Water-Supply and Irrigation Paper No. 125 Series P, Hydrographic Progress Reports, 30

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

REPORT

OF

PROGRESS OF STREAM MEASUREMENTS

FOR

THE CALENDAR YEAR 1904

PREPARED UNDER THE DIRECTION OF F. H. NEWELL

BY

R. E. HORTON, N. C. GROVER, and JOHN C. HOYT

PART II.—Hudson, Passaic, Raritan, and Delaware River Drainages

WASHINGTON
GOVERNMENT PRINTING OFFICE
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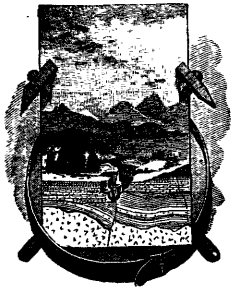

WASHINGTON
GOVERNMENT PRINTING OFFICE
1905

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DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
HYDROGRAPHIC BRANCH,
Washington, D. C., May 4, 1905.

SIR: I transmit herewith the manuscript of Part II of a series of twelve papers which compose the Report of Progress of Stream Measurements for the Calendar Year 1904. Parts I to VI of this report contain the results of the data collected in the territory east of Mississippi River. Parts VII to XII are devoted to the data collected in the territory west of Mississippi River.

The larger part of the original data for this report was collected under the direction of district hydrographers R. E. Horton and N. C. Grover. Mr. Horton had charge of the work in New York, and was assisted by C. C. Covert and H. R. Beebe. The computations for that portion of the report were made under the direction of Mr. Horton. Mr. Grover had charge of the work in New Jersey, and was assisted by F. H. Tillinghast and Frank H. Brundage. A limited amount of the data was collected by other parties, as shown in the list of acknowledgments. The assembling of the data and its preparation for publication were done under the direction of J. C. Hoyt, who has been assisted by R. H. Bolster, Robert Follansbee, W. E. Hall, F. H. Tillinghast, H. D. Padgett, and A. H. Horton.

I request that this manuscript be published as one of the series of Water-Supply and Irrigation Papers.

Very respectfully,

F. H. NEWELL,
Chief Engineer.

Hon. CHARLES D. WALCOTT,
Director United States Geological Survey.

PROGRESS REPORT OF STREAM MEASUREMENTS FOR THE CALENDAR YEAR 1904.

PART II.

By R. E. Horton, N. C. Grover, and J. C. Hoyt.

INTRODUCTION.

The hydrographic work of the United States Geological Survey includes the collection of facts concerning and the study of conditions affecting the behavior of water from the time it reaches the earth as rain or snow until it joins the oceans or great navigable rivers. These investigations became a distinct feature of the work of the Survey in the fall of 1888, when an instruction camp was established at Embudo, N. Mex. Since that date the work has been continually and gradually extended as larger funds became available. The first distinctive appropriation for gaging streams was made by the act of August 18, 1894, which contained an item of $12,500, "for gaging the streams and determining the water supply of the United States, including the investigation of underground currents and artesian wells in the arid and semiarid sections." (Digest of Appropriations for 1895, p. 270.)

Since that time a similar act has been passed each year and the appropriations have gradually increased, as shown in the following table:

Annual appropriations for hydrographic surveys.

Year ending June 30, 1895	$12,500
Year ending June 30, 1896	25,000
Year ending June 30, 1897	50,000
Year ending June 30, 1898	50,000
Year ending June 30, 1899	50,000
Year ending June 30, 1900	50,000
Year ending June 30, 1901	100,000
Year ending June 30, 1902	100,000
Year ending June 30, 1903	200,000
Year ending June 30, 1904	200,000
Year ending June 30, 1905	200,000
Year ending June 30, 1906	200,000

The chief feature of the work of the hydrographic division is the systematic study of the flow of the surface waters and the conditions affecting the same. In this connection other information that may be of use to the engineer or others in hydrographic studies, such as river profiles, duration and extent of damage by floods, water-power data, etc., is collected. Furthermore, the work has been so directed that the information collected will be of direct value in the commercial and agricultural development of the country.

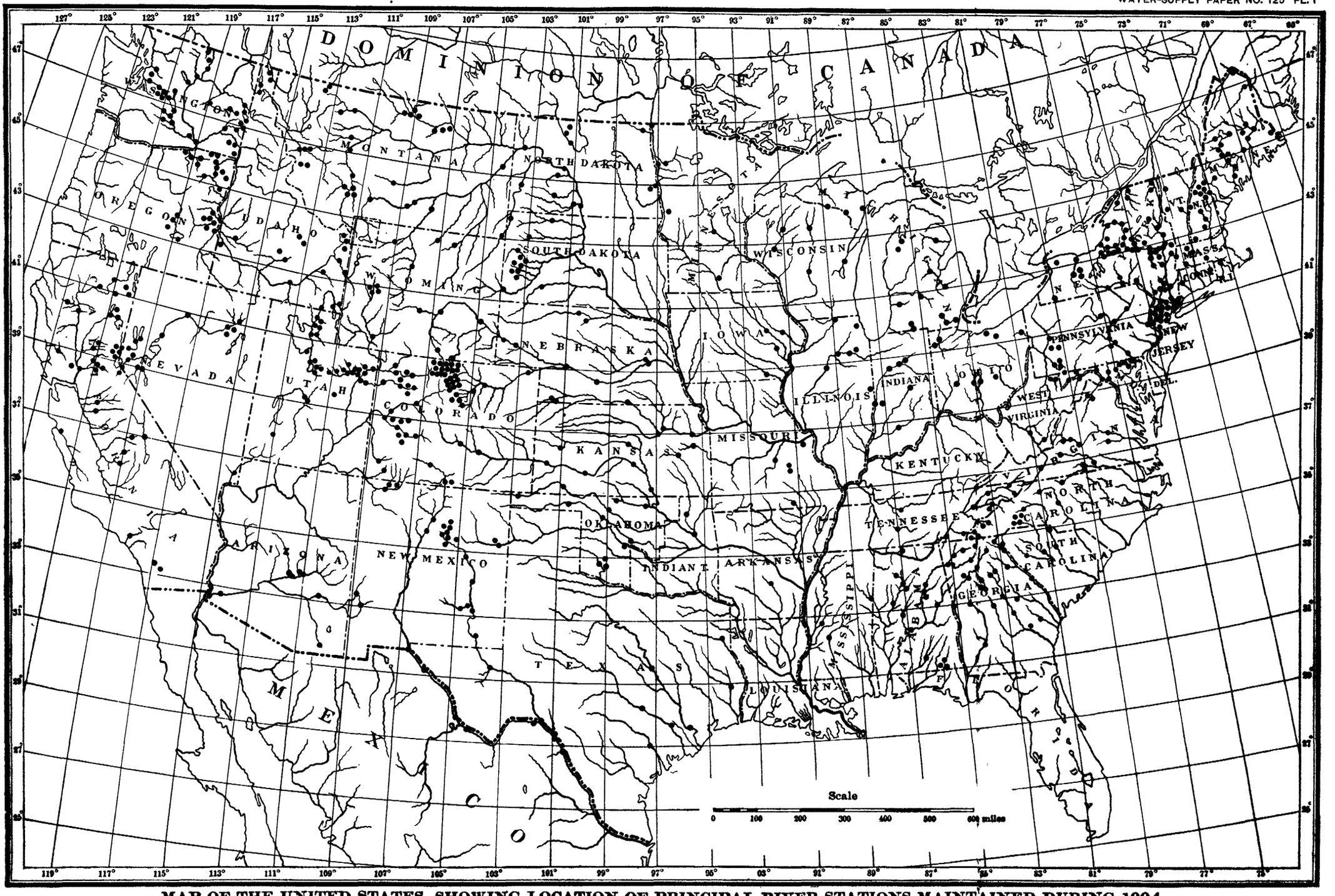
As a result of the increased appropriations since June 30, 1902, the work has been largely extended and thoroughly systemized. The various States have been grouped into districts, each of which is under the supervision of a district hydrographer who, with a corps of assistants, devotes his whole time to the study of the hydrographic resources of his district.

The methods used in the collection of these data and in their preparation for publication are given in detail in Water-Supply Paper No. 94. (Hydrographic Manual, U. S. Geol. Survey.)

The general plan of stream gaging which has been developed is to obtain eventually data in regard to the flow of all the important streams in the United States. With this in view gaging stations are established at points where the data will be of greatest commercial value. At these stations discharge measurements are taken from time to time as typical river stages, and the daily surface fluctuation is obtained by means of gage readings. From these two factors it is possible to estimate both the total flow and its distribution through the period of observation.

The selection of the site for a gaging station and the length of time the station is maintained depend largely upon the needs of each locality. If the stream is to be used for water power, special efforts are made to obtain information concerning the low-water flow. If water is to be stored, the high waters are given special attention. In all sections certain permanent stations are maintained for general statistical purposes to show the conditions which exist through long periods. They also act as primary stations, and are used in connection with short series of measurements to determine the flow in particular portions of the drainage basin.

Gaging stations are divided into two general classes: First, current-meter stations, and, second, weir stations. The former class is subdivided as to location into bridge, cable, boat, and wading stations. Fig. 1 shows a cable station with car, tag line, inclined gage, etc. In addition to the bridge, cable, or boat, the equipment of a current-meter gaging station consists in a gage for determining the daily fluctuations of the water surface, bench marks to which the zero of the gage is referred, and permanent marks on the bridge or a tagged line indicating the points of measurement. Where the current is



MAP OF THE UNITED STATES, SHOWING LOCATION OF PRINCIPAL RIVER STATIONS MAINTAINED DURING 1904.

swift some appliance, generally a secondary cable, is necessary to hold the meter below the surface.

Gaging stations are generally located at bridges, if the channel conditions are satisfactory, as from them the meter can be easily manipulated, and the cost of the equipment is comparatively small. The stations are located as far as possible at points where the channel is straight, both above and below the gaging section, and where there are no cross currents, backwater, or boils. The bed of the stream should be as clear as possible from large projections and of a permanent character. The banks should be high, and should overflow at high stages only. At stations with shifting beds more measurements are made, and special methods of computing daily discharges are employed. Great care is taken in the selection and equipment of gaging stations in order that the data may have the required degree of accuracy.

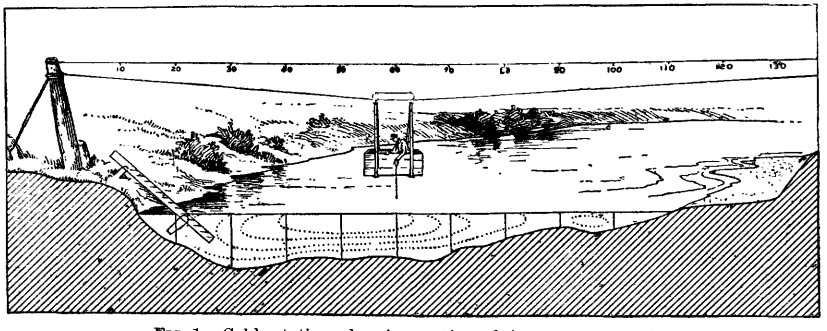


FIG. 1.—Cable station, showing section of river, car, gage, etc.

On many of the larger rivers, where water power is developed by dams, estimates of flow are obtained by observing the head on the crest and using a weir formula. On the smaller streams sharp-crested weirs are in some cases erected.

The principal instrument used in stream-measurement work is the current meter, by which the velocity of the flow of water is determined. After years of experience the Survey has adopted the Price current meter for general work. This meter, as is shown on Pl. II, is made in two sizes, known as the large and small Price. The small Price has been largely developed by the officers of the Survey, using the Price acoustic meter as a basis.

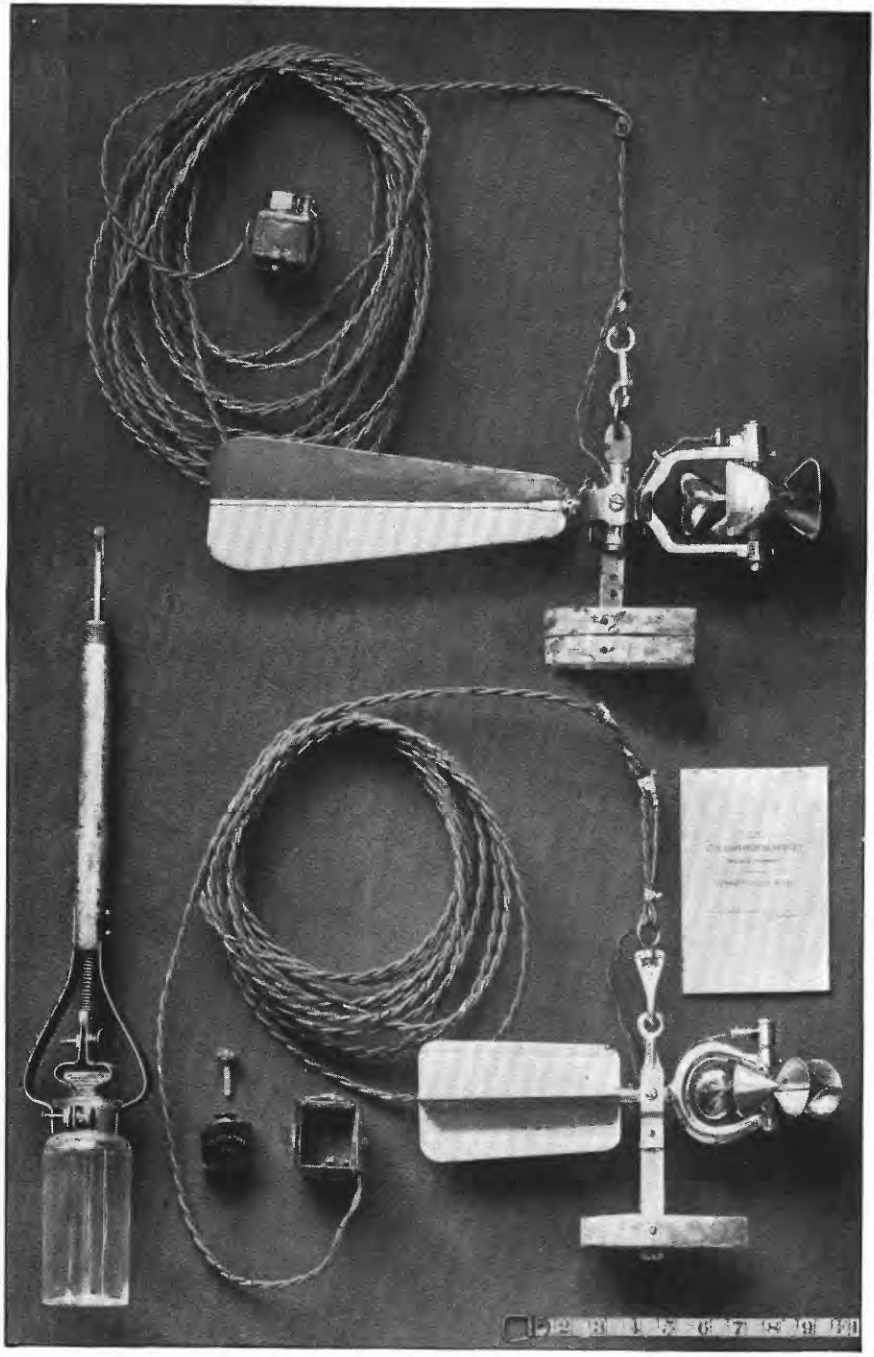
A discharge measurement is the determination of the quantity of water flowing past a certain point at a given time. This quantity is the product of two factors: (1) The mean velocity, which is the function of the cross section, surface slope, wetted perimeter, and roughness of bed; (2) the area, which depends upon the permanency of the bed and the fluctuations of the surface, which govern the depth.

