14,	·053	·235	·067	·030	·072	·093
,, 16,	·036	·059	·067	·023	·037	·053
,, 19,	·052	·099	·198	·020	·048	·081
,, 21,	·056	·068	—	·049	·046	·077
,, 23,	·024	·104	—	·025	·030	·052
,, 26,	·068	·053	·047	·026	·030	·058
,, 28,	·139	·216	·103	·021	·054	·127
,, 30,	·071	·059	·030	·061	·043	·065
Averages,	·054	·085	·060	·029	·042	·072
December 3,	·151	·188	·197	·059	·098	·141
,, 5,	·028	·127	·162	·025	·163	·169
,, 7,	·106	·144	·122	·043	·073	·091
,, 10,	·022	·093	·269	·050	?	·060
,, 12,	·093	·053	·272	·025	·110	·079
,, 14,	·023	·031	·021	·018	·046	·032
,, 17,	·100	·127	·123	—	·083	·078
,, 19,	·054	·124	·059	—	·025	·091
,, 21,	·190	·300	·176	·043	·510	·195
,, 24,	·011	·012	·029	·040	·021	·052
Averages,	·078	·120	·143	·038	·125	·099
December 31 to January 2, 1878,	·112	·069	·109	—	—	·052
January 4,	·146	·032	·087	—	·034	·114
,, 7,	·070	·059	·018	—	·040	·142
,, 9,	·033	?	·023	·045	·033	·017
,, 14 to 16,	·053	·057	·026	·075	·089	·045
,, 18,	·036	·076	·048	·073	·026	·046
,, 21,	·045	·071	·040	·033	·031	?
,, 23,	·096	·143	·041	·057	·049	·043
,, 25,	?	?	·093	·124	·155	·191
,, 30,	·108	·115	·128	·153	—	·108
Averages,	·078	·078	·061	·080	·057	·084
February 1 to 4,	?	·190	·171	·093	·081	·132
,, 6,	?	?	?	·152	·136	?
,, 8,	·083	·149	?	·084	·057	·058
,, 11,	·045	·109	?	·022	·045	·033
,, 13,	?	·095	·104	·037	·085	·088
,, 15,	·096	·078	·056	·092	·111	·102
,, 18,	·166	·088	·088	·070	*	·055
,, 20,	·113	·102	?	?	—	·042
,, 22,	·083	·056	·047	·046	—	·016
,, 25,	·050	·017	·037	·051	—	·044
,, 27,	·070	·037	·032	·063	—	·039
Averages,	·088	·092	·076	·071	—	·061
March 1,	·070	·038	·023	·015	—	·008
,, 4,	·024	·018	·061	·015	—	·006
,, 6,	?	·124	·087	·155	—	·053
,, 8,	·057	·051	·030	·014	—	·036
,, 11,	·048	—	·017	·025	—	·023
,, 13,	·017	·050	·066	·046	—	·019
,, 15,	·041	·065	·031	·029	—	·025
,, 18,	·037	·020	·026	·024	·018	·022
,, 20 to 22,	·072	·027	·069	·022	·054	·085
,, 25 to 28,	·025	—	·019	—	·012	·036
Averages,	·043	·049	·043	·038	—	·031
April 9 to 12,	.041	·033	·064	·183	—	·031
,, 16,	·050	·056	·162	·026	·092	·078
,, 19,	·182	·032	·080	·082	·139	·023
,, 23,	—	·081	·101	·044	·022	·025
,, 26,	·199	·039	·055	·014	·085	·021
,, 30,	·090	·064	·116	·026	·063	·076
Averages,	·112	·051	·096	·063	·080	·042

* Water pipe burst.

Average Velocity of the Wind, Rain-fall, and Average Temperature, during each of the Intervals referred to in the Tables.*

Date.	Average Velocity of Wind.	Total Rain.	Average Temperature.
November 2,	15	·12	49·87
,, 5,	17	·51	50·30
,, 7,	17	1·13	49·62
,, 9,	10·7	·22	47·06
,, 12,	16·3	·00	47.20
,, 14,	16	Rain-gauge out of repair.	44·25
,, 16,	21		49·00
,, 19,	18		49·87
,, 21,	9·3		41·62
,, 23,	17	·74	40·42
,, 26,	6·6	·00	38·54
,, 28,	13·5	·26	40·06
,, 30,	9·5	·26	39·96
December 3,	7·4	·35	41·12
,, 5,	4·7	·00	40·12
,, 7,	17	·29	47·87
,, 10,	15	·63	40·79
,, 12,	16	1·00	45·56
,, 14,	14	·44	41·00
,, 17,	14	·33	43·45
,, 19,	10·7	·05	45·25
,, 21,	12·4	·09	44·37
,, 24,	21	·30	45·41
December 30 to Jan. 2, 1878,	9·2	·03	41·57
January 4,	12	·10	43·25
,, 7,	12·9	·20	43·33
,, 9,	11·1	·00	38·75
,, 14 to 16,	16·5	·08	46·75
,, 18,	8·2	·21	45·67
,, 21,	14·8	·51	44·94
,, 23,	12·6	1·07	43·50
,, 25,	11·2	·50	35·62
,, 30,	6·6	·93	35·70
February 1 to 4,	3·8	·01	39·29
,, 6,	10·7	·00	38·50
,, 8,	13	·00	39·06
,, 11,	2·8	·00	41·58
,, 13,	10·4	·00	38·43
,, 15,	17·6	·21	38·18
,, 18,	19·3	·51	47·58
,, 20,	15·3	·23	46·75
,, 22,	18·2	·06	47·87
,, 25,	13·7	·00	46·16
,, 27,	11·9	·17	42·75
March 1,	12·7	·68	48·75
,, 4,	18·4	·53	48·70
,, 6,	30	·63	46·81
,, 8,	27·1	·27	47·43
,, 11,	14·0	·21	40·45
,, 13,	7·8	·02	43·25
,, 15,	3·2	·00	38·74
,, 18,	7·3	·02	41·00
,, 20 to 22,	22·3	·00	48·06
,, 25 to 28,	9·0	·04	45·86
April 9 to 12,	20	·00	45·42
,, 16,	12·5	·72	50·83
,, 19,	7	·35	51·45
,, 23,	13·7	1·54	49·71
,, 26,	15·6	·00	47·42
,, 30,	9	·00	48·71

* The Wind is given from 12 noon to 12 noon; the Rain-fall and Temperature from 9 A.M. to 9 A.M.

Summary of Averages for the Months of May, 1877, to April, 1878.

Substance Examined.	Month.	Stirling Square.	Calton.	Hospital, Kennedy St.	Sailors' Home.	Broomielaw Bridge.	Western Infirmary.
Carbonic Acid,	Nov.,	3·544	3·503	3·379	3·304	3·176	3·206
	Dec.,	3·721	3·615	3·624	3·483	3·203	3·455
	Jan.,	3·349	3·776	3·556	—	3·555	3·385
	Feb.,	3·285	3 661	3·595	3·741	—	3·639
	March,	—	—	—	—	—	—
	April,	3·057	3·099	3·328	3.199	3·052	2·989
Sulphur in combination,	May,	·26	·36	·42	·28	·29	·14
	June,	·19	·23	·26	·17	—	·09
	July,	·18	·22	·16	·14	·14	·07
	August,	·20	·27	·36	·20	·25	·13
	Sept.,	·30	·30	·31	·27	·31	·12
	Oct.,	·37	·42	·33	·36	·35	·19
	Nov.,	·39	·42	·38	·31	·33	·22
	Dec.,	·43	·43	·40	—	·44	·24
	Jan.,	·45	·38	·47	—	—	·27
	Feb.,	·40	·26	·24	·30	—	·21
	March,	·30	·30	·35	·29	—	·20
	April,	·24	·17	·38	·29	—	·08
Chlorine free and combined,	May,	·09	·08	·63	·05	·05	·06
	June,	·07	·08	·51	·05	—	·05
	July,	·08	·11	·17	·06	·09	·09
	August,	·09	·06	·57	·05	·09	·06
	Sept.,	·10	·02	·15	·03	·07	·06
	Oct.,	·09	·04	·18	·05	·07	·08
	Nov.,	·02	—	·09	·01	·01	·02
	Dec.,	·03	·03	·07	—	·03	·01
	Jan.,	·03	·03	·11	·03	·03	·02
	Feb.,	·07	·07	·16	·06	—	·05
	March,	·20	·25	·31	·13	—	·26
	April,	—	·13	—	·11	—	·04
Nitrogen as Ammonia,	May,	·052	·067	·033	·046	·038	·016
	June,	·053	·076	·019	·038	—	·012
	July,	·191	·128	·040	·053	—	·031
	August,	·195	·122	·051	·079	·067	·046
	Sept.,	·141	·107	·071	·062	·058	·049
	Oct.,	·104	·115	·058	·074	·047	·053
	Nov.,	·092	·106	·060	·039	·060	·060
	Dec.,	·066	·102	·121	·084	·073	·075
	Jan.,	·095	·118	·067	·078	·077	·079
	Feb.,	·088	·100	·082	·084	—	·069
	March,	·080	·090	·072	·052	—	·034
	April,	·163	·099	·092	·089	·046	·070
Nitrogen as Albumenoid Ammonia,	May,	·075	·081	·064	·057	·050	·044
	June,	·088	·096	·082	·061	—	·054
	July,	·081	·067	·064	·074	—	·067
	August,	·101	·100	·095	·078	·070	·073
	Sept.,	·091	·101	·078	·118	·071	·062
	Oct.,	·050	·048	·049	·029	·090	·056
	Nov.,	·054	·085	·060	·029	·042	·072
	Dec.,	·078	·120	·143	·038	·125	·099
	Jan.,	·078	·078	·061	·080	·057	·084
	Feb.,	·088	·092	·076	·071	—	·061
	March,	·043	·049	·043	·038	—	·031
	April,	·112	·051	·096	·063	·080	·042
Organic Matter, as represented by Nitrogen in both the above Forms,	May,	·127	·148	·097	·103	·088	·060
	June,	·141	·172	·101	·099	—	·066
	July,	·272	·195	·104	·127	—	·098
	August,	·296	·222	·146	·157	·137	·119
	Sept.,	·232	·208	·149	·180	·129	·111
	Oct.,	·154	·163	·107	·103	·137	·109
	Nov.,	·146	·191	·120	·068	·102	·132
	Dec.,	·144	·222	·264	·122	·198	·174
	Jan.,	·173	·197	·128	·158	·134	·163
	Feb.,	·176	·192	·158	·155	—	·130
	March,	·123	·139	·115	·090	—	·065
	April,	·275	·150	·188	·152	·126	·112
Average for the Twelve Months.							
Sulphur in combination,	—	·31	·31	·34	·26	·30	·16
Chlorine free and combined,	—	·08	·08	·27	·06	·05	·07
Nitrogen as Ammonia,	—	·110	·103	·064	·065	·058	·050
Nitrogen as Albumenoid Ammonia,	—	·078	·081	·076	·061	·073	·062
Organic Matter, &c.,	—	·188	·184	·140	·126	·131	·112