In making the measurement an arbitrary number of points are laid off perpendicular to the thread of the stream (see fig. 1). These points are usually at regular intervals varying from 2 to 20 feet, depending upon the size and conditions of the stream. They are known as measuring points, and at them the observed data, the velocities and soundings, are taken. The perpendiculars dropped from the measuring points divide the gaging section into strips, and for each strip or pair of strips the mean velocity, area, and discharge are determined independently; thus conditions existing in one part of the stream are not distributed to parts where they do not apply.

The methods of obtaining velocity with the current meters which are in general use may be grouped into three classes: Single point, multiple point, and integration.

The single-point method consists in holding the meter either at the depth of the thread of mean velocity, or at an arbitrary depth for which the coefficient for reducing to mean velocity has been determined. Extensive experiments by vertical velocity-curves show that the thread of mean velocity lies at from 0.5 to 0.7 of the total depth. In general practice the thread of mean velocity is considered to be at 0.6 depth, and it is at this depth that the meter is held in the majority of the measurements, this being known as the six-tenth depth method. It is found by a large number of vertical velocity-curve measurements, taken on various streams and under various conditions, that the coefficient for reducing the velocity obtained at six-tenths depth to mean velocity is practically unity, ranging, in a series of 910 measurements made at 39 gaging stations, between 0.94 and 1.04, with a mean for the 910 observations of 1.00. In the other principal single-point method the meter is held near the surface, usually 1 foot below, or low enough to be out of the action of the wind or other disturbing influences. This is known as the subsurface method. The coefficient for reducing the velocities taken at the subsurface has been found by repeated experiments with vertical velocity-curves to be from 0.85 to 0.95, depending upon the depth of the stream and velocity and channel conditions. This method is specially adapted for flood measurements, or when the velocity is so great that the meter can not be kept at 0.6 depth.

The three principal multiple-point methods in general use are: The vertical velocity-curve; top and bottom; and top, bottom, and mid depth. In the vertical velocity-curve method a series of velocity determinations are taken in the vertical at regular intervals, usually from 0.5 to 1 foot apart. By plotting these velocities as abscissas and their depths as ordinates, and drawing a smooth curve through these points, the vertical velocity-curve is produced, which shows the change in velocity from the surface to the bottom of the stream. The mean velocity in the vertical is then obtained by dividing the depth



PRICE CURRENT METERS, WITH BUZZERS.

into the area bounded by this mean velocity curve and the initial line. Owing to the length of time it takes to make these measurements they are seldom used except for determining coefficients for purposes of comparison and for measurements under ice.

In the second multiple-point method the meter is held from 0.5 to 1 foot below the surface and about 0.5 foot above the bottom, and the mean of the velocities at these two points is taken as the mean velocity for that vertical. This method is not well adapted for general work, as the roughness of the bottom disturbs the velocity at that point. For shallow streams with comparatively smooth beds good results are obtained by this method. In the third multiple-point method the meter is held at mid depth, 0.5 foot below the surface and 0.5 foot above the bottom, and the mean velocity is determined by dividing the sum of the top velocity, twice the mid-depth velocity, and the bottom velocity by 4.

The vertical integration method consists in moving the meter at a slow, uniform speed from the surface to the bottom and back again to the surface. The number of revolutions and the time taken in the operation is noted, and the mean velocity is found by dividing the number of revolutions by the number of seconds taken in the run. This method has the advantage in that the velocity at each point of the vertical is measured twice. It is well adapted for measurements under ice and as a check on the point methods.

The area, which is the other factor for determining the discharge of the stream, depends upon the stage of the river, which is taken on a gage, and the general contour of the bed of the stream, which is found by sounding. The soundings are usually taken at each measuring point at the time of the discharge measurement, either by using the meter and cable or by a special sounding line or rod. For stations with permanent beds standard cross sections are usually taken during low water. These sections serve to check the soundings which are taken at the time of the measurements, and from them any change which may have taken place in the bed of the stream can be detected. They are also used for obtaining the area for use in high-water measurement computations, as accurate soundings are hard to obtain at high stages.

In computing the discharge measurements from the observed velocities and depths at the various points of measurements the measuring section is divided into elementary strips, as shown in fig. 1, and the mean velocity, area, and discharge are determined separately for either a single or double strip. The total discharge and area are the sums of those for the various strips, and the mean velocity is obtained by dividing the total discharge by the total area.

The volume of water flowing in a stream is known as run-off. In expressing it various units are used, depending upon the kind of work for which the data are needed. Those used in this report are "second-

feet," "acre-feet," "run-off per square mile," and "run-off in depth in inches," and may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second, and is the body of water flowing in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second.

The "acre-foot" is the unit of capacity used in connection with storage for irrigation work, and is equivalent to 43,560 cubic feet. It is the quantity required to cover an acre to a depth of 1 foot. There is a convenient relation between the second-foot and the acre-foot; 1 second-foot flowing for twenty-four hours will deliver 86,400 cubic feet, which equals 1.9835 acre-feet, or, approximately, 2 acre-feet.

The expression "second-feet per square mile" means the average number of cubic feet of water flowing each second from every square mile of drainage area on the assumption that the run-off is uniformly distributed.

"Depth in inches" means the depth of water in inches that would have covered the drainage area, uniformly distributed, if all the water could have accumulated on the surface. This quantity is used for comparing run-off with rainfall, which quantity is usually given in depth in inches.

It should be noticed that "acre-feet" and "depth in inches" represent the actual quantities of water which are produced during the periods in question, while "second-feet," on the contrary, is merely a rate of flow per second.

The base data for computing the daily discharge of a stream are the daily gage heights and the various discharge measurements, of which there should be a sufficient number to cover the range of stage. The fundamental laws upon which these computations are based are the following:

(1) The discharge will remain constant so long as the conditions at or near the gaging station remain constant;

(2) Neglecting the change of slope due to the rise and fall of the stream, the discharge will be the same whenever the stream is at a given stage; and

(3) The discharge is both a function of, and increases gradually with, the gage heights. (2 and 3 depend on 1.)

As the beds of many streams are changeable, the problem divides itself into two classes: (1) Those of streams with permanent or practically permanent beds, and (2) those of streams with changeable beds. The base data and methods of obtaining them are the same for either class, and it is only in the computation of the mean daily flow that different methods are necessary.

In determining the daily discharge of streams with permanent beds, the results of the discharge measurements are plotted on cross-section paper, with gage heights as ordinates and discharges as abscissas.

Through these points a smooth curve is drawn, which shows the discharge for any gage height, and from which a rating table is prepared. The mean velocity and area determined for each discharge measurement are also plotted. Through these points the curves of mean velocity and of area are drawn, and the rating curve is largely determined by taking the product of the mean velocity and the area at various stages as determined by these curves. These curves of mean velocity and area are of special value in determining the location of the rating curve for stages at which actual discharge measurements are not available and for extending the discharge curve outside the limits of the measurements. In the preparation of the rating table the discharge for each tenth or half-tenth on the gage is found from the curve. The first and second differences of these discharges are then taken and adjusted according to the law that they shall either be constant or increasing, never decreasing. The discharges in the table are then changed in accordance with these adjusted differences. In making up the station rating curve the individual discharge measurements and the conditions under which they were taken are carefully studied, in order that proper weight shall be given to each measurement. Rating curves in general take the form of a parabola, and as a rule the high-water portion of the curve approaches a straight line. For stations of permanent character the results of the measurements from year to year should be within 5 per cent of the curve, with the exception of those taken during high water, when the probable error may be as high as 10 per cent.

The determination of the daily discharge of streams with changeable beds is difficult, and unless frequent discharge measurements are made the results obtained are only roughly approximate. For streams with continually shifting beds, such as Colorado River and the Rio Grande, discharge measurements are made every two or three days, and the discharges for the intervening days are obtained by interpolation, modified by the gage heights for these days. For stations with beds which shift slowly, or are only materially changed during floods, station rating curves and tables can be prepared for the periods between changes, and satisfactory results can be obtained with two or three measurements a month, providing measurements are taken soon after the changes occur.

In determining the flow for periods when the streams are frozen, special rating curves and tables have to be prepared from measurements taken under these conditions. The methods of constructing these curves and tables are the same as for open sections. The discharge measurements, however, are either taken by integration in verticals or by the vertical velocity-curve method, as sufficient experiments have not been made on ice-covered streams to determine the laws which govern the position of the thread of mean velocity.

The Report of Progress of Stream Measurements for the Calendar Year 1904, of which this is Part II, is published in a series of twelve Water-Supply Papers, Nos. 124–135, inclusive, under the following subtitles:

Part 1. Atlantic coast of New England drainage.
Part 2. Hudson, Passaic, Raritan, and Delaware River drainages.
Part 3. Susquehanna, Patapsco, Potomac, James, Roanoke, Cape Fear, and Yadkin River drainages.
Part 4. Santee, Savannah, Ogeechee, Altamaha rivers, and Eastern Gulf of Mexico drainage.
Part 5. Eastern Mississippi River drainage.
Part 6. Great Lakes and St. Lawrence River drainage.
Part 7. Hudson Bay, Minnesota, Wapsipinicon, Iowa, Des Moines, and Missouri River drainages.
Part 8. Platte, Kansas, Meramec, Arkansas, and Red River drainages.
Part 9. Western Gulf of Mexico drainage.
Part 10. Colorado River and Great Basin drainage.
Part 11. The Great Basin and Pacific Ocean drainage in California.
Part 12. Columbia River and Puget Sound drainage.

The territory covered by each paper is given in the subtitle, and the larger drainages are, for convenience in arrangement, subdivided into smaller ones, under which the data are arranged, as far as practicable, geographically.

These papers contain the data that have been collected at the regular gaging stations, the results of the computations based upon the observations, and such other information that has been collected that has a direct bearing on these data, including, as far as practicable, descriptions of the drainage areas and the streams draining them.

For each regular station are given, as far as available, the following data:

1. Description of station.
2. List of discharge measurements.
3. Gage-height table.
4. Rating table.
5. Table of estimated monthly and yearly discharges and run-off.

The descriptions of stations give, as far as possible, such general facts about the locality and equipment as would enable the reader to find the station and use the same. They also give, as far as possible, a complete history of all the changes that have occurred since the establishment of the station that would be factors in using the data collected.

The discharge-measurement table gives the results of the discharge measurements made during the year. This includes the date, the hydrographer's name, the gage height, and the discharge in second-feet.

The table of daily gage heights gives for each day the mean height of the surface of the river as found from the mean of the gage read-

ings taken on that day. At most of the stations the gage is read in the morning and in the evening.

The rating table gives discharges in second-feet corresponding to each stage of the river as given by the gage heights.

In the table of estimated run-off the column headed "Maximum" gives the mean flow for the day when the mean gage height was the highest, and it is the flow as given in the rating table for that mean gage height. As the gage height is the mean for the day, there might have been short periods when the water was higher and the corresponding discharge larger than given in this column. Likewise in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" gives the average flow for each second during the month. Upon this mean the computations for the three remaining columns which are defined on page 14 are based.

In the computations for the tables of this report the following general and special rules have been used:

Fundamental rules for computation.

1. The highest degree of precision consistent with the rational use of time and money is imperative.

2. All items of computation should, in general, be expressed by at least two and by not more than four significant figures.

3. Any measurement in a vertical velocity, mean velocity, or discharge curve whose per cent of error is 5 times the average per cent error of all the other measurements should be rejected.

4. In reducing the number of significant figures, or the number of decimal places, by dropping the last figure, the following rules apply:

(a) When the figure in the place to be rejected is less than 5, drop it without changing the preceding figure. Example: 1,827.4 becomes 1,827.

(b) When the figure in the place to be rejected is greater than 5, drop it and increase the preceding figure by 1. Example: 1,827.6 becomes 1,828.

(c) When the figure in the place to be rejected is 5, and it is preceded by an even figure, drop the 5. Example: 1,828.5 becomes 1,828.

(d) When the figure in the place to be rejected is 5, and it is preceded by an odd figure, drop the 5 and increase the preceding figure by 1. Example: 1,827.5 becomes 1,828.

5. In constructing and applying rating tables a maximum limit of one-half per cent error should seldom be exceeded.

Special rules for computation.

1. Rating tables are to be constructed as close as the data upon which they are based will warrant. No decimals are to be used when the discharge is over 50 second-feet.

2. Daily discharges shall be applied directly to the gage heights as they are tabulated.

3. Monthly means are to be carried out to one decimal place when the quantities are below 100 second-feet. Between 100 and 10,000 second-feet, the last figure in the monthly mean shall be a significant figure. This also applies to the yearly mean.

4. Second-feet per square mile and depth in inches for the individual months shall be carried out at least to three significant figures, except in the case of decimals,

where the first significant figure is preceded by one or more naughts (0), when the quantity shall be carried out to two significant figures. Example: 1.25; .125; .012; .0012. The yearly means for these quantities are always to be expressed in three significant figures and at least two decimal places.

The results of the stream measurements made during previous years by the United States Geological Survey can be found in the following Survey publications. A detailed index of these reports (from 1888–1903) is given in Water-Supply Paper No. 119.

1888. Tenth Annual Report, Part II.
1889. Eleventh Annual Report, Part II.
1890. Twelfth Annual Report, Part II.
1891. Thirteenth Annual Report, Part III.
1892. Fourteenth Annual Report, Part II.
1893. Bulletin No. 131.
1894. Bulletin No. 131; Sixteenth Annual Report, Part II.
1895. Bulletin No. 140.
1896. Water-Supply Paper No. 11; Eighteenth Annual Report, Part IV.
1897. Water-Supply Papers Nos. 15 and 16; Nineteenth Annual Report, Part IV.
1898. Water-Supply Papers Nos. 27 and 28; Twentieth Annual Report, Part IV.
1899. Water-Supply Papers Nos. 35 to 39, inclusive; Twenty-first Annual Report, Part IV.
1900. Water-Supply Papers Nos. 47 to 52, inclusive; Twenty-second Annual Report, Part IV.
1901. East of Mississippi River, Water-Supply Papers Nos. 65 and 75.
West of Mississippi River, Water-Supply Papers Nos. 66 and 75.
1902. East of Mississippi River, Water-Supply Papers Nos. 82 and 83.
West of Mississippi River, Water-Supply Papers Nos. 84 and 85.
1903. East of Mississippi River, Water-Supply Papers Nos. 97 and 98.
West of Mississippi River, Water-Supply Papers Nos. 99 and 100.
1904. East of Mississippi River, Water-Supply Papers Nos. 124 to 129, inclusive.
West of Mississippi River, Water-Supply Papers Nos. 130 to 135, inclusive.

A limited number of these are for free distribution, and as long as the supply lasts they may be obtained by application to the Director United States Geological Survey or to members of Congress. Other copies are filed with the Superintendent of Public Documents, Washington, D. C., from whom they may be had at prices slightly above cost. Copies of Government publications are, as a rule, furnished to the public libraries in our large cities, where they may be consulted by those interested.

COOPERATION AND ACKNOWLEDGMENTS.

Most of the measurements presented in this paper have been obtained through local hydrographers. Acknowledgment is extended to other persons and corporations who have assisted local hydrographers or have cooperated in any way, either by furnishing records of the height of water or by assisting in transportation.

The following list, arranged alphabetically by States, gives the names of the resident hydrographers and others who have assisted in furnishing and preparing the data contained in this report:

New Jersey.—District hydrographer, E. G. Paul during first half and N. C. Grover[a] during the last half of the year, assisted by H. D. Comstock.