TABLE showing the variations in the velocity and direction of the Wind during the months of November, 1877, to April, 1878.

N.B.—*The entries in the three last columns refer to the time between the corresponding dates and those immediately before them.*

NOVEMBER.

DATE.					AVERAGE DIRECTION OF WIND.	AVERAGE VELOCITY OF WIND.	DURATION OF WIND.	
Day.	Date.	Hours.	Minutes.				Hours.	Minutes.
Thursday,	1	0	0	A.M.				
,,	,,	10	0	P.M.	W.S.W.	14	22	0
Friday,	2	6	20	A.M.	S.	13	8	20
,,	,,	10	0	A.M.	S.S.W.	21	3	40
,,	,,	6	0	P.M.	S.	22	8	0
Saturday,	3	10	30	A.M.	W.S.W.	12	16	30
,,	,,	8	40	P.M.	S.S.W.	19	10	10
Sunday,	4	6	30	A.M.	S.	17	9	50
,,	,,	7	0	P.M.	S.S.E.	18	12	30
Monday,	5	0	20	P.M.	S.W.	19	17	20
,,	,,	7	40	P.M.	S.S.E.	24	7	20
,,	,,	11	50	P.M.	W.S.W.	9	4	10
Tuesday,	6	8	30	A.M.	S.W.	17	8	40
,,	,,	4	40	P.M.	S.S.W.	18	8	10
,,	,,	10	40	P.M.	S.S.E.	18	6	0
Wednesday,	7	7	0	A.M.	S.W.	17	8	20
Thursday,	8	4	0	P.M.	S.S.W.	11	33	0
Friday,	9	4	30	A.M.	S.E.	11	12	30
,,	,,	8	0	A.M.	S.	10	3	30
,,	,,	2	10	P.M.	S.S.W.	9	6	10
,,	,,	9	20	P.M.	S.S.E.	7	7	10
Saturday,	10	6	30	A.M.	E.	8	9	10
Sunday,	11	4	0	A.M.	S.S.W.	14	21	30
,,	,,	5	0	P.M.	S.E.	24	13	0
Tuesday,	13	8	30	A.M.	S.	22	39	30
Wednesday,	14	10	20	A.M.	S.S.W.	11	25	50
,,	,,	9	0	P.M.	S.S.E.	15	10	40
Thursday,	15	1	15	P.M.	S.S.W.	23	16	15
,,	,,	10	10	P.M.	S.S.E.	19	8	55
Friday,	16	8	30	P.M.	S.W.	24	22	20
Saturday,	17	3	15	P.M.	S.S.W.	17	18	45
Sunday,	18	1	20	A.M.	S.	20	10	5
,,	,,	5	0	A.M.	S.S.W.	22	3	40
,,	,,	1	0	P.M.	S.W.	15	8	0
Monday,	19	0	10	P.M.	S.S.W.	16	23	10
Tuesday,	20	7	30	A.M.	W.S.W.	10	19	20
,,	,,	6	40	P.M.	W.	13	11	10
Wednesday,	21	9	30	A.M.	S.W.	6	14	50
,,	,,	1	15	P.M.	E.	8	3	45
,,	,,	6	20	P.M.	E.N.E.	8	5	5
Thursday,	22	8	20	A.M.	S.W.	21	14	0
,,	,,	11	30	A.M.	W.S.W.	11	3	10
,,	,,	4	0	P.M.	S.S.W.	14	4	30
,,	,,	11	50	P.M.	W.S.W.	12	7	50
Friday,	23	6	20	A.M.	W.N.W.	26	6	30
,,	,,	3	30	P.M.	W.	19	9	10
,,	,,	9	20	P.M.	W.S.W.	7	5	50
Saturday,	24	4	0	A.M.	W.	4	6	40
,,	,,	2	0	P.M.	E.N.E.	7	10	0
Sunday,	25	7	15	A.M.	N.E.	4	17	15
,,	,,	8	40	P.M.	W.S.W.	7	13	25
Monday,	26	4	0	A.M.	S.W.	5	7	20
,,	,,	2	40	P.M.	S.S.E.	9	10	40
Tuesday,	27	1	30	A.M.	S.S.E.	18	10	50
,,	,,	6	0	P.M.	S.W.	14	16	30
Wednesdsy,	28	2	50	A.M.	S.	6	8	50
,,	,,	9	30	P.M.	S.S.W.	16	18	40
Thursday,	29	7	50	A.M.	E.	10	10	20
,,	,,	1	0	P.M.	S.	4	5	10
,,	,,	4	20	P.M.	W.	5	3	20
,,	,,	7	0	P.M.	S.W.	5	2	40
,,	,,	12	0	MID.	S.	6	5	0
Friday,	30	6	0	A.M.	E.S.E.	9	6	0
,,	,,	10	50	P.M.	N.E	11	16	50
,,	,,	12	0	MID.	W.	3	1	10

DECEMBER.

DATE.					Average Direction of Wind.	Average Velocity of Wind.	Duration of Wind.	
Day.	Date.	Hours.	Minutes.				Hours.	Minutes.
Saturday,	1	0	0	A.M.				
,,	,,	7	20	A.M.	W.	15	7	20
Sunday,	2	2	5	A.M.	N.N.W.	9	18	45
,,	,,	7	45	A.M.	N.	4	5	40
Monday,	3	9	0	P.M.	N.E.	4	37	15
Tuesday,	4	0	30	P.M.	E.S.E.	6	15	30
,,	,,	3	10	P.M.	E.N.E.	5	2	40
Wednesday,	5	4	35	P.M.	N.E.	4	25	25
Thursday,	6	1	30	P.M.	E.S.E.	16	20	55
,,	,,	11	0	P.M.	S.S.W.	23	9	30
Friday,	7	7	20	A.M.	W.S.W.	19	8	20
,,	,,	0	0	P.M.	S.	14	4	40
Saturday,	8	6	30	A.M.	S.W.	12	18	30
Sunday,	9	4	0	A.M.	S.S.W.	17	21	30
Monday,	10	7	0	A.M.	S.S.E.	20	27	0
,,	,,	0	0	P.M.	S.E.	9	5	0
,,	,,	7	50	P.M.	S.S.E.	12	7	50
Tuesday,	11	0	30	A.M.	S.	11	4	40
,,	,,	4	50	A.M.	W.S.W.	7	4	20
,,	,,	7	0	P.M.	S.S.E.	16	14	10
Wednesday,	12	8	0	A.M.	S.S.W.	19	13	0
,,	,,	4	0	P.M.	W.	23	8	0
Thursday,	13	0	30	P.M.	S.W.	16	20	30
Friday,	14	4	0	A.M.	W.	12	15	30
Saturday,	15	1	30	A.M.	S.W.	7	21	30
,,	,,	4	10	P.M.	S.	12	14	40
Sunday,	16	6	20	A.M.	W.S.W.	16	14	10
,,	,,	9	0	P.M.	W.	17	14	40
Monday,	17	3	0	A.M.	S.W.	12	6	0
,,	,,	0	30	P.M.	S.S.W.	20	9	30
Tuesday,	18	6	40	A.M.	W.S.W.	13	18	10
,,	,,	11	50	A.M.	S.E.	3	5	10
Wednesday,	19	5	30	A.M.	S.S.W.	10	17	40
,,	,,	10	50	A.M.	S.W.	12	5	20
,,	,,	11	0	P.M.	W.	6	12	10
Thursday,	20	11	20	P.M.	S.S.W.	15	24	20
Friday,	21	5	10	P.M.	S.W.	13	17	50
Saturday,	22	5	30	P.M.	S.S.W.	26	24	20
Sunday,	23	10	30	A.M.	W.	16	17	0
,,	,,	3	10	P.M.	W.N.W.	19	4	40
Monday,	24	4	0	A.M.	S.W.	22	12	50
,,	,,	7	30	A.M.	W.S.W.	26	3	30
Tuesday,	25	6	30	A.M.	W.	20	23	0
,,	,,	2	50	P.M.	S.W.	5	8	20
,,	,,	5	30	P.M.	S.	4	2	40
Wednesday,	26	3	10	A.M.	E.S.E.	4	9	40
Thursday,	27	2	20	A.M.	W.	18	23	10
,,	,,	11	30	A.M.	W.S.W.	13	9	10
Friday,	28	2	30	A.M.	W.	16	15	0
,,	,,	0	20	P.M.	W.S.W.	3	9	50
,,	,,	8	20	P.M.	E.	7	8	0
Saturday,	29	6	30	A.M.	N.E.	14	10	10
,,	,,	10	0	A.M.	N.	6	3	30
Sunday,	30	1	30	A.M.	S.S.W.	21	15	30
,,	,,	6	0	A.M.	S.	16	4	30
,,	,,	3	30	P.M.	S.S.W.	17	9	30
,,	,,	11	0	P.M.	W.S.W.	6	7	30
Monday,	31	10	0	A.M.	W.	10	11	0
,,	,,	12	0	MID.	S.W.	9	14	0

JANUARY.