New York.—District hydrographer, R. E. Horton,[b] assisted by C. C. Covert. Records have been furnished by the following: E. A. Fisher, city engineer, and John F. Skinner, special assistant engineer, Rochester, N. Y.; T. P. Yates, Waverly, N. Y.; William S. Bacot, Utica, N. Y.; International Paper Company, Fort Edward, N. Y.; Schroon River Pulp and Paper Company, Warrensburg, N. Y.; Duncan Company, R. P. Bloss, Mechanicsville, N. Y.; George Beebe, deputy city engineer, Syracuse, N. Y. Special acknowledgment is made of the interest and assistance of Hon. Edward A. Bond, State engineer, and William Pierson Judson, deputy State engineer.

Pennsylvania.—District hydrographer, E. G. Paul during first half and N. C. Grover during the last half of the year, assisted by H. D. Comstock. Special acknowledgment is due to Mr. John E. Codman for the records of flow of the streams in the vicinity of Philadelphia.

HUDSON RIVER DRAINAGE BASIN.

HUDSON RIVER AT FORT EDWARD, N. Y.

This station, which is located at the dam of the International Paper Company, was established in 1895, in connection with the upper Hudson storage surveys.[c] The dam is of framed timber on slate-rock foundation, and has but little leakage. The crest is straight, very nearly level, and 587.6 feet in length. The crest gage zero stands at the level of the lip of the dam proper. Flashboards are usually maintained on the dam from 15 inches to 18 inches in height. A record is kept of the height of flashboards, and of the times of their setting and removal.

There are 62 water wheels in the adjoining mill. These are nearly all of modern types, which have been tested at the Holyoke flume. A record is kept of the daily run of each in hours, as well as of the working head, which is usually 19 feet. The discharge through the turbines is taken from diagrams expressing the flow as a function of the working head and number of wheel-hours run.

In the winter of 1896–97 a flood spillway was cut around the south end of the dam, over which the water begins to flow whenever it reaches the level of the crest of the flashboards. The profile of the spillway is very irregular and causes some uncertainty in the calculated flow during times of high water.

Whenever the flashboards are off from the main dam the flow is computed by means of coefficients derived from the United States Geological Survey experiments on a model dam of similar cross section.

With the flashboards on, the flow has been computed by the Francis formula for the thin-edged weir. During the dry season but little water passes over the dam, the entire flow being employed to drive the turbines.

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[a] The office of the district hydrographer for New Jersey and Pennsylvania is at the United States Geological Survey, Washington, D. C.

[b] The office of the district hydrographer for New York is 75 Arcade, Utica, N. Y.

[c] See Report of State Engineer and Surveyor of New York, 1895, p. 105.

A new and accurate profile of the crest of the dam, obtained in 1903 has been used to determine the discharge for 1903 and 1904.

During the navigation season water is diverted from Hudson River at Glens Falls feeder dam, 7 miles above Fort Edward, for the supply of Champlain Canal.

The Champlain Canal feeder was measured at Glens Falls on August 25, 1904, giving a discharge of 302 second-feet.

The drainage area tributary to the Hudson above Fort Edward is 0.62 of that of the same stream above Mechanicsville gaging station. The principal intervening tributaries are Hoosic River and Batten Kill, having drainage areas of 730 and 460 square miles, respectively.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Mean daily discharge, in second-feet, of Hudson River at Fort Edward, N. Y., for 1903 and 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	4,460	[b]6,800	[b]9,500	10,640	3,840	2,380	6,460	2,070	5,990	2,940	[b]4,430	[b]2,840
2	4,260	6,460	12,680	10,640	1,640	2,310	6,460	[b]3,820	5,810	2,940	5,140	4,520
3	2,100	5,980	10,800	8,970	[b]2,160	2,510	6,160	4,800	5,240	1,660	4,590	3,890
4	[b]3,820	5,980	10,800	6,840	4,250	2,350	[b]6,050	4,800	4,540	1,370	4,860	4,020
5	4,980	6,840	9,560	[b]6,330	4,560	2,350	[b]6,050	5,060	1,430	2,940	4,860	2,200
6	4,810	6,840	8,880	11,840	4,420	1,520	5,410	5,810	[b]2,840	3,440	4,860	[a]710
7	4,460	4,300	8,040	10,800	3,510	[b]600	4,550	5,990	[b]3,420	3,810	2,870	2,990
8	4,530	[b]5,130	[b]14,030	10,040	4,560	2,920	4,390	4,090	3,580	4,060	[b]2,460	3,880
9	4,170	5,980	17,680	8,880	2,250	3,260	4,220	[b]5,130	3,720	4,440	4,440	3,880
10	1,870	4,980	17,680	8,880	[b]1,980	3,260	3,800	5,810	3,720	16,600	4,300	3,630
11	[b]3,820	4,810	17,520	5,750	3,460	3,260	2,010	5,990	3,720	[b]16,340	4,300	3,750
12	3,620	6,160	17,520	[b]6,800	2,950	3,880	[b]2,460	6,290	2,050	13,500	4,300	1,940
13	3,840	6,160	17,520	7,820	2,440	5,060	4,030	7,250	[b]2,460	10,800	4,300	[b]2,460
14	3,860	4,000	15,430	7,210	2,440	[b]6,050	4,200	7,040	3,280	10,800	2,460	4,060
15	4,100	[b]6,330	[b]17,360	4,980	2,830	12,050	4,200	4,090	2,780	8,420	[b]2,460	3,810
16	4,260	5,660	16,460	5,260	1,660	7,350	4,310	[b]6,050	2,390	7,200	4,060	3,810
17	2,100	5,260	14,380	5,260	[b]1,260	5,910	4,200	4,290	2,700	3,380	4,200	3,940
18	[b]2,460	4,980	14,380	6,840	2,670	9,490	2,130	3,540	3,030	8,120	4,620	3,810
19	3,540	4,710	15,540	[b]6,800	2,670	9,120	[b]2,460	3,360	1,740	11,320	4,260	2,000
20	3,380	4,710	18,020	5,260	3,830	3,710	3,690	[b]780	[b]2,460	10,320	4,260	[b]2,160
21	3,540	2,550	17,380	4,260	[b]3,540	11,550	3,690	[b]360	3,030	10,320	1,880	4,560
22	4,130	6,960	[b]23,960	4,210	2,920	16,640	4,310	1,640	2,890	8,880	[b]2,460	4,000
23	4,170	5,710	27,710	4,040	1,330	15,860	5,980	[b]3,820	2,390	8,880	[b]4,300	4,000
24	2,100	4,010	[b]35,780	4,040	[b]990	14,680	6,460	4,640	2,640	5,520	[b]4,300	4,000
25	[b]3,820	4,010	[b]34,890	1,750	[b]2,070	13,690	4,170	4,390	2,640	4,880	[b]2,460	[b]3,820
26	4,360	4,010	28,760	[b]2,840	[b]1,610	13,080	[b]6,050	4,840	1,540	4,980	[b]2,460	[b]3,820
27	4,260	2,010	22,060	3,740	[b]1,610	11,880	6,460	4,840	[b]2,460	4,980	[b]2,840	[b]3,820
28	4,100	[b]5,320	15,750	3,740	[b]1,430	10,940	4,710	4,840	2,890	4,530	[b]2,840	4,140
29	4,080	.....	[b]18,060	3,740	1,610	10,040	4,030	2,770	2,640	4,060	[b]3,210	4,140
30	4,360	.....	10,290	3,740	1,220	7,820	4,030	[b]5,130	2,390	4,080	[b]3,210	4,140
31	2,200	.....	9,910	.....	[b]1,670	.....	4,030	5,740	.....	1,900	.....	4,140

[a] Water power of upper Hudson River is described in Report of New York State Engineer and Surveyor, 1895, pp. 124-154.

[b] Sundays, holidays, and for repairs, mills shut down.

Mean daily discharge, in second-feet, of Hudson River at Fort Edward, N. Y., etc.—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1904.												
1	6,620	3,020	3,080	13,240	a21,380	4,020	3,030	3,620	2,210	3,310	5,050	2,410
2	4,430	2,750	3,120	10,800	22,660	4,430	2,310	2,200	2,220	a7,450	4,960	2,530
3	a3,210	2,900	3,380	a13,330	21,540	4,130	830	2,830	1,770	6,180	4,160	1,140
4	5,960	2,640	3,490	13,540	20,120	3,890	(a)	2,340	a1,200	4,820	3,920	a2,190
5	5,870	2,640	2,610	14,080	19,740	a9,200	3,030	2,330	a2,810	5,190	1,870	2,710
6	5,620	1,910	a2,460	16,340	17,320	8,890	3,420	4,150	3,310	4,490	a2,800	1,810
7	5,990	a2,460	3,950	16,340	13,630	7,980	3,030	a3,990	2,190	3,480	3,670	2,160
8	6,120	3,610	4,200	18,380	a16,120	6,000	2,780	3,860	3,010	1,520	3,260	2,720
9	4,790	4,280	7,420	18,370	11,820	5,690	2,210	2,340	2,530	a3,010	3,120	2,160
10	a2,460	4,530	8,040	a27,630	11,820	11,240	(a)	2,520	1,750	3,620	2,910	1,020
11	5,460	4,440	8,420	31,620	8,410	9,810	2,410	2,720	a2,010	3,860	3,280	a1,730
12	5,210	4,360	7,010	29,480	6,300	a13,400	2,160	2,810	2,780	5,510	2,070	2,740
13	5,120	3,020	a7,820	26,560	6,300	8,440	2,280	1,940	2,220	5,380	a2,800	2,160
14	5,120	a5,130	4,900	25,380	4,860	7,350	2,780	a1,730	2,840	5,050	3,980	2,530
15	5,370	4,030	4,620	17,320	a10,090	6,940	2,910	2,230	2,230	2,680	2,660	2,160
16	4,290	3,900	4,980	12,630	6,300	6,000	2,030	2,060	2,230	a3,990	2,660	2,160
17	a2,160	3,680	4,170	a11,680	7,190	4,430	(a)	1,460	1,910	4,290	2,660	1,220
18	5,030	3,090	4,260	11,280	7,390	2,810	2,410	1,770	a1,510	3,560	2,410	a1,730
19	4,650	2,430	2,840	11,000	7,390	a1,700	2,410	1,950	3,550	3,220	1,220	2,190
20	4,410	1,840	a2,460	9,280	7,620	3,180	1,910	1,280	2,710	3,510	a2,490	2,600
21	4,160	a3,820	4,360	8,820	6,330	3,180	2,160	a450	2,730	3,730	3,080	2,030
22	4,520	3,630	4,210	7,190	a9,540	3,180	1,780	6,330	2,730	14,020	2,030	1,910
23	3,550	3,540	5,980	4,750	7,190	3,180	1,710	6,820	2,740	a20,510	2,580	2,060
24	a3,210	3,790	11,280	a10,090	6,300	3,160	(a)	6,660	2,020	16,780	1,640	980
25	6,240	3,930	13,540	15,680	5,950	1,040	1,780	4,840	a2,980	13,840	2,230	a2,740
26	6,240	3,840	11,820	15,680	5,950	a1,540	1,410	4,450	4,540	11,160	1,140	a2,660
27	6,120	2,390	a16,810	13,540	6,300	3,000	1,410	2,450	4,350	9,480	a2,010	2,990
28	6,120	a3,820	16,340	13,540	4,860	2,440	1,660	a2,030	4,680	7,980	3,580	3,220
29	6,120	3,260	13,240	21,540	a6,000	1,180	2,160	2,660	4,680	4,850	2,780	3,740
30	4,920	.....	13,240	21,740	5,950	1,280	1,480	2,320	4,150	a7,450	2,280	3,740
31	a2,460	.....	13,240	.....	5,300	.....	(a)	2,270	.....	5,720	.....	1,560

a Sundays, holidays, for repairs, mills shut down.

Estimated monthly discharge of Hudson River at Fort Edward, N. Y., for 1903 and 1904.

[Drainage area, 2,800 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
January	4,980	1,870	3,728	1.33	1.53
February	6,960	2,010	5,238	1.87	1.95
March	35,780	8,040	17,040	6.09	7.02
April	11,840	1,750	6,398	2.28	2.54
May	4,560	990	2,561	.915	1.05
June	16,640	600	7,184	2.57	2.87
July	6,460	2,010	4,554	1.63	1.88
August	7,250	360	4,486	1.60	1.84
September	5,990	1,430	3,080	1.10	1.23
October	16,600	1,370	6,691	2.39	2.76
November	5,140	1,880	3,733	1.33	1.48
December	4,560	710	3,546	1.27	1.46
The year	35,780	360	5,687	2.03	27.61
1904.					
January	6,620	2,160	4,889	1.75	2.02
February	5,130	1,840	3,403	1.22	1.27
March	16,810	2,460	7,009	2.50	2.88
April	31,620	4,750	16,030	5.72	6.38
May	22,660	4,860	10,250	3.66	4.22
June	13,400	1,040	5,090	1.82	2.03
July, 26 days	3,420	830	[a]2,211	.790	.911
August	6,820	450	2,949	1.05	1.21
September	4,680	1,200	2,753	.983	1.10
October	20,510	1,520	6,440	2.30	2.65
November	5,050	1,140	2,843	1.02	1.14
December	3,740	980	2,248	.803	.926
The year	31,620	450	5,510	1.97	26.74

[a] Mean for 26 days taken as mean for entire month.

HUDSON RIVER AT MECHANICSVILLE, N. Y.

A record of the flow of Hudson River at Mechanicsville has been kept by the Duncan Company, beginning December, 1888. The record includes two daily readings of the depth on the crest of the dam, and a continuous record of the run of the water wheels in the adjoining paper mill. The accompanying tables show the monthly and daily

mean flow at Mechanicsville, computed by Mr. R. P. Bloss, the engineer of the company. The flow over the dam has heretofore been computed by the Francis formula for the Merrimac dam:

$$Q=3.012\ L\ H^{1.53}.$$

L being 794 feet. H=depth on crest of dam in feet. The same formula has been used in all cases, whether flashboards are on or off.

The water supply of Champlain Canal is drawn from Hudson River, above Mechanicsville; the gagings at Mechanicsville do not therefore represent precisely the natural yield of the drainage basin.

During 1904 the dam has been increased in height by the addition of a rounded concrete crest, raised to the height of the flashboards formerly used. A new apron has also been constructed. These changes have caused a break in the record. A new discharge table for the dam is being prepared, using coefficients derived from the experiments of the United States Geological Survey at Cornell University, and the record will be continued as formerly.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Mean daily discharge, in second-feet, of Hudson River at Mechanicsville, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Day.	Jan.	Feb.	Mar.
1	4,410	5,770	5,770	17	7,140	5,580	.....
2	3,970	4,730	4,930	18	5,640	5,500	.....
3	5,550	4,320	6,030	19	5,510	4,270	.....
4	5,450	4,370	11,180	20	5,850	5,320	.....
5	5,350	3,560	9,130	21	4,600	6,660	.....
6	5,250	3,980	.....	22	3,390	7,310	.....
7	4,330	5,500	.....	23	9,310	11,850	.....
8	4,910	15,130	.....	24	12,970	9,780	.....
9	4,930	9,910	.....	25	9,340	7,770	.....
10	6,920	8,020	.....	26	6,800	6,700	.....
11	5,870	7,680	.....	27	5,790	6,290	.....
12	5,780	7,770	.....	28	5,190	6,450	.....
13	4,730	7,270	.....	29	4,770	6,550	.....
14	4,840	8,060	.....	30	5,070	.....	.....
15	4,550	7,380	.....	31	5,910	.....	.....
16	5,840	5,410	.....				