DATE.					Average Direction of Wind.	Average Velocity of Wind.	Duration of Wind.	
Day.	Date.	Hours.	Minutes.				Hours.	Minutes.
Tuesday,	1	0	0	A.M.				
,,	,,	8	0	P.M.	S.S.W.	10	20	0
Wednesday,	2	2	30	A.M.	W.	15	6	30
,,	,,	2	40	P.M.	S.W.	4	12	10
Thursday,	3	6	20	P.M.	S.S.W.	16	27	40
Friday,	4	2	50	A.M.	S.W.	3	8	30
Saturday,	5	9	30	A.M.	N.E.	11	30	40
,,	,,	11	30	A.M.	S.E.	3	2	0
,,	,,	11	20	P.M.	S.W.	13	11	50
Sunday,	6	9	30	P.M.	W.S.W.	16	22	10
Monday,	7	10	0	A.M.	S.W.	12	12	30
,,	,,	8	0	P.M.	N.N.E.	15	10	0
Wednesday,	9	0	10	A.M.	N.	12	28	10
,,	,,	2	0	A.M.	N.N.W.	6	1	50
,,	,,	9	10	A.M.	W.N.W.	7	7	10
,,	,,	2	10	P.M.	N.N.W.	5	5	0
Saturday.	12	6	50	A.M.	W.N.W.	1	64	40
,,	,,	8	30	A.M.	S.W.	4	1	40
,,	,,	0	40	P.M.	S.	10	4	10
,,	,,	11	0	P.M.	S.S.W.	18	10	20
Sunday,	13	11	50	A.M.	S.W.	19	12	50
,,	,,	11	20	P.M.	W.S.W.	23	11	30
Monday,	14	4	10	A.M.	S.W.	18	4	50
,,	,,	2	40	P.M.	W.S.W.	11	10	30
Tuesday,	15	8	40	A.M.	S.W.	4	18	0
,,	,,	10	30	A.M.	W.	10	1	50
Wednesday,	16	10	10	A.M.	W.S.W.	27	23	40
,,	,,	3	0	P.M.	W.	20	4	50
,,	,,	4	50	P.M.	W.S.W.	17	1	50
,,	,,	9	0	P.M.	W.N.W.	16	4	10
Thursday,	17	6	0	A.M.	W.S.W.	13	9	0
Friday,	18	6	10	A.M.	W.	4	24	10
,,	,,	10	30	A.M.	N.W.	4	4	20
,,	,,	0	30	P.M.	W.	6	2	0
Saturday,	19	4	30	A.M.	S.W.	3	16	0
,,	,,	10	30	A.M.	S.	8	6	0
,,	,,	0	40	P.M.	S.S.W.	10	2	10
Sunday,	20	1	10	A.M.	S.	18	12	30
,,	,,	3	50	A.M.	S.S.W.	21	2	40
,,	,,	8	30	A.M.	W.S.W.	12	4	40
Monday,	21	1	10	A.M.	S.S.W.	28	16	40
,,	,,	2	50	P.M.	W.	13	13	40
,,	,,	11	10	P.M.	N.E.	8	8	20
Tuesday,	22	1	0	A.M.	N.W.	3	1	50
,,	,,	2	0	A.M.	W.	5	1	0
,,	,,	4	40	A.M.	W.S.W.	4	2	40
,,	,,	11	0	A.M.	S.W.	4	6	20
,,	,,	0	20	P.M.	S.E.	4	1	20
,,	,,	1	40	P.M.	N.E.	5	1	20
,,	,,	10	40	P.M.	S.	11	9	0
Wednesday,	23	5	0	P.M.	W.S.W.	26	18	20
Thursday,	24	9	20	P.M.	W.	17	28	20
Friday,	25	0	10	A.M.	W.S.W.	14	2	50
,,	,,	3	10	A.M.	N.N.E.	9	3	0
,,	,,	6	0	P.M.	W.N.W.	17	14	50
Saturday,	26	1	0	A.M.	W.S.W.	6	7	0
,,	,,	8	50	A.M.	W.	8	7	50
,,	,,	10	20	A.M.	N.	7	1	30
,,	,,	9	0	P.M.	W.	4	10	40
Sunday,	27	9	50	A.M.	E.S.E.	6	12	50
,,	,,	5	50	P.M.	N.E.	9	8	0
,,	,,	8	30	P.M.	S.E.	8	2	40
,,	,,	11	30	P.M.	S.	11	3	0
Monday,	28	3	40	P.M.	W.	9	16	10
Tuesday,	29	2	20	P.M.	W.S.W.	6	22	40
,,	,,	11	0	P.M.	S.W.	3	8	40
Thursday,	31	2	0	P.M.	N.	2	39	0
,,	,,	5	30	P.M.	N.N.W.	4	3	30
,,	,,	12	0	MID	W.	4	6	30

FEBRUARY.