Estimated monthly discharge of Hudson River at Mechanicsville, N. Y., for 1904.

[Drainage area, 4,500 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January	12,970	4,330	5,805	1.29	1.49
February	15,130	4,270	6,858	1.52	1.64
March, 5 days	11,180	4,930	7,408	1.65	.307

INDIAN RIVER AT INDIAN LAKE, HAMILTON COUNTY, N. Y.

A record of the stage of water in Indian Lake reservoir, located in the upper Hudson River drainage basin, as described in preceding reports, has been continued.[a] The reported stage of water in the reservoir is shown in the table below. The reservoir gates were not opened until August 13 and were closed September 28, 1904. They were again opened November 22 and remained open until December 31.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Stage of water in Indian Lake reservoir, Hamilton County, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	16.08	10.58	7.67	10.83	26.25	33 25	34.21	29.50	26.08	27.92	28.50	25.95
2	15.96	10.37	7.67	11.00	27.50	33.33	34.25	29.25	25.67	27.75	28.38	25.79
3	15.83	10.17	7.63	11.42	28.67	33.42	34.25	29.08	25.25	27.62	28.25	25.41
4	15.71	9.96	7.63	11.67	29.83	33.33	34.25	28.83	25.08	27.50	28.16	25.17
5	15.58	9.58	7.58	11 92	30.83	33.17	34.25	28.58	24.75	27.42	28.00	24.91
6	15.46	9.37	7.58	12.17	31.75	33.08	34.25	28.33	24.42	27.42	27.88	24.62
7	15.33	9.25	7.58	12.50	32.58	33.17	34.25	28.33	24.08	27.38	27.75	24.25
8	15.21	9.25	7.58	13.00	33.33	33.25	34.25	28.33	23.75	27.33	27.67	23.91
9	15.04	9.21	7.58	13.67	33.83	33.83	34.25	28.25	23.42	28.08	27.58	23.58
10	14.92	9.08	7.58	14.58	34.17	34.42	34.25	28.08	23.08	29.08	27.50	23.25
11	14.75	8.92	7.58	15.50	34.42	34.58	34.21	27.92	22.75	29.83	27.42	22.91
12	14.58	8.75	7.58	16.25	34.58	34.67	34.17	27.83	22.42	30.08	27.33	22.67
13	14.42	8.67	7.63	16.67	34.67	34.67	33.83	27.58	22.08	30.17	27.25	22.33
14	14.25	8.58	7.67	17.08	34.75	34.67	33.62	27.33	21.75	30.25	27.16	22.00
15	14.00	8.46	7.71	17.42	34.92	34.62	33.46	27.00	21.42	30.33	27.08	21.67
16	13.75	8.33	7.75	17.75	34.83	34.58	33.17	26.66	21.08	30.33	27.00	21.33
17	13.50	8.25	7.75	18.00	34.92	34.54	32.92	26.42	20.83	30.25	27.00	21.00
18	13.25	8.21	7.75	18.17	35.00	34.50	32.67	26.17	20.58	30.33	27.00	20.75
19	13.00	8.17	7.71	18.33	34.83	34.46	32.46	26.00	20.33	30.50	27.00	20.45
20	12.83	8.08	7.67	18.58	34.92	34.42	32.25	26.08	20.08	30.42	26.96	20.17
21	12.67	8.00	7.63	18.75	34.92	34.42	32.08	26.17	19.75	30.33	26.92	19.88
22	12.50	7.92	7.58	18.92	34.79	34.42	31.92	26.17	19.50	30.16	26.83	19.58
23	12.33	7.83	7.67	19.17	34.58	34.42	31.67	26.25	19.25	29.96	26.79	19.33
24	12.17	7.75	7.83	19.42	34.33	34.37	31.50	26.33	19.00	29.75	26.75	19.08
25	12.00	7.75	8.17	20.17	34.00	34.25	31.33	26.42	19.00	29.62	26.71	18.83
26	11.83	7.75	8.50	21.00	33.79	34.17	31.17	26.46	19.17	29.42	26.67	18.58
27	11.63	7.75	9.08	21.75	33.46	34.17	30.92	26.50	19.21	29.25	26.33	18.33
28	11.42	7.71	9.58	22.75	33.08	34.17	30.58	26.50	19.17	29.08	25.83	18.04
29	11.21	7.67	9.92	23.92	33.00	34.17	30.33	26.54	19.25	28.92	25.42	17.83
30	11.00	.....	10.25	25.17	33.08	34.17	30.08	26.54	19.67	28.75	25.00	17.58
31	10.79	.....	10.50	.....	33.17	.....	29.83	26.33	.....	28.62	.....	17.33

HOOSIC RIVER AT BUSKIRK, N. Y.

A gaging station was established at the highway bridge in Buskirk village, September 25, 1903. The gage is read twice each day by Bert C. Henry, from a chain gage attached to the bridge. Hoosic River has its headwaters on the west slope of the Hoosic Mountains in Ver-

[a] See also Report on Stream Gagings, contained in Supplement, Report of State Engineer and Surveyor, 1902, pp. 230 to 234.

mont and Massachusetts. Two head branches, one flowing southward, the other northward along the west slope of this range, join at North Adams, Mass. The stream then flows in a northwestern direction, entering Hudson River 3 miles north of Mechanicsville. The drainage basin above Buskirk is rugged and precipitous, the distribution of tributaries affording rapid concentration of the run-off from the steep rock slopes. The soil is generally firm and tenacious in the valleys. The ridges are sparsely wooded. The general elevation of the valley at the junction of the headwaters is 1,000 feet. Numerous dams, affording power for textile, agricultural-implement, and other industries, are scattered throughout the length of the stream from North Adams to Schaghticoke.[a] There are no important lakes and but one storage reservoir in the drainage basin, this being at Farnam, near the head of the South Branch.

The State boundary to the south of Hoosic River follows the Taconic Ridge, which forms the divide between the Hoosic in Massachusetts and Little Hoosic River in New York.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Drainage areas of Hoosic River.[a]

Location.	Area, place to place.	Total square miles.
Above junction branches, North Adams, Mass	118.8	118.8
Above New York State line	115.6	234.4
Above Hoosic Falls	118.5	352.9
Above mouth Walloomsac River	2.6	355.5
Walloomsac River, above mouth	159.0	514.5
Above Buskirk	64.1	578.6
Above Schaghticoke	56.7	635.3
Above mouth	80.5	715.8

[a] From United States Geological Survey Topographic Atlas, the drainage basin being shown on the Taconic, Mettawee, and Cohoes sheets.

Discharge measurements of Hoosic River at Buskirk, N. Y., in 1904.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Sq. feet.	*Ft. per sec.*	*Feet.*	*Second-feet.*
March 2[b]	C. C. Covert	564	0.79	3.29	446
July 27	do	314	.71	1.60	225
August 26	H. R. Beebe	336	.88	1.75	294
October 6	A. M. Evans	398	1.23	2.11	489
November 10	H. R. Beebe	387	1.23	2.09	475

[a] Water power as it existed in 1880 is described in Tenth Census, 1880, vol. 16, pt. 1, pp. 375–380.
[b] River frozen over below bridge. Probable backwater.

Mean daily gage height, in feet, of Hoosic River at Buskirk, N. Y., for 1904.

Day.	Jan.[a]	Feb.[a]	Mar.[a]	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.89	2.53	3.79	3.76	4.38	2.46	2.30	1.75	1.49	3.26	2.55	2.22
2	3.86	2.59	3.53	5.26	4.04	2.36	2.42	1.60	1.50	2.88	2.51	2.12
3	3.86	2.43	7.22	4.23	3.68	2.34	2.12	1.88	1.53	2.63	2.41	2.08
4	3.51	2.76	10.78	3.51	3.56	2.24	2.04	1.75	2.03	2.25	2.35	3.08
5	3.76	2.51	8.18	3.51	3.31	2.62	1.96	1.68	1.86	2.11	2.31	3.63
6	3.66	2.49	6.95	3.60	2.88	2.55	1.93	1.65	1.73	2.15	2.25	3.62
7	3.59	2.13	6.75	4.09	2.97	2.63	1.81	1.50	1.58	2.21	2.25	3.42
8	3.69	7.89	14.75	4.27	2.67	3.38	1.83	1.55	1.52	2.25	2.21	3.22
9	3.66	5.41	11.74	5.62	2.80	11.66	1.79	1.62	1.49	2.15	2.08	3.25
10	3.51	4.33	9.44	5.72	2.60	7.18	1.73	1.52	1.62	2.35	2.21	3.18
11	3.51	4.13	8.44	5.07	2.95	4.91	2.09	1.62	1.69	2.61	1.92	3.02
12	3.29	3.89	7.47	4.35	2.77	4.03	1.81	1.92	1.67	2.68	1.95	3.15
13	3.39	3.61	7.09	4.15	2.65	3.65	2.09	1.75	1.59	2.68	1.82	3.40
14	3.29	2.86	6.74	3.85	2.50	3.38	1.96	1.48	1.58	2.55	2.18	3.28
15	3.29	2.91	6.31	3.47	2.40	3.13	1.83	1.72	5.56	2.53	2.15	3.30
16	3.19	3.29	5.54	3.45	3.30	3.93	1.69	1.62	3.81	2.41	2.18	3.25
17	2.96	3.19	4.97	3.25	3.87	2.71	1.56	1.58	2.74	2.41	2.10	3.18
18	2.99	3.06	4.94	3.59	3.20	2.63	1.61	1.52	2.51	2.21	1.98	3.05
19	3.11	3.09	5.11	3.82	3.35	2.51	1.72	1.45	2.06	2.18	1.98	3.20
20	3.06	3.19	6.01	3.47	4.05	2.55	1.68	1.60	2.00	2.18	1.80	2.95
21	3.11	2.76	4.14	3.27	3.37	2.40	1.62	3.00	2.07	3.41	2.45	3.00
22	3.11	6.59	3.21	3.08	3.16	2.40	1.68	2.22	2.00	5.71	2.58	3.12
23	6.96	7.26	6.46	3.06	2.94	2.32	1.60	2.15	1.97	3.98	2.40	3.00
24	3.96	5.29	4.06	3.34	2.72	2.24	1.48	2.08	1.93	3.53	2.35	3.05
25	3.11	4.61	4.28	4.08	2.64	2.14	1.70	1.80	2.00	3.11	2.45	2.92
26	2.86	4.09	8.26	4.14	3.24	2.07	1.60	1.84	2.12	3.11	2.10	3.05
27	2.59	3.91	6.46	4.01	2.84	2.10	1.68	1.74	2.24	3.11	2.10	3.70
28	2.56	3.53	4.48	5.26	2.66	2.04	1.72	1.49	2.06	2.81	2.28	6.20
29	2.66	3.63	3.73	5.01	2.42	2.10	1.95	1.64	2.06	2.71	2.05	3.68
30	2.43	.....	3.48	4.74	2.46	2.07	1.75	1.57	3.99	2.65	2.25	3.08
31	2.46	.....	3.50	.....	2.74	.....	1.50	1.54	.....	2.61	.....	2.92

[a] River frozen near gage at times.

MOHAWK RIVER AT LITTLE FALLS, N. Y.

This gaging station is located at the lower, or Gilbert's dam, at Little Falls, N. Y. The dam is of masonry, having the form of a circular arc in plan, and furnishes power for the Astoronga Knitting Mill and the Little Falls Paper Company's mills. In the Astoronga Knitting Mill there are installed two turbines, one 43 inches and the other 54 inches in diameter, built by T. H. Risdon & Co., Mount Holly, N. J. In the Little Falls Paper Company's mill are three Camden turbines and one 60-inch Day turbine, built in Little Falls. There are three dams at Little Falls. The lower two are used for water-power development. The upper one is a State dam, diverting water for the supply of Erie Canal. The gage record as kept at the lower dam shows the amount of water flowing downstream from Little Falls, but does not include diversion at the State dam above the gaging station, and hence does not represent the total yield or inflow from the tributary drain-

age area of 1,306 square miles. In calculating the discharge for 1903 and 1904 use has been made of the experiments of the United States Geological Survey at Cornell University, 1903, on flow over dams.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Mean daily discharge, in second-feet, of Mohawk River at Little Falls, N. Y., for 1903 and 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	1,869	5,705	13,520	8,025	1,041	675	3,005	1,523	2,045	1,106	1,710	1,440
2	1,670	6,243	14,130	7,203	2,002	675	3,722	1,270	1,575	1,072	1,429	1,344
3	2,179	6,419	12,610	5,863	1,067	578	2,582	1,183	1,312	935	1,333	1,346
4	4,119	6,439	8,943	8,573	1,150	652	1,835	1,479	1,533	1,012	1,294	1,346
5	5,011	7,145	6,940	7,907	1,154	629	1,525	4,762	1,275	2,042	1,661	1,344
6	4,451	6,273	5,885	6,218	1,197	573	2,138	4,090	1,488	2,776	2,468	1,043
7	3,084	6,026	5,940	6,114	1,148	540	2,778	3,340	746	2,424	2,133	1,266
8	2,473	4,512	7,971	7,866	1,148	629	1,442	2,901	851	2,498	1,608	1,268
9	2,088	3,406	14,510	7,414	1,078	819	1,346	855	821	10,510	1,529	1,065
10	1,633	2,949	16,740	8,011	850	1,023	1,140	2,835	821	20,260	1,528	885
11	1,347	2,836	22,310	7,190	974	870	1,268	2,477	991	17,960	1,346	961
12	1,388	4,086	20,800	5,921	1,022	2,141	834	5,440	1,221	11,940	1,346	1,265
13	1,250	5,722	16,260	5,724	1,022	5,462	964	4,166	966	7,133	1,343	1,279
14	1,552	5,591	11,480	4,372	953	3,816	1,033	2,830	927	5,297	1,343	1,348
15	1,755	3,812	9,412	3,783	988	2,745	999	2,288	1,140	3,396	1,292	1,348
16	1,854	3,888	8,609	3,209	816	3,048	1,068	1,039	927	2,536	1,344	1,442
17	1,773	2,593	8,118	3,209	490	2,326	1,038	1,189	1,044	2,368	3,088	1,346
18	1,334	2,143	7,636	2,741	910	2,472	921	1,189	1,434	8,225	4,768	1,266
19	1,427	1,831	7,839	2,432	1,091	2,035	753	1,033	1,562	7,589	4,580	1,227
20	1,373	2,141	8,761	2,296	988	1,666	867	1,528	1,096	6,487	2,833	1,030
21	1,555	1,900	11,680	2,422	1,022	7,453	1,349	2,968	1,100	5,215	1,878	2,540
22	2,217	1,887	13,160	2,041	910	8,297	2,038	1,934	1,066	3,610	1,658	3,282
23	2,565	2,138	8,333	1,536	877	7,125	3,606	1,309	997	1,451	1,777	3,150
24	2,135	2,138	18,040	1,354	633	6,874	4,458	1,040	962	2,586	2,087	3,210
25	1,562	2,039	16,500	1,462	628	5,841	2,776	2,633	962	2,289	2,083	3,117
26	1,807	1,764	10,330	1,662	605	5,915	2,011	6,129	798	2,039	1,442	2,617
27	1,708	1,813	7,750	1,578	557	4,992	1,487	4,991	808	1,926	1,033	1,945
28	1,646	2,316	6,384	1,310	628	2,842	2,044	3,889	857	1,727	1,346	2,136
29	1,907	.....	6,077	1,192	605	2,881	1,200	2,784	1,031	1,826	1,015	1,446
30	4,810	.....	5,216	1,074	639	1,772	1,342	1,303	1,138	1,826	1,568	1,489
31	6,026	.....	8,410	.....	400	.....	1,566	2,361	.....	1,874	.....	1,723
1904.												
1	1,538	1,771	1,841	8,499	9,601	1,927	1,131	1,072	857	6,888	1,665	1,182
2	1,428	1,613	1,792	11,200	9,474	1,490	1,784	1,072	820	4,820	1,665	1,103
3	547	1,442	1,991	9,680	7,859	1,441	1,987	1,072	998	3,079	1,539	991
4	1,189	1,343	2,787	8,471	7,735	1,090	1,701	820	1,081	2,034	1,539	579
5	1,189	1,265	3,490	8,172	7,191	2,067	1,091	733	2,097	1,818	1,399	930
6	1,068	1,265	3,173	8,192	6,737	3,023	2,354	1,604	1,526	1,883	1,134	930
7	1,268	1,421	3,307	9,347	6,137	3,034	2,194	2,392	1,233	1,878	1,361	930
8	1,346	4,672	4,970	10,250	4,522	2,171	1,452	1,392	897	1,717	1,442	930
9	1,346	4,769	5,963	14,480	3,789	6,415	1,078	1,003	936	1,505	1,079	930
10	1,176	4,597	5,432	15,860	2,581	7,322	996	1,035	1,006	2,115	1,081	866
11	1,286	4,402	5,825	17,060	2,078	4,621	1,213	933	734	7,257	1,079	440
12	1,247	4,022	5,639	12,050	2,127	2,760	1,340	758	794	7,430	934	930
13	1,247	3,731	4,403	9,557	1,660	1,880	1,304	787	794	5,447	1,091	928