DATE.					Average Direction of Wind.	Average Velocity of Wind.	Duration of Wind.	
Day.	Date.	Hours.	Minutes.				Hours.	Minutes.
Friday,	1	0	0	A.M.				
Saturday,	2	3	0	A.M.	W.S.W.	5	27	0
,,	,,	1	30	P.M.	N.N.E.	3	10	30
,,	,,	5	50	P.M.	W.	4	4	20
Sunday,	3	0	45	A.M.	N.W.	4	6	55
,,	,,	7	0	P.M.	N.E.	2	18	15
,,	,,	10	30	P.M.	N.W.	2	3	30
Monday,	4	4	15	A.M.	W.	4	5	45
,,	,,	2	45	P.M.	W.S.W.	8	10	30
Tuesday,	5	4	10	A.M.	S.S.W.	13	13	25
Wednesday,	6	11	30	A.M.	S.W.	10	31	20
Thursday,	7	10	0	A.M.	S.S.W.	16	22	30
Friday,	8	8	50	A.M.	W.S.W.	11	22	50
,,	,,	5	20	P.M.	S.W.	6	8	30
Saturday,	9	5	0	A.M.	W.	3	11	40
,,	,,	10	15	A.M.	S.	2	5	15
,,	,,	0	50	P.M.	W.S.W.	5	2	35
,,	,,	4	40	P.M.	S.S.W.	6	3	50
Sunday,	10	1	45	P.M.	S.W.	1	21	5
,,	,,	7	50	P.M.	W.	4	6	5
,,	,,	10	20	P.M.	S.W.	3	2	30
Monday,	11	8	40	A.M.	W.N.W.	2	10	20
Tuesday,	12	3	45	A.M.	E.N.E.	6	19	5
,,	,,	8	0	A.M.	E.S.E.	5	4	15
,,	,,	0	30	P.M.	E.N.E.	6	4	30
,,	,,	5	40	P.M.	S.S.E.	8	5	10
,,	,,	11	0	P.M.	E.	8	5	20
Thursday,	14	11	30	P.M.	E.N.E.	21	48	30
Friday,	15	2	40	P.M.	S.S.E.	8	15	10
,,	,,	5	30	P.M.	E.	12	2	50
Saturday,	16	5	0	A.M.	S.S.W.	18	11	30
,,	,,	10	10	A.M.	S.	19	5	10
Sunday,	17	0	40	P.M.	S.S.W.	23	26	30
,,	,,	6	50	P.M.	S.S.E.	13	6	10
Monday,	18	10	30	A.M.	S.S.W.	20	15	40
,,	,,	7	20	P.M.	W.S.W.	20	8	50
Tuesday,	19	4	25	A.M.	W.	6	9	5
,,	,,	4	20	P.M.	S.	11	11	55
Wednesday,	20	6	30	A.M.	S.S.E.	20	14	10
,,	,,	1	20	P.M.	S.W.	22	6	50
,,	,,	7	30	P.M.	W.	20	6	10
Friday,	22	10	30	A.M.	W.S.W.	18	39	0
,,	,,	10	20	P.M.	W.	13	11	50
Saturday,	23	8	0	A.M.	W.S.W.	10	9	40
,,	,,	6	15	P.M.	S.W.	14	10	15
Sunday,	24	4	0	A.M.	W.	9	9	45
Monday,	25	5	20	P.M.	W.S.W.	17	37	20
Tuesday,	26	10	50	A.M.	W.	10	17	30
,,	,,	4	15	P.M.	S.W.	15	5	25
,,	,,	9	0	P.M.	S.S.W.	10	4	45
,,	,,	10	50	P.M.	E.S.E.	5	1	50
,,	,,	11	50	P.M.	N.E.	3	1	0
Wednesday,	27	8	0	A.M.	S.S.W.	16	8	10
,,	,,	10	30	A.M.	S.S.E.	9	2	30
Thursday,	28	8	0	A.M.	S.S.W.	10	21	30
,,	,,	2	40	P.M.	S.	19	6	40
,,	,,	12	(	MID.	S.W.	19	9	20

MARCH.