Mean daily discharge, in second-feet, of Mohawk River, etc.—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1904.												
14	1,331	2,914	3,368	7,580	1,820	2,027	1,177	1,166	858	3,880	1,079	930
15	1,331	2,521	2,897	6,097	1,882	1,396	1,095	850	1,226	2,659	1,081	930
16	1,282	2,402	2,369	4,764	4,658	1,536	923	850	2,036	2,101	1,048	889
17	998	1,955	2,361	4,327	4,290	1,236	956	754	1,217	1,926	1,080	818
18	1,265	1,806	2,187	4,521	2,638	969	996	732	1,082	1,528	979	878
19	1,226	1,707	2,038	4,591	2,084	1,353	1,482	856	1,429	1,485	933	889
20	1,226	1,645	2,071	3,788	2,841	1,068	1,065	2,765	1,138	1,359	820	930
21	1,265	1,418	2,471	3,203	4,476	1,033	856	8,712	2,957	4,454	932	889
22	1,265	1,707	2,827	3,138	2,922	1,115	732	6,741	2,602	8,633	1,106	930
23	1,525	2,508	4,909	3,589	2,144	1,191	682	7,162	1,667	6,866	1,002	1,001
24	2,523	2,939	3,365	4,288	1,983	1,395	1,040	5,905	1,768	4,937	1,142	1,418
25	2,937	2,706	10,870	7,568	1,968	930	990	3,875	4,042	3,263	1,182	996
26	2,649	2,409	24,220	10,070	2,227	1,370	1,131	2,238	7,310	2,690	1,070	954
27	2,521	2,229	22,110	8,227	3,320	993	1,337	1,489	4,613	2,696	819	1,480
28	2,353	1,842	16,360	10,480	4,208	823	1,346	1,235	2,948	2,696	1,069	6,340
29	2,080	1,930	10,970	10,790	4,397	794	2,530	1,063	2,151	2,530	1,069	5,068
30	1,982	.....	8,966	10,160	2,127	693	2,398	1,072	7,449	2,161	1,069	4,959
31	1,626	.....	8,359	.....	2,130	.....	1,271	890	.....	1,819	.....	4,866

Estimated monthly discharge of Mohawk River at Little Falls, N. Y., for 1903 and 1904.

[Drainage area, 1,306 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
January	6,026	1,250	2,309	1.77	2.04
February	7,145	1,764	3,777	2.89	3.01
March	22,310	5,216	10,980	8.41	9.70
April	8,573	1,074	4,323	3.31	3.70
May	2,002	400	922	.706	.814
June	8,297	540	2,912	2.23	2.49
July	4,458	753	1,778	1.36	1.57
August	6,129	855	2,541	1.95	2.25
September	2,045	746	1,116	.855	.955
October	20,260	935	4,643	3.56	4.10
November	4,768	1,015	1,862	1.43	1.60
December	3,282	885	1,662	1.27	1.46
The year	22,310	400	3,235	2.48	33.69

Estimated monthly discharge of Mohawk River at Little Falls, N. Y., etc.—Continued.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1904.					
January	2,937	547	1,525	1.17	1.35
February	4,769	1,265	2,447	1.87	2.02
March	24,220	1,792	5,914	4.53	5.22
April	17,060	3,138	8,336	6.38	7.12
May	9,601	1,660	3,987	3.05	3.52
June	7,322	693	1,972	1.51	1.69
July	2,530	682	1,343	1.03	1.19
August	8,712	732	2,033	1.56	1.80
September	7,449	734	2,009	1.54	1.72
October	8,633	1,359	3,405	2.61	3.01
November	1,665	819	1,150	.881	.983
December	6,340	440	1,511	1.16	1.34
The year	24,220	440	2,969	2.27	30.96

MOHAWK RIVER AT DUNSBACH FERRY BRIDGE, N. Y.

This gaging record is kept at the dam of the West Troy Water Company, one-fifth mile above Dunsbach Ferry Bridge, 9 miles from the mouth of the river. The dam is in two sections, situated on opposite sides of a Hudson River shale island. The left wing at the upper end of the island has a crest length of 380 feet. The right wing, 500 feet downstream at the foot of the island, has a crest 280 feet long. The record was established March 12, 1898, for the primary purpose of checking a system of levels for the United States Board of Engineers on Deep Waterways, by D. J. Howell, civil engineer, who has furnished the earlier portion of the record. No record was kept from April 1, 1899, to August 1, 1900. In the pumping station adjoining the dam are two turbines of the old American type, one 66 inches and the other 75 inches in diameter. A new 54-inch Victor turbine was installed during 1902. The discharge is calculated from the recorded daily run of the water wheels and working head. The turbines drive pumps taking water from the river for water-supply purposes at the rate of 1,500,000 gallons per day, equivalent to a continuous flow of 2¼ second-feet. The capacity is being increased. The dam is of masonry, with a flat granite crest 5.5 feet wide. It was rebuilt in 1903 and a new profile obtained. The crest gage is attached to the

timber cribbing 50 feet above the lower section of the dam, with its zero mark at elevation 172.00 referred to the United States Deep Waterways datum. Gage readings are taken twice daily, at intervals of about 12 hours, by Robert Wilson. The mean of the two daily readings is used in computing the flow. The discharge over the main dam has been calculated by means of the weir formula, using coefficients derived from the United States Geological Survey experiments. During high water the current of the stream through the cross section of the channel leading to the lower dam has a velocity of several feet per second. The head due to this velocity has been added to the observed head as a correction for velocity of approach to the lower dam. The upper dam is situated 450 feet upstream from the crest gage.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Mean daily discharge, in second-feet, of Mohawk River at Dunsbach Ferry Bridge, N. Y., for 1903 and 1904.

Day.	Jan.[a]	Feb.[a]	Mar.[b]	Apr.[b]	May.[b]	June.[b]	July.[b]	Aug.[a]	Sept.[a]	Oct.	Nov.	Dec.
1903.												
1	.....	.....	39,310	27,350	1,950	2,320	7,830	.....	.....	1,520	3,760	2,760
2	.....	.....	29,490	18,850	1,850	2,320	7,440	.....	.....	1,760	3,560	2,760
3	.....	.....	23,630	13,870	1,950	2,320	6,850	.....	.....	1,870	3,430	2,760
4	.....	.....	21,370	18,510	2,450	2,560	6,630	.....	.....	1,980	3,430	2,760
5	.....	.....	16,490	13,550	2,150	2,700	3,350	.....	.....	2,600	3,100	2,760
6	.....	.....	15,510	13,270	2,090	2,900	2,650	.....	.....	2,930	3,680	2,760
7	.....	.....	16,830	11,770	2,150	2,940	2,870	.....	.....	3,760	4,540	2,760
8	.....	.....	21,750	23,170	2,028	3,080	3,350	.....	.....	6,680	3,900	2,760
9	.....	.....	39,310	24,430	2,028	2,970	3,918	.....	.....	29,990	3,350	2,430
10	.....	.....	36,150	18,850	2,030	3,230	3,440	.....	.....	[c]84,880	2,990	2,430
11	.....	.....	50,790	12,370	1,910	4,490	3,440	.....	.....	43,210	3,020	2,100
12	.....	.....	46,670	12,050	1,810	8,850	5,580	.....	.....	30,770	3,350	2,100
13	.....	.....	39,310	9,850	1,810	13,030	5,380	.....	.....	21,310	3,300	1,860
14	.....	.....	35,190	6,350	1,750	12,710	4,690	.....	.....	13,730	2,910	2,600
15	.....	.....	29,490	6,810	1,750	11,550	4,980	.....	.....	8,440	3,020	3,260
16	.....	.....	27,370	7,310	1,660	11,550	4,920	.....	.....	7,680	3,020	3,430
17	.....	.....	19,950	8,810	1,660	9,890	5,070	.....	.....	6,680	4,380	3,260
18	.....	.....	18,850	7,310	1,580	7,590	5,008	.....	.....	9,280	12,170	3,100
19	.....	.....	17,830	5,890	1,580	8,180	4,890	.....	.....	14,690	11,240	3,760
20	.....	.....	18,150	5,670	1,620	11,400	5,160	.....	.....	13,110	7,920	6,420
21	.....	.....	19,950	5,388	1,620	19,950	5,490	.....	.....	11,240	6,170	9,280
22	.....	.....	22,890	5,188	1,620	29,050	6,850	.....	.....	9,280	4,360	11,860
23	.....	.....	31,250	5,188	1,470	22,510	18,850	.....	.....	6,920	3,650	8,440
24	.....	.....	35,190	4,880	1,310	22,890	14,230	.....	.....	6,170	4,060	7,430
25	.....	.....	52,950	3,330	1,200	23,630	12,430	.....	.....	5,920	3,840	6,930
26	.....	.....	32,590	3,210	1,200	23,630	9,890	.....	.....	5,270	3,760	6,420
27	.....	.....	21,750	3,070	1,200	13,930	7,590	.....	.....	5,060	3,590	5,270
28	.....	.....	24,850	2,450	1,270	10,970	7,110	.....	.....	4,620	2,930	4,620
29	.....	.....	14,170	2,090	1,430	9,890	6,630	.....	.....	4,410	2,760	3,590
30	.....	.....	12,110	1,950	1,620	7,110	6,630	.....	.....	4,190	2,930	3,590
31	.....	.....	19,230	.....	2,120	.....	6,390	.....	.....	4,190	.....	3,550

[a] Record not available
[b] Record approximate, dam in injured condition
[c] Maximum somewhat greater Approximate owing to back water.

Mean daily discharge, in second-feet, of Mohawk River—Continued.

Day.	Jan.[a]	Feb.[a]	Mar.[a]	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1904.												
1	2,760	1,870	3,570	18,870	21,460	3,760	2,460	2,760	2,020	7,940	3,430	2,930
2	2,430	1,640	3,680	30,940	18,870	3,430	2,760	2,430	1,790	11,860	3,430	2,430
3	2,100	1,180	4,000	30,020	16,400	3,100	2,760	2,600	1,560	8,190	3,100	2,090
4	2,100	1,180	4,150	19,610	14,690	3,100	2,430	2,600	1,790	6,680	3,100	1,830
5	2,410	910	10,320	18,130	13,730	3,260	2,760	2,270	2,520	4,620	3,100	1,870
6	2,520	950	8,920	19,240	11,860	3,590	2,740	2,100	2,190	2,930	2,760	1,870
7	2,430	950	7,860	18,870	10,960	4,190	3,090	2,760	2,100	2,760	2,760	1,760
8	2,100	2,100	8,110	24,220	9,560	4,840	2,760	3,260	1,870	2,560	2,600	1,640
9	1,870	12,480	18,790	25,020	8,720	10,400	2,430	3,100	2,100	1,870	2,430	1,640
10	1,870	5,920	15,630	31,400	7,680	18,500	2,430	2,600	2,430	2,760	2,430	1,640
11	2,070	5,060	12,720	30,940	6,930	14,040	2,100	2,100	2,270	4,620	2,430	1,870
12	2,170	4,620	11,160	27,070	5,920	9,280	2,100	1,870	2,100	7,940	2,430	1,980
13	1,720	4,190	10,320	22,250	5,060	5,700	2,600	1,690	1,980	9,280	2,270	2,100
14	1,870	3,430	8,640	16,740	4,190	4,410	2,390	1,610	2,100	7,180	2,270	2,100
15	1,640	2,760	7,600	12,800	4,410	4,190	2,270	1,610	2,270	5,660	2,270	1,980
16	1,870	1,520	6,340	11,860	5,700	3,760	1,840	1,640	2,430	5,050	2,270	1,870
17	1,870	1,180	5,410	10,960	7,430	3,760	2,060	1,520	2,100	3,830	2,270	1,870
18	1,300	1,070	5,190	10,960	6,680	3,260	2,430	1,410	2,270	2,860	2,430	1,870
19	1,180	1,160	4,540	13,110	6,170	2,760	2,590	1,410	2,270	2,760	2,600	1,870
20	1,180	950	5,190	10,680	6,170	2,430	2,890	2,930	1,870	2,760	3,100	1,760
21	1,180	930	5,620	9,000	6,930	2,100	2,270	9,560	2,270	4,110	3,260	1,640
22	1,180	960	7,600	8,440	7,180	2,270	2,080	13,730	2,760	25,980	3,760	2,760
23	1,300	870	10,600	8,720	5,920	2,100	2,060	12,170	3,980	17,420	3,430	2,100
24	1,870	840	22,960	9,000	5,060	2,230	2,100	9,560	2,930	11,550	3,260	2,270
25	5,920	900	25,740	10,680	4,620	2,350	2,100	7,430	3,100	9,000	2,930	2,430
26	3,760	1,760	35,500	17,760	3,980	2,020	2,630	5,700	5,060	6,680	2,760	2,600
27	2,760	1,410	49,470	17,080	4,620	2,020	2,380	4,190	7,180	6,420	2,700	4,620
28	2,430	950	36,790	19,240	5,270	2,020	2,320	3,590	5,920	5,920	2,430	15,030
29	2,100	950	27,290	25,820	4,840	2,010	3,260	2,600	5,270	5,490	2,600	16,740
30	2,100	.....	21,760	22,640	4,410	2,170	2,930	1,750	4,410	5,060	3,100	10,120
31	1,870	.....	19,940	.....	3,760	.....	2,760	2,090	.....	3,590	.....	8,190

[a] Record approximate owing to ice conditions.

Estimated monthly discharge of Mohawk River at Dunsbach Ferry Bridge, N. Y., for 1903 and 1904.