DATE.					Average Direction of Wind.	Average Velocity of Wind.	Duration of Wind.	
Day.	Date.	Hours.	Minutes.				Hours.	Minutes.
Friday,	1	0	0	A.M.				
,,	,,	10	30	A.M.	S.S.W.	16	10	30
,,	,,	5	10	P.M.	S.W.	13	6	40
Saturday,	2	1	0	A.M.	W.S.W.	12	7	50
,,	,,	4	20	A.M.	W.	18	3	20
,,	,,	11	40	P.M.	W.S.W.	18	19	20
Sunday,	3	5	0	P.M.	S.W.	17	17	20
Monday,	4	4	20	P.M.	S.S.W.	19	23	20
Tuesday,	5	9	50	A.M.	W.S.W.	28	17	30
,,	,,	5	0	P.M.	S.W.	33	7	10
Wednesday,	6	3	40	A.M.	W.S.W.	30	10	40
,,	,,	10	10	A.M.	W.	37	6	30
,,	,,	11	0	P.M.	W.N.W.	29	12	50
Thursday,	7	0	10	A.M.	S.	9	1	10
,,	,,	3	50	A.M.	W.	12	3	40
,,	,,	9	0	A.M.	W.S.W.	18	5	10
Friday,	8	7	35	P.M.	W.N.W.	31	34	35
,,	,,	10	0	P.M.	E.	9	2	25
Saturday,	9	0	30	A.M.	E.S.E.	5	2	30
,,	,,	3	40	A.M.	S.	3	3	10
,,	,,	11	0	A.M.	W.S.W.	3	7	20
,,	,,	5	40	P.M.	S.	10	6	40
,,	,,	6	50	P.M.	S.E.	4	1	10
,,	,,	8	10	P.M.	E.N.E.	4	1	20
,,	,,	10	0	P.M.	E.S.E.	4	1	50
Sunday,	10	1	5	A.M.	N.E.	4	3	5
,,	,,	2	30	P.M.	W.	13	13	25
Monday,	11	10	30	A.M.	W.S.W.	21	20	0
,,	,,	10	20	P.M.	W.	15	11	50
Tuesday,	12	6	20	P.M.	W.N.W.	5	20	0
Wednesday,	13	7	15	A.M.	N.E.	7	12	55
,,	,,	9	30	A.M.	N.N.E.	5	2	15
,,	,,	1	0	P.M.	N.	7	3	30
,,	,,	5	30	P.M.	N.E.	10	4	30
Thursday,	14	9	20	A.M.	E.	3	15	50
Friday,	15	11	30	A.M.	W.S.W.	2	26	10
,,	,,	5	35	P.M.	E.N.E.	10	6	5
Saturday,	16	9	20	A.M.	N.E.	3	15	45
,,	,,	11	20	P.M.	S.W.	8	14	0
Sunday,	17	5	20	A.M.	W.S.W.	3	6	0
,,	,,	9	15	A.M.	S.	2	3	55
,,	,,	3	30	P.M.	S.W.	6	6	15
,,	,,	8	0	P.M.	W.S.W.	11	4	30
Monday,	18	6	0	A.M.	W.	11	10	0
,,	,,	10	20	A.M.	W.S.W.	14	4	20
Tuesday,	19	1	20	A.M.	W.	19	15	0
,,	,,	7	30	A.M.	W.N.W.	8	6	10
,,	,,	11	30	A.M.	W.	10	4	0
,,	,,	6	40	P.M.	W.N.W.	18	7	10
Wednesday,	20	0	20	P.M.	W.	10	17	40
Thursday,	21	8	10	A.M.	W.S.W.	18	19	50
Friday,	22	2	15	A.M.	W.N.W.	19	18	5
,,	,,	10	0	A.M.	N.W.	7	7	45
Saturday,	23	0	0	A.M.	N.N.W.	8	14	0
,,	,,	11	0	A.M.	W.N.W.	10	11	0
,,	,,	4	15	P.M.	N.N.W.	12	5	15
,,	,,	9	0	P.M.	N.N.E.	6	4	45
Sunday,	24	6	40	A.M.	W.	7	9	40
,,	,,	7	50	P.M.	N.N.W.	23	13	10
,,	,,	10	15	P.M.	E.N.E.	3	2	25
Monday,	25	10	20	P.M.	N.N.W.	10	24	5
Tuesday,	26	0	0	P.M.	W.N.W.	9	13	40
,,	,,	8	40	P.M.	W.S.W.	22	8	40
Wednesday,	27	0	30	A.M.	N.N.E.	7	3	50
,,	,,	10	10	A.M.	N.N.W.	3	9	40
,,	,,	0	10	P.M.	N.N.E.	8	2	0
,,	,,	4	20	P.M.	N.N.W.	6	4	10
,,	,,	9	10	P.M.	N.E.	9	4	50
Thursday,	28	0	40	A.M.	E.S.E.	6	3	30
,,	,,	10	0	A.M.	E.N.E.	5	9	20
,,	,,	7	0	P.M.	E.	12	9	0
Friday,	29	3	30	A.M.	N.E.	10	8	30
,,	,,	5	0	P.M.	N.N.E.	17	1	30
Saturday,	30	9	25	P.M.	N.N.W.	12	28	25
Sunday,	31	8	40	A.M.	W.	8	11	15
,,	,,	12	0	MID.	W.N.W.	17	15	20