[Drainage area, 3,440 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
January					
February					
March [a]	52,950	12,110	27,430	7.97	9.19
April [a]	27,350	1,950	10,090	2.93	3.27
May [a]	2,450	1,200	1,738	.505	.582
June [a]	29,050	2,320	10,340	3.01	3.36
July [a]	18,850	2,650	6,404	1.86	2.14
August					
September					
October	84,880	1,520	12,070	3.51	4.05
November	12,170	2,760	4,271	1.24	1.38
December	11,860	1,860	4,188	1.22	1.41
1904.					
January	5,920	1,180	2,127	.618	.712
February	12,480	840	2,231	.649	.700
March	49,470	3,570	13,720	3.99	4.60
April	31,400	8,440	18,400	5.35	5.97
May	21,460	3,760	8,038	2.34	2.70
June	18,500	2,010	4,435	1.29	1.44
July	3,090	1,840	2,477	.720	.830
August	13,730	1,410	3,763	1.09	1.26
September	7,180	1,560	2,830	.823	.918
October	17,420	1,870	6,624	1.93	2.23
November	3,760	2,270	2,790	.811	.905
December	16,740	1,640	3,467	1.01	1.16
The year	49,470	840	5,908	1.72	23.42

[a] Record approximate.

January, February, and March, 1904, record only approximate owing to ice conditions.

ORISKANY CREEK NEAR ORISKANY, N. Y.

A gaging station was established at Wood Road Bridge, 1 mile above the village of Oriskany, June 5, 1901. A vertical board scale is read twice daily by C. H. Smith. Discharge measurements are made during low water only by fording the stream a short distance below the

bridge. The gaging station at Wood Road Bridge was discontinued November 30, 1904, and a new gaging station established at Coleman, 1 mile upstream, where a cableway has been erected for use in making current meter measurements during high water. A dam at Reeder's mills, one-fourth mile upstream, affords opportunity for checking the freshet discharge, and also affords some protection against ice which obstructs Oriskany Creek very seriously in winter. Observations at the cable station were begun August 13, 1904, and are taken twice daily by Peter Gambel. The flow of Oriskany Creek is diverted, as a whole or in part, at the State dam below the gaging station during navigation season. The dam affords opportunity to determine the freshet discharge of the stream during the spring period from the time the ice goes out until the opening of the Erie Canal. Oriskany Creek receives the inflow from storage reservoirs at the head of Chenango River.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Discharge measurements of Oriskany Creek near Oriskany, N. Y., in 1904.

Date.	Hydrographer.	Area.	Mean velocity.	Gage height.	Discharge.
		Sq. feet.	*Ft. per sec.*	*Feet.*	*Second-feet.*
September 28	C. C. Covert	81	1.38	0.80	112
October 7	A. M. Evans	89	1.42	.84	126
November 16	H. R. Beebe	77	1.31	.68	101

Mean daily gage height, in feet, of Oriskany Creek at Coleman, N. Y., for 1904.

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.50	0.82	1.02	0.72	17	1.60	0.68	0.82	0.65	0.45
2	.....	.88	.82	1.05	.72	18	1.78	.52	.82	.50	.40
3	.....	.72	.88	1.18	.68	19	1.60	.62	.80	.62	.38
4	.....	.52	.75	1.00	.90	20	2.04	.32	.78	.72	.72
5	.....	.65	.75	.70	.90	21	1.62	.80	2.10	.92	.30
6	.....	.62	.80	.95	.82	22	1.18	.70	1.98	.88	.45
7	.....	.62	.80	.92	.82	23	1.80	.58	1.35	.82	.42
8	.....	.58	.72	.90	.90	24	1.12	.55	1.25	.78	2.25
9	.....	.65	.72	.90	.72	25	1.95	.85	1.15	.88	.45
10	.....	.68	.90	.88	1.00	26	.85	.82	1.15	.68	.72
11	.....	.50	1.15	.85	.30	27	.78	.85	1.20	.70	.....
12	.....	.52	1.05	.60	.35	28	.68	.82	1.18	.78	.....
13	0.85	.58	.98	.75	.42	29	.70	.82	1.00	.82	.....
14	1.40	.52	.98	.78	.40	30	.62	.88	1.00	.78	.....
15	1.75	1.52	.62	.70	.35	31	.60	.....	1.12	.....	.....
16	1.68	.75	.75	.80	.30						

Mean daily gage height, in feet, of Oriskany Creek at Wood Road Bridge, near Oriskany, N. Y., for 1904.

Day.	Jan.[a]	Feb.[a]	Mar.[a]	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	4.15	.....	4.65	4.75	2.90	1.95	1.60	1.75	1.60	1.65	1.95
2	4.05	.....	4.20	4.90	2.90	1.85	1.70	1.90	1.65	1.65	1.90
3	3.90	.....	4.80	3.80	2.70	1.90	1.60	1.75	1.85	1.65	2.05
4	3.95	.....	5.45	3.80	2.30	1.80	1.40	1.60	1.70	1.70	1.95
5	4.15	.....	4.90	3.60	2.25	2.10	1.50	1.70	1.50	1.60	1.60
6	4.40	3.90	4.95	3.50	2.55	2.00	1.75	2.20	1.55	2.00	2.05
7	4.10	5.65	5.60	4.20	2.40	1.80	1.60	1.80	1.40	1.75	1.90
8	4.35	7.75	7.30	3.90	2.30	1.70	1.45	1.70	1.50	1.55	1.90
9	4.35	6.15	6.75	4.05	2.25	2.45	1.50	1.75	1.65	1.70	1.85
10	4.35	5.30	6.10	4.15	2.20	2.35	1.60	1.65	1.60	1.90	1.90
11	3.75	4.90	5.30	3.75	2.35	1.95	1.70	1.65	1.40	2.05	2.05
12	3.25	4.70	4.95	3.95	2.10	1.80	1.75	1.65	1.50	2.10	1.65
13	3.65	4.20	4.80	3.35	2.10	1.85	1.65	1.50	1.40	2.00	1.60
14	4.10	4.20	4.90	3.15	2.05	1.75	1.50	1.65	1.40	1.70	1.80
15	4.00	3.70	4.55	3.15	3.35	1.90	1.65	1.75	2.00	1.50	1.50
16	3.90	.....	4.55	3.10	2.80	2.05	1.70	1.75	1.55	1.75	1.70
17	3.95	.....	4.80	3.20	2.30	1.70	1.50	1.50	1.50	1.60	1.80
18	3.70	.....	4.50	3.10	2.20	1.45	2.10	1.70	1.45	1.50	1.70
19	3.90	.....	4.50	3.05	2.30	1.35	1.95	1.60	1.50	1.75	1.55
20	3.70	3.40	5.45	2.90	2.80	1.50	1.55	3.15	1.60	1.65	1.65
21	3.80	3.40	5.85	2.90	2.30	1.80	1.60	2.40	1.60	3.50	1.90
22	3.95	6.40	6.30	2.80	1.95	1.65	1.55	1.95	1.65	2.65	1.85
23	5.20	5.00	7.95	2.80	1.75	1.65	2.40	2.55	1.35	2.35	1.75
24	5.10	5.00	7.50	2.60	2.05	1.55	1.80	1.90	1.75	1.95	1.70
25	4.75	4.40	7.65	2.80	1.90	1.55	1.80	1.80	1.85	1.75	1.80
26	4.55	4.05	7.30	2.60	2.00	1.45	2.10	1.85	1.75	1.90	1.90
27	4.45	3.65	5.50	2.65	2.15	1.55	1.85	1.70	1.65	1.85	1.80
28	4.45	4.15	4.00	3.40	1.90	1.55	1.95	1.55	1.70	2.05	1.90
29	4.30	5.15	3.65	3.30	1.95	1.70	2.45	1.50	1.65	2.00	2.20
30	4.30	.....	3.70	3.10	2.10	1.75	2.00	1.65	2.35	1.90	2.50
31	4.10	.....	3.70	.....	2.30	.....	1.80	1.55	.....	2.00	.....

[a] Ice conditions January 1 to March 25.

Mean daily discharge, in second-feet, of Oriskany Creek at State dam, near Oriskany, N. Y., for 1904.

Day.	Mar.	Apr.	Day.	Mar.	Apr.	Day.	Mar.	Apr.	Day.	Mar.	Apr.
1	.....	1,250	9	.....	765	17	.....	420	25	2,710	280
2	.....	1,140	10	.....	1,190	18	.....	420	26	3,855	280
3	.....	635	11	.....	730	19	.....	385	27	1,542	280
4	.....	550	12	.....	550	20	.....	350	28	780	280
5	.....	635	13	.....	550	21	.....	330	29	590	280
6	.....	875	14	.....	510	22	.....	280	30	925	280
7	.....	825	15	.....	350	23	.....	280	31	875	.....
8	.....	765	16	.....	350	24	1,340	280			

Estimated monthly discharge of Oriskany Creek near Oriskany, N. Y., for 1904.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
March 25–31	3,855	590	1,577
April	1,250	280	536

STARCH FACTORY CREEK NEAR NEW HARTFORD, N. Y.

A gaging weir was erected on this stream above the head of the former Savage reservoir May 26, 1903. The stream flows in a gulf 300 feet below the general plateau. The weir has a horizontal iron crest 6 feet in length with end contractions. The weir gage is placed 6 feet upstream from the weir and is observed twice daily. The discharge is calculated by the Francis formula. In extreme freshets, the discharge is observed at a masonry intake dam a short distance downstream. The drainage basin of Starch Factory Creek includes Graefenberg Creek and reservoir, as elsewhere described. Graefenberg reservoir has a capacity of 30,000,000 gallons, and water is diverted therefrom through a 12-inch conduit.

The region tributary to Starch Factory Creek consists of cleared farm land, chiefly sodded slopes rising from the stream to the divide on either side, a height of 300 to 400 feet, in a distance of about 1 mile from the main stream. A limited number of lateral tributaries drain the more remote portions of the area. The stream is tributary to Mohawk River near Utica, N. Y. The drainage basin is shown on the Utica sheet of the United States Geological Survey Topographic Atlas, from which the drainage areas have been taken.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Drainage areas of Starch Factory Creek.

	Sq. miles.
Above Graefenberg reservoir dam [a]	0.45
Above gaging weir	3.40
Above Savage reservoir dam	3.81
Above mouth	6.60

[a] Topographic area above Graefenberg reservoir dam. The yield is developed from this area by tiling from springs.

Mean daily discharge, in second-feet, of Starch Factory Creek near New Hartford, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.59	1.00	1.22	a87.00	5.24	1.34	2.02	1.63	0.61	0.71	1.18	1.02
2	1.47	1.00	1.28	b43.75	3.31	1.18	1.34	4.76	.56	.66	1.08	.81
3	1.47	.90	8.00	b15.35	2.28	1.18	1.21	1.45	.48	.56	1.02	.61
4	1.47	.79	25.12	b8.10	2.15	5.92	1.12	1.18	.65	.56	.96	.56
5	1.47	.79	3.20	b7.05	2.02	2.28	1.75	.93	.56	.56	.96	.56
6	1.41	1.28	2.22	b21.16	1.81	1.94	1.51	1.06	.48	.66	.96	.61
7	1.34	69.88	8.03	b27.50	1.69	1.21	1.18	.80	.48	.71	.96	.61
8	1.34	33.00	48.45	b15.60	1.63	1.18	1.06	.74	.48	.56	.91	.61
9	1.34	14.00	9.70	b28.00	1.57	14.09	.87	.74	.48	.61	.86	.61
10	1.22	13.50	5.33	21.80	1.45	6.12	1.63	.74	.48	1.62	.91	.61
11	1.22	10.80	3.99	16.80	1.45	2.98	2.15	.74	.48	2.67	.86	.56
12	1.34	7.89	3.29	17.70	1.34	1.75	2.98	.74	.48	1.49	.86	.56
13	1.22	4.94	2.40	7.50	1.15	1.21	2.02	.74	.48	1.08	.86	.56
14	1.22	4.00	2.03	4.80	1.12	1.18	1.21	.93	.48	.96	.86	.56
15	1.22	2.03	1.90	5.00	10.83	1.27	1.12	.68	1.81	.86	.81	.56
16	1.22	1.53	1.90	4.70	5.54	2.10	1.00	.68	.81	.86	.86	.56
17	1.22	1.72	1.90	8.22	2.82	1.45	1.00	.62	.56	.66	.71	.56
18	1.10	1.34	1.78	9.20	1.94	1.27	2.10	.68	.56	.66	.61	.66
19	1.05	1.28	3.73	5.82	1.75	1.21	1.06	.59	.61	.66	.61	.66
20	1.00	1.16	4.27	4.40	2.42	1.12	.87	12.24	.61	.66	.86	.66
21	.95	1.34	2.88	3.65	2.28	1.18	.87	2.58	.61	31.38	1.19	.66
22	1.10	3.73	6.86	6.32	1.69	1.18	.80	14.72	.56	4.97	1.08	.71
23	2.09	2.22	b62.00	13.70	1.33	1.18	8.70	4.01	.56	2.90	.96	1.36
24	1.90	1.72	b46.00	7.48	1.94	1.18	1.51	2.02	1.02	1.95	.91	7.36
25	1.59	1.41	250.00	9.54	1.33	1.00	1.06	1.45	1.13	1.68	1.02	2.08
26	1.34	1.41	a221.50	5.34	2.98	2.10	6.32	(c)	1.53	1.81	.96	1.31
27	1.22	1.16	a40.00	10.24	2.74	2.10	1.88	(c)	.86	2.08	.91	21.90
28	1.10	1.16	a19.50	16.45	1.57	2.10	2.74	(c)	.66	1.74	.86	26.20
29	1.05	1.22	a17.50	7.58	1.27	1.45	6.02	(c)	1.81	1.68	.86	6.84
30	1.00	.....	a21.00	6.90	1.39	1.57	1.94	(c)	1.36	1.55	.96	3.96
31	1.00	.....	a26.00	.....	1.69	.....	1.39	(c)	.....	1.24	.....	3.46

a50-foot spillway. b Approximate. c Repairing weir.

Estimated monthly discharge of Starch Factory Creek near New Hartford, N. Y., for 1904.

[Drainage area, 3.40 square miles.]

Month.	Discharge in second-feet.			Corrected mean.[a]	Run-off.		Rainfall.
	Maximum.	Minimum.	Mean.		Second-feet per square mile.	Depth in inches.	Inches.
January	2.09	0.95	1.30	2.07	0.609	0.702	1.69
February	69.88	.79	6.49	7.26	2.14	2.31	1.79
March	250.00	1.22	27.51	28.27	8.45	9.74	2.91
April	87.00	3.65	14.89	15.67	4.61	5.14	3.53
May	10.83	1.12	2.38	3.15	.926	1.07	3.61
June	14.09	1.12	2.23	3.00	.882	.984	4.82
July	6.32	.80	2.01	2.78	.818	.943	6.94
August 1–25	14.72	.59	2.30	3.07	.903	.840	4.34
September	1.81	.48	.74	1.51	.444	.496	2.79
October	31.38	.56	2.28	3.05	.897	1.03	3.11
November	1.19	.61	.91	1.68	.494	.551	.60
December	26.20	.56	2.85	3.62	1.06	1.22	2.80

[a] Including diversion to Graefenberg reservoir.

SYLVAN GLEN CREEK NEAR NEW HARTFORD, N. Y.