DATE.					Average Direction of Wind.	Average Velocity of Wind.	Duration of Wind.	
Day.	Date.	Hours.	Minutes.				Hours.	Minutes.
Monday,	1	0	0	A.M.				
Tuesday,	2	8	0	P.M.	W.N.W.	18	44	0
Wednesday,	3	7	0	A.M.	N.N.E.	2	11	0
,,	,,	10	30	A.M.	W.	4	3	30
,,	,,	3	20	P.M.	S.W.	10	4	50
,,	,,	5	10	P.M.	E.S.E.	7	1	50
,,	,,	7	10	P.M.	E.N.E.	6	2	0
Thursday,	4	2	40	A.M.	S.E.	2	7	30
,,	,,	5	10	A.M.	S.W.	2	2	30
,,	,,	6	20	P.M.	W.	10	13	10
Friday,	5	10	10	A.M.	S.W.	3	15	50
,,	,,	3	10	P.M.	W.S.W.	7	5	0
,,	,,	9	0	P.M.	W.	7	5	50
Saturday,	6	5	30	A.M.	N.N.E.	4	8	30
,,	,,	9	50	A.M.	N.E.	4	4	20
,,	,,	2	20	P.M.	S.	11	4	30
Sunday,	7	5	0	A.M.	S.W.	8	14	40
,,	,,	10	10	A.M.	E.N.E.	6	5	10
,,	,,	8	0	P.M.	S.E.	13	9	50
Monday,	8	7	30	A.M.	E.N.E.	15	11	30
,,	,,	2	0	P.M.	E.S.E.	22	6	30
,,	,,	9	40	P.M.	E.	23	7	40
Tuesday,	9	7	0	A.M.	N.E.	15	9	20
Saturday,	13	7	30	A.M.	E.N.E.	20	96	30
,,	,,	2	10	P.M.	E.	16	6	40
,,	,,	9	0	P.M.	E.S.E.	11	6	50
Sunday,	14	4	20	A.M.	S.	7	7	20
,,	,,	0	10	P.M.	S.W.	11	7	50
Monday,	15	5	0	A.M.	S.S.W.	13	16	50
,,	,,	5	40	P.M.	S.W.	19	12	40
Tuesday,	16	2	0	A.M.	S.S.W.	9	8	20
,,	,,	2	10	P.M.	S.E.	6	12	10
,,	,,	7	0	P.M.	S.	7	4	50
Wednesday,	17	0	0	P.M.	S.E.	3	17	0
,,	,,	4	0	P.M.	W.	4	4	0
Thursday,	18	6	30	A.M.	E.	6	14	30
,,	,,	4	0	P.M.	E.N.E.	8	9	30
,,	,,	6	40	P.M.	S.S.W.	7	2	40
,,	,,	9	0	P.M.	N.E.	6	2	20
Friday,	19	0	10	P.M.	E.N.E.	13	15	10
,,	,,	7	0	P.M.	S.S.E.	13	6	50
Saturday,	20	0	30	A.M.	E.S.E.	8	5	30
,,	,,	7	30	P.M.	E.N.E.	14	19	0
,,	,,	10	20	P.M.	S.W.	4	2	50
Sunday,	21	10	30	A.M.	E.N.E.	12	12	10
,,	,,	3	10	P.M.	N.N.E.	5	4	40
,,	,,	7	0	P.M.	S.W.	6	3	50
,,	,,	10	0	P.M.	W.	3	3	0
Monday,	22	10	20	A.M.	E.N.E.	12	12	20
Tuesday,	23	8	20	A.M.	N.N.E.	22	22	0
Wednesday,	24	10	50	P.M.	N.E.	19	38	30
Thursday,	25	3	30	A.M.	N.N.E.	13	4	40
Friday,	26	3	0	A.M.	N.E.	14	23	30
,,	,,	6	0	A.M.	N.N.E.	4	3	0
,,	,,	10	0	A.M.	N.	11	4	0
Saturday,	27	8	0	A.M.	N.E.	8	22	0
,,	,,	3	40	P.M.	N.N.E.	7	7	40
,,	,,	4	40	P.M.	N.	4	1	0
,,	,,	6	0	P.M.	W.	3	1	20
Sunday,	28	1	0	P.M.	N.N.E.	7	19	0
,,	,,	2	10	P.M.	N.W.	2	1	10
,,	,,	4	0	P.M.	N.N.E.	6	1	50
,,	,,	10	0	P.M.	S.S.W.	6	9	0
Monday,	29	2	30	P.M.	N.N.E.	15	16	30
,,	,,	7	0	P.M.	E.	13	4	30
Tuesday,	30	12	0	MID.	N.N.E.	17	29	0