New Hartford, or Sylvan Glen, Creek is the inflowing stream tributary to reservoir No. 4 of the Utica waterworks. The stream consists of two main branches, the larger flowing in a deep-cut wooded shale valley, the smaller draining a shallow ravine and a marshy divide. The flow of this stream became very small in May, 1900, and it may become dry at times. The weir, which is located at the mouth of the stream, was erected in January, 1904, by the Consolidated Water Company, of Utica, N. Y., by whom the record is furnished. The gage is placed 6 feet upstream and is read twice daily. The weir has a central low-water notch 2 inches deep and 2 feet long, and a main crest 8 feet long with two end contractions. The drainage basin, which lies at an elevation of from 700 to 1,500 feet above tide, is shown on the Utica and Oriskany sheets of the United States Geological Survey Topographic Atlas. It comprises chiefly woodland and pasture with some tillage, 1.18 square miles in extent.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Mean daily discharge, in second-feet, of Sylvan Glen Creek at New Hartford, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.15	0.20	11.65	1.38	0.31	0.26	0.64	0.10	0.16	0.34	0.20
2	.....	.15	.21	4.21	.88	.23	.64	.60	.10	.13	.31	.15
3	.....	.15	1.17	1.83	.77	.23	.31	.47	.13	.12	.31	.10
4	.....	.14	2.27	1.90	.60	3.29	.12	.26	.12	.12	.29	.09
5	.....	.14	.42	2.27	.49	.55	.55	.19	.09	.11	.29	.12
6	.....	.15	.29	1.90	.41	.73	.36	.27	.09	.12	.26	.12
7	0.22	3.23	1.51	6.65	.38	.34	.17	.20	.08	.11	.25	.13
8	.22	9.61	9.53	4.06	.31	.27	.12	.16	.10	.09	.25	.13
9	.22	4.41	3.19	5.41	.27	6.15	.09	.13	.10	.11	.23	.12
10	.22	1.61	.96	4.80	.23	1.75	.29	.15	.09	.40	.23	.12
11	.22	.62	.62	3.75	.19	.73	13.94	.16	.08	.73	.20	.10
12	.20	.36	.39	3.85	.17	.47	5.16	.13	.08	.45	.21	.10
13	.21	.27	.32	1.68	.16	.32	1.31	.13	.07	.34	.20	.12
14	.20	.27	.27	1.15	.13	.25	.49	.17	.09	.26	.23	.11
15	.20	.25	.25	1.09	3.56	7.90	.32	.12	.41	.21	.21	.12
16	.20	.21	.22	1.38	1.15	1.09	5.16	.08	.15	.20	.21	.12
17	.20	.18	.22	3.65	.60	.47	.17	.08	.10	.16	.17	.12
18	.15	.15	.22	3.26	.36	.32	.47	.10	.08	.13	.13	.12
19	.15	.12	.24	1.98	.41	.25	.19	.09	.10	.12	.16	.13
20	.14	.11	.62	1.20	1.26	.17	.11	4.06	.13	.11	.23	.15
21	.14	.10	.37	1.90	.60	.21	.10	.99	.11	16.01	.27	.15
22	.15	.42	1.26	1.38	.40	.32	.10	4.06	.09	1.46	.23	.15
23	.44	.29	15.12	1.09	.25	.19	3.75	1.53	.08	.82	.21	.47
24	.32	.26	9.23	.93	.27	.13	.64	.51	.36	.64	.19	2.30
25	.26	.21	39.61	1.09	.21	.11	.38	.36	.34	.55	.27	.60
26	.22	.20	27.59	.93	1.46	.09	3.85	.26	.38	.64	.21	.32
27	.22	.15	2.72	1.46	1.15	.07	.77	.19	.26	.73	.16	22.07
28	.20	.15	1.10	3.96	.43	.07	.99	.15	.17	.60	.16	8.16
29	.15	.22	1.10	1.98	.32	.13	2.21	.12	.38	.43	.15	2.70
30	.15	.....	2.56	1.75	.68	.38	.73	.11	.36	.38	.10	1.46
31	.15	.....	1.68	.....	.49	.....	.47	.10	.....	.36	.....	1.20

Estimated monthly discharge of Sylvan Glen Creek near New Hartford, N. Y., for 1904.

[Drainage area, 1.18 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January 7–31	0.44	0.14	[a]0.21	0.178	0.205
February	9.61	.10	.84	.712	.768
March	39.61	.20	4.05	3.43	3.95
April	11.65	.93	2.80	2.37	2.64
May	3.56	.13	.64	.542	.625
June	7.90	.07	.92	.780	.870
July	13.94	.09	1.43	1.21	1.40
August	4.06	.08	.53	.449	.518
September	.41	.07	.16	.136	.152
October	16.01	.09	.86	.729	.841
November	.34	.10	.22	.186	.208
December	22.07	.09	1.35	1.14	1.31
The year			1.17	.988	13.49

[a] Mean for 25 days taken as mean for entire month.

GRAEFENBERG CREEK NEAR NEW HARTFORD, N. Y.

A gaging weir was erected above the inflow to Graefenberg reservoir, June 7, 1903, and a standard rain gage was placed on the adjoining meadow slope some distance from trees and structures. This small catchment basin, having a topographic area, 0.282 square mile in extent, is cleared farm land, chiefly meadow and pasture.[a] It lies between elevations 1,100 and 1,300 feet above tide, and near the summit of the general plateau south of Mohawk River. The soil is porous and the stream is fed largely from the ground water reserve.[b] The weir is compound in form, 5 feet crest length with two end contractions and a central notch 2 feet long .21 foot deeper.

The discharge is calculated by the Francis formula. The gages are read by R. O. Salisbury, and the record furnished by the Consolidated Water Company of Utica, N. Y.

[a] Yield from this area developed by tiling from springs in surrounding slopes.

[b] Other nearby stream channels have tributary areas of equal or larger extent run dry in summer.

Precipitation, in inches, at Graefenberg reservoir, near New Hartford, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.01	.....	0.36	0.34	.....	0.03	0.745	0.15	T.	T.	.....	.....
2	T.	T.	.....	.35	.....	.....	.19	.02	T.	0.02	T.	.....
3	.41	0.04	T.	.50	.....	T.	.195	.17	T.	.03	.....	.....
4	.04	.03	.10	.....	.....	.....	.....	.....	0.19	.....	.....	0.04
5	.....	.01	.....	.....	.....	.90	.09	.....	.....	.....	T.	T.
6	T.	.31	.....	.....	.....	.225	.39	.135	.....	.18	0.04	.04
7	.....	T.	T.	.....	.....	.01	T.	.....	.....	T.	T.	T.
8	.....	.57	.73	.....	.....	.....	T.	.....	.....	.....	.....	.02
9	.05	T.	T.	.03	T.	1.18	.....	T.	.02	.04	.....	.03
10	.09	.....	.04	.23	T.	.29	.31	.....	T.	.22	.....	.....
11	.01	.....	.....	.17	.....	.....	.365	.08	.....	.31	.....	.....
12	(a)	.....	.....	.24	.....	.....	1.08	.04	.....	.04	.....	.....
13	.....	.....	T.	.05	.....	.....	.19	.01	T.	.13	.03	.05
14	.....	T.	T.	T.	.....	.....	.....	.23	.....	.....	.....	T.
15	.....	.....	.12	.03	0.78	.13	.....	.....	.76	.....	.....	T.
16	.....	.10	.02	.52	.75	.81	.015	.....	.01	.....	.....	.....
17	.....	.01	.....	.....	.....	.....	.....	.....	.....	.....	.....	T.
18	.....	.....	.08	.....	.....	.....	.41	.13	.....	.....	.....	.02
19	.....	.....	.21	.....	T.	.....	.....	.....	.02	.....	.....	.02
20	.....	.03	T.	.06	.34	.....	.....	1.19	.....	.....	.....	.02
21	.....	.....	T.	.02	.80	.14	.005	.....	.19	.76	.10	.12
22	.....	T.	.08	.....	T.	.01	.....	.....	T.	.70	.....	T.
23	.....	.05	.....	.....	T.	.17	.745	1.04	.....	T.	.....	.05
24	.....	.11	.....	.....	.24	.....	.30	.....	.25	T.	.....	.14
25	.....	.03	.....	.11	.....	T.	T.	.....	.24	T.	.16	.....
26	.....	T.	.....	.005	.32	.....	.615	.01	T.	.08	.02	.01
27	.09	.....	.18	.02	.23	.....	.065	.....	.26	.11	T.	.60
28	.....	.....	.14	.69	.10	.....	.26	.....	.....	T.	.09	1.33
29	.....	.20	.....	.07	.....	.38	.77	.....	T.	.....	.03	.07
30	.01	.....	.....	.07	.....	.01	.....	.....	.36	.....	.....	.....
31	.....	.....	.....	.....	.35	.....	.....	.....	.....	.....	.....	.....
Total	.71	1.49	2.06	3.505	3.91	4.28	6.74	3.20	2.30	2.62	.47	2.56

a No record January 12–25, 1904.

Precipitation, in inches, at Savage reservoir, near Utica, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	0.96	0.29	0.07	0.02	0.53	0.35	.....	.....	.....	.....
2	.....	0.05	.....	.52	.....	.....	.23	.03	.....	0.07	.....	.....
3	0.42	.07	.....	.09	.....	.....	.....	.78	.....	.03	.....	.....
4	.06	.24	.11	.....	.....	.72	.01	.....	0.35	.....	.....	.....
5	.....	.....	.....	.....	.....	.07	.70	.....	.03	.....	0.06	.....
6	.....	.....	.....	.....	.....	.23	.....	.39	.....	.21	.....	0.08
7	.....	.76	.64	.27	.....	.05	.....	.....	.....	.....	.....	.....
8	.06	.10	.....	.....	.....	.07	.....	.....	.....	.....	.....	.05
9	.10	.09	.....	.10	.....	1.42	.....	.....	.07	.07	.....	.07
10	.....	.03	.....	.23	.....	.31	.43	.....	.....	.26	.....	.....
11	.....	.....	.11	.21	.....	.....	.21	.09	.....	.41	.....	.....
12	.....	.....	.....	.16	.....	.....	1.02	.04	.....	.05	.....	.....
13	.....	.....	.....	.13	.....	.....	.36	.01	.....	.16	.....	.14
14	.34	.....	.....	.....	.....	.....	.....	.34	.....	.....	.11	.04
15	.....	.09	.19	.07	1.54	1.04	.01	.....	.84	.....	.....	.....
16	.20	.04	.06	.37	.12	.03	.....	.....	.06	.....	.....	.....
17	.....	.13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18	.....	.....	.38	.....	.....	.....	.45	.27	.....	.....	.....	.06
19	.10	.....	.....	.....	.10	.....	.....	.....	.16	.....	.....	.04
20	.18	.....	.....	.....	.31	.....	.....	1.37	.....	.....	.....	.06
21	.....	.....	.....	.19	.19	.10	.02	.76	.21	1.10	.09	.17
22	.99	.10	.07	.....	.....	.26	.....	.....	.....	.95	.....	.....
23	.....	.18	.61	.....	.06	.....	1.14	1.04	.....	.02	.....	.08
24	.....	.17	.....	.14	.33	.....	.01	.....	.46	.03	.....	.17
25	.07	.04	.05	.....	.02	.....	.....	.....	.35	.....	.21	.....
26	.....	.....	.23	.....	.61	.....	.71	.02	.....	.10	.03	.....
27	.05	.....	.....	.09	.26	.....	.14	.....	.32	.15	.06	.60
28	.....	.....	.....	.61	.....	.02	.25	.....	.....	.....	.12	1.32
29	.11	.....	.....	.....	.42	.40	.92	.....	.....	.....	.05	.09
30	.....	.....	.....	.12	.....	.63	.....	.....	.43	.....	.....	.06
31	.....	.....	.35	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	2.68	2.09	3.76	3.59	4.03	5.37	7.14	5.49	3.28	3.61	.73	3.03

REELS CREEK AND JOHNSTON BROOK NEAR DEERFIELD, N. Y.

A gaging record at the waterworks intake dam on Reels Creek was begun January 1, 1901.[a] In order to secure a more accurate record during periods of diversion, a weir was constructed on the shale rock stream bed just above the intake dam in 1903. A second weir was constructed on Johnston Brook, a tributary of Reels Creek, which enters below the point of gaging the latter. The calculated flow and the precipitation observed from a standard rain gage at Deerfield reservoir are given below.

The drainage of Reels Creek lies on the north slope of Mohawk River, to which the stream is tributary. The tributaries are numerous and the valleys deep cut with gravel or sodded slopes favoring rapid discharge of storm waters.

Johnston Brook flows in a deep valley whose tributaries are, lying

[a] See Water-Supply Paper No. 82, p. 82, and Water-Supply Paper No. 97, p. 209; see also Report on Stream Gaugings, contained in Supplement, Report of State Engineer and Surveyor, New York, for 1902, pp. 136-141, also 1903, pp. 94-98.

mostly to the north of the stream, drained by short parallel feeders that head well below the divide and are supplied to some extent from ground storage.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Drainage areas of Reels Creek.[a]

Location.	Square miles.	
	Place to place.	Total.
Reels Creek above weir	4.42	4.42
Reels Creek above Johnston Brook	.05	4.47
Johnston Brook above weir	.78	.78
Johnston Brook above mouth	.01	.79
Reels Creek including Johnston Brook	.79	5.26
Reels Creek above mouth	4.14	9.4

[a] From the Utica sheet of the United States Geological Survey Topographic Atlas.

Mean daily discharge, in second-feet, of Reels Creek near Deerfield, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.68	3.52	2.49	30.50	23.50	.....	0.54	0.17	0.17	1.70	2.93	0.83
2	2.42	3.21	2.75	44.80	6.80	.....	1.91	.79	.17	.54	2.78	.74
3	2.23	2.90	4.21	30.50	3.40	.....	1.10	.24	.17	.31	2.18	.50
4	2.23	2.68	19.62	30.50	2.40	.....	.50	.17	.45	.31	2.04	.50
5	2.23	2.49	28.50	30.50	2.40	17.80	1.10	.28	.21	.31	2.04	.45
6	2.16	2.98	61.85	32.80	2.40	33.90	1.38	.17	.17	1.38	1.91	.45
7	2.10	13.41	99.20	82.00	2.40	6.00	.74	.17	.17	1.04	1.50	.45
8	2.10	9.75	65.00	50.10	2.40	3.40	.34	.17	.17	1.04	1.38	.45
9	2.10	.....	9.10	44.80	1.80	38.70	.31	.17	.17	1.04	1.32	.45
10	2.10	.....	8.35	49.10	1.80	10.50	1.10	.17	.17	1.38	1.27	.45
11	2.10	8.94	9.00	76.00	1.80	9.00	.64	.17	.17	1.77	1.22	.45
12	2.10	7.70	9.00	115.20	1.80	.....	.74	.17	.17	3.58	1.16	.45
13	2.10	6.17	9.00	30.50	1.80	.....	.54	.17	.17	3.82	1.16	.45
14	2.10	4.57	9.00	45.10	1.80	.....	.31	.17	.17	3.42	1.16	.45
15	2.10	3.52	10.50	18.00	30.50	.....	.21	.17	.17	3.25	1.16	.45
16	2.10	2.75	7.70	15.30	23.50	.....	.17	.17	.17	2.78	1.16	.45
17	2.10	2.49	7.92	14.00	9.00	.....	.17	.17	.17	2.26	1.16	.45
18	2.10	2.49	7.81	18.70	2.90	.....	.79	.17	.17	2.04	1.16	.45
19	2.10	2.49	8.04	13.60	2.40	.....	.31	.17	1.50	1.50	1.16	.45
20	2.10	2.49	10.14	8.30	12.00	30.50	.21	.....	2.41	1.27	1.91	.45
21	2.10	2.49	9.64	9.00	5.20	144.10	.17	6.74	1.70	.....	1.77	.45
22	5.92	2.49	8.72	10.50	2.40	99.40	.17	3.01	.45	11.78	1.44	.45
23	17.80	3.06	24.31	13.60	2.40	.....	7.26	7.26	.17	7.16	1.32	1.04
24	8.04	2.90	19.43	10.50	6.80	.45	2.93	2.11	1.10	5.08	1.27	.....
25	5.65	2.55	92.80	12.00	8.30	.38	1.27	.79	2.48	3.74	1.38	.....
26	4.04	2.49	197.00	14.40	22.50	.31	9.22	.24	1.10	4.00	.98	1.91
27	4.04	2.49	175.50	24.50	27.50	.31	1.70	.17	.54	3.82	.79	.....
28	4.04	2.75	49.90	30.50	7.70	.31	.93	.17	.24	3.74	.74	.....
29	3.69	2.62	33.60	19.50	2.90	2.78	1.32	.17	3.92	3.74	.74	.....
30	3.52	.....	30.50	29.50	8.30	1.50	.64	.17	4.36	3.74	.93	.....
31	3.21	.....	35.20	.....	7.70	.....	.31	.17	.....	3.42	.....	.....

Estimated monthly discharge of Reels Creek near Deerfield, N. Y., for 1904.

[Drainage area, 4.5 square miles.]

Month.	Discharge in second-feet.			Run-off.		Rainfall.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	Inches.
January	17.80	2.10	3.40	0.756	0.872	4.62
February, 27 days	13.41	2.49	4.01	.891	.895	3.85
March	197.00	2.49	34.38	7.64	8.81	2.97
April	115.20	8.30	31.81	7.07	7.89	2.64
May	30.50	1.80	7.69	1.71	1.97	4.17
June, 17 days	14.41	.31	23.49	5.22	3.30	6.16
July	9.22	.17	1.26	.280	.323	4.63
August, 30 days	7.26	.17	.83	.184	.205	4.87
September	4.36	.17	.78	.173	.193	4.51
October, 30 days	11.78	.31	2.83	.629	.702	3.87
November	2.93	.74	1.44	.320	.357	.27
December, 24 days	1.91	.45	.57	.127	.113	3.36

Mean daily discharge, in second-feet, of Johnston Brook near Deerfield, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.45	0.50	0.87	8.00	3.22	1.00	0.34	0.18	0.18	0.40	0.37	0.21
2	.45	.50	.87	6.06	1.68	.40	1.00	.18	.18	.18	.34	.12
3	.45	.50	1.68	4.42	1.00	.37	.28	.40	.26	.18	.30	.12
4	.45	.50	1.46	2.92	.74	.37	.18	.18	.22	.18	.30	.12
5	.45	.50	1.36	2.71	.64	3.69	.74	.18	.18	.18	.30	.12
6	.45	.64	6.68	4.79	.47	4.02	.57	.30	.18	.24	.28	.12
7	.45	7.12	8.00	12.64	.47	.52	.24	.18	.18	.18	.24	.12
8	.45	2.31	2.84	6.06	.44	.37	.18	.18	.18	.18	.24	.12
9	.45	1.93	1.46	4.42	.42	(a)	.18	.18	.18	.18	.22	.12
10	.45	1.56	1.36	(b)	.40	.92	1.15	.18	.18	1.74	.18	.12
11	.45	1.46	1.36	10.50	.37	.57	.26	.18	.18	2.24	.18	.12
12	.45	1.05	1.36	10.85	.37	.42	.42	.18	.18	2.44	.18	.12
13	.45	.57	1.36	4.70	.37	.37	.26	.18	.18	1.56	.18	.12
14	.50	.52	1.36	3.38	.37	.64	.18	.18	.18	.74	.18	.12
15	.50	.50	1.30	1.68	4.61	1.20	.18	.18	.52	.78	.18	.12
16	.50	.50	1.30	1.68	2.71	.57	.18	.18	.18	.37	.18	.12
17	.50	.50	1.36	2.06	.92	.37	.18	.18	.18	.32	.18	.12
18	.50	.50	1.46	2.84	.69	.37	1.31	.18	.18	.30	.18	.12
19	.50	.50	1.46	1.62	.37	.37	.21	.18	1.87	.30	.18	.12
20	.50	.50	1.87	1.31	2.64	.37	.18	(a)	1.31	.26	.26	.12
21	.50	.50	1.87	1.56	1.10	1.51	.18	4.02	.30	10.28	.25	.12
22	1.05	.50	2.31	1.46	.42	1.51	.18	1.62	.18	2.71	.21	.12
23	4.10	.78	10.86	1.25	.37	.47	3.46	1.93	.18	1.31	.21	.24
24	1.40	.87	3.76	1.15	1.00	.19	.57	.37	.92	.57	.21	2.06
25	.60	.60	(a)	1.41	1.10	.18	.18	.21	1.93	.47	.25	.78
26	.55	.50	(a)	1.31	3.61	.18	2.51	.18	1.31	.57	.24	.30
27	.55	.50	(a)	1.99	2.71	.18	.32	.18	.26	.57	.18	.82
28	.55	.78	(a)	7.67	.42	.18	.22	.18	.18	.57	.13	7.45
29	.55	.92	2.58	3.38	.37	3.07	.18	.18	(a)	.57	.13	2.44
30	.55	.....	3.30	1.87	.82	.50	.18	.18	1.87	.57	.21	1.31
31	.55	.....	2.18	.....	.92	.....	.18	.18	.....	.50	.....	.54

a Discharge exceeds capacity of weir; record not available.
b Repairing weir; record not available.

Estimated monthly discharge of Johnston Brook near Deerfield, N. Y., for 1904.

[Drainage area, 0.79 square mile.]

Month.	Discharge in second-feet.			Run-off.		Rainfall.
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.	Inches.
January	4.10	0.45	0.65	0.823	0.949	4.62
February	7.12	.50	.99	1.25	1.34	3.85
March, 27 days	(a)	.87	2.50	3.16	3.17	2.97
April, 29 days	12.64	1.15	4.06	5.14	5.54	2.64
May	4.61	.37	1.15	1.46	1.68	4.19
June, 29 days	(a)	.18	.86	1.09	1.18	6.16
July	3.46	.18	.53	.671	.774	4.63
August, 30 days	(a)	.18	.43	.544	.607	4.87
September, 29 days	(a)	.18	.48	.608	.656	4.51
October	10.28	.18	1.02	1.29	1.49	3.87
November	.37	.13	.22	.278	.310	.27
December	7.45	.12	.60	7.59	.875	3.36

a Discharge exceeds capacity of weir; record not available.

Precipitation, in inches, at Deerfield reservoir, near Deerfield, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		0.02							0.30			
2	0.65	.12					0.75	0.57		0.05		
3			0.60						.32			
4		.06				0.52						0.10
5		.04				.52	.65	.17		.30		
6		.74		0.45								
7		.94	.44									.05
8	.25					2.03			.25			.10
9			.05	.35		.25						
10							.12	.08		.70		
11				.32						.40		
12				.08			.25			.30		
13				.12				.12				.13
14	1.08		.04			.39						
15		.05		.25	1.49	.38			.32			
16	.22				.08							
17												
18			.22	.25			.77		.82			.10
19		.03							.78			.13
20	.02				.68	.51		2.00			0.05	.20
21	.88				.32			1.25		1.75		
22	1.20	.24	.72			.92		.65				
23		.40			.48		1.08					
24		.16							.48			
25					.23					.17	.22	
26	.32		.45		.40		.65	.03	.32	.20		
27				.40								
28		.45		.20			.86					2.10
29		.60		.10		.52			.92			
30				.12	.41	.12						.45
31			.45		.08							
Total	4.62	3.85	2.97	2.64	4.17	6.16	4.63	4.87	4.51	3.87	.27	3.36

NAIL CREEK AT UTICA, N. Y.

The record of the flow of this stream, obtained at a weir at the foot of the water-supply pond of the Globe Woolen Mill, Utica, N. Y., has been furnished by William S. Bacot, civil engineer. The weir consists of eight notches, each 1 foot in length and 1 foot in depth, cut in $\frac{1}{8}$-inch steel plates attached to the upstream side of the waste gates of the pond mentioned. The depth of overflow is observed on a vertical enameled iron gage, divided to feet and hundredths, located 9 feet upstream from the weir. Outflow takes place from a still pond. The waste gates to which the weir is attached are practically water-tight. The very slight leakage occurring has been estimated and allowed for, together with water diverted for use in the adjoining mills. Four of the weir notches are placed 2 inches below the remaining four notches. The lower notches take the entire ordinary flow of the stream. The pond above the weir has an area of 1.4 acres, and a slight error may be introduced in the results on windy days by water slopping over the crests of the higher notches.

The effective drainage area at the weir is less than the natural drainage area, owing to diversion to the combined sewer system of the city in the lower portion of the watershed. The drainage area is nearly all heavily sodded land, comprising suburban plats and pasturage. It contains possibly 5 per cent of cultivated area and an equal percentage of hard earth roads and pavements. Perhaps 10 per cent is sparsely timber covered. The entire area is underlaid with slate shale, usually at a depth of from 2 to 5 feet below surface, and the soil is heavy clay, with occasional gravel and loam. The basin comprises an upper and a lower plateau; the main tributaries rise in the steep side slopes of the upper plateau, which are often deeply serrated, forming gulfs from which springs issue, excepting in unusual droughts. The lower plateau is more or less swampy near the margin of the hills. The upper plateau contains a large cemetery, in which are numerous artificial drains, also a number of small ponds. The drainage areas are shown on the Oriskany and Utica sheets of the United States Geological Survey Topographic Atlas. The drainage from the plateau is received on the north in an artificial ditch following the highway and which separates the area tributary to the stream from the urban district. Below the junction of the main branches, the stream flows in the abandoned channel of the Chenango canal, in which one branch of the stream flows from its source. In unusual freshets the artificial channel carrying the north branch of the stream underneath the street for a distance of about 1,000 feet is of insufficient capacity, and the overflow passes directly into the city sewers and is diverted from its natural course.

Drainage areas of Nail Creek.[a]

	Sq. miles.
Natural area above Globe Woolen Mill	4.32
Effective area prior to August 31, 1904	3.66
Effective area after August 31, 1904	3.49
Upland area above 600 contour	1.40

Mean daily discharge, in second-feet, of Nail Creek at Utica, N. Y., for 1904.

Day.	June.	July.	Aug.	Sept.	Oct.	Day.	June	July.	Aug.	Sept.	Oct.
1		1.61	1.81	0.60	1.07	17				0.69	
2		2.25	1.55	.81		18		1.32	0.69		
3					1.10	19		1.14	.99	.88	
4				.75	1.03	20		1.14	1.81	.81	
5		1.74			1.10	21		1.14		.84	
6		1.68				22		1.14	1.68	.81	
7		1.32		.92		23		5.54	4.19	.88	
8		1.49		.88		24			2.17	1.03	
9		1.28		.88		25		1.18	1.74		
10				.92		26		4.29	1.61	.88	
11		1.68		.92		27	1.32	2.40	1.44	1.07	
12		3.52		1.10		28	1.72	1.61		1.10	
13		3.15		.78		29	1.61	4.39	.84	1.10	
14		1.88		.81		30	1.32	1.95		1.95	
15		2.02	1.10	1.68		31					
16		1.32	1.14	.81							

Estimated monthly discharge of Nail Creek at Utica, N. Y., for 1904.

[Drainage area preceding August 31, 1904, 3.66; succeeding August 31, 1904, 3.49 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.[a]	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
June, 4 days			1.49	0.407	0.061
July, 25 days			2.09	.571	.531
August, 14 days			1.63	.445	.232
September, 25 days			.96	.276	.257
October, 4 days			1.08	.309	.046

[a] Part of maximum flow diverted.

WEST CANADA CREEK AT TWIN ROCK BRIDGE, N. Y.

A current-meter gaging station was established at Twin Rock Bridge, September 7, 1900, by R. E. Horton. A gage board, divided decimally, is attached to the upstream side of the right-hand abutment, the coping of the abutment over the gage being used as a bench mark.

[a] From the Utica sheet of the United States Geological Survey Topographic Atlas.

The bridge is 167.5 feet long between abutments, and consists of two spans. The bed is of gravel and cobble, and the entire flow passes underneath at all stages. In the winter the stream becomes completely ice covered, requiring special discharge measurements. The gage is read twice each day by George Rood, and the record is furnished by the Utica Gas and Electric Company. The drainage area is shown on the Utica, Little Falls, Remsen, Wilmurt, Old Forge, and Canada Lakes sheets of the United States Geological Survey Topographic Atlas. There are about fifty small lakes and a few undrained ponds in the watershed of the stream. Most of these are situated near the headwaters and above the gaging station, the largest single water surface being Honnedaga Lake, 1.4 square miles in extent. There is also a small amount of controllable storage in reservoirs formed by three dams. Swamps and marshes are numerous in the region of the headwaters, usually adjoining lakes and tributaries and having an extent of one-half square mile or less each. Much of the region above the gaging station is timber covered. There are extensive sand areas in the central and upper drainage basins. The soil of the upper watershed is underlaid by granitic gneiss usually at or near the surface, excepting in alluvial valleys. From a point just above Twin Rock Bridge and extending downstream beyond Trenton Falls the underlying geological formation is Trenton limestone.[a]

Compacted snow accumulates in the woodlands in winter, often to a depth of 3 or 4 feet, and representing an inch of water for each 5 or 6 inches of snow. This melts slowly, feeding the stream in March and April, which months may show a run-off greatly exceeding the precipitation. The drainage area above Twin Rock Bridge is 364 square miles; above Trenton Falls, 375 square miles. During the present season a Frieze self-recording gage has been erected at Trenton Falls dam. Tests by weir to determine the discharging capacity of the turbines, which are a special Swiss design, have been made by the power company.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

[a] For geological description of Trenton Falls see paper by C. S. Prosser and E. R. Cumings in Report of New York State Museum, 1895, pp. 619–628.

Discharge measurements of West Canada Creek at Twin Rock Bridge, N. Y., in 1904.

Date.	Hydrographer.	Area.	Mean velocity.	Gage height.	Discharge.
		Sq. feet.	*Feet per sec.*	*Feet.*	*Second-feet.*
June 3	C. A. Swancott	547	0.85	2.18	463
August 4	do	404	.75	1.30	304
August 30	do	394	.67	1.45	[a] 265
September 19	Horton and Evans	580	1.03	2.48	[b] 597
October 8	A. M. Evans	575	1.26	2.33	728
October 15	do	645	1.77	2.83	1,142
November 21	Weeks and Swancott	455	.86	1.63	394

[a] Log jam at center pier. [b] Log jam below section.

Mean daily gage height, in feet, of West Canada Creek at Twin Rock Bridge, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.40	2.20	2.60	3.82	7.70	2.35	3.40	2.30	1.00	6.15	2.10	1.35
2	3.50	2.10	2.68	4.48	8.95	2.45	3.85	2.00	1.10	3.50	2.40	1.35
3	2.00	2.10	2.80	4.45	8.55	2.22	3.70	1.60	1.55	3.45	2.25	1.30
4	2.00	2.05	2.88	3.68	8.40	2.00	3.15	1.20	4.00	2.05	2.30	1.30
5	2.00	2.12	3.50	3.52	8.60	3.45	3.45	1.00	3.60	2.25	2.20	1.20
6	2.00	2.00	3.50	3.48	8.80	3.15	4.35	4.15	3.10	2.45	1.90	1.20
7	2.05	2.15	3.45	3.80	8.35	3.00	3.55	2.90	2.55	2.40	1.78	1.15
8	.....	3.20	4.35	4.50	8.20	4.40	2.05	2.55	2.15	2.30	1.72	1.15
9	2.20	3.80	5.15	7.00	7.20	5.90	2.10	3.10	2.10	2.22	1.80	1.10
10	2.30	2.00	4.85	9.00	6.10	8.45	2.00	1.70	2.00	3.50	1.85	1.70
11	2.30	3.90	4.45	7.42	4.45	4.45	1.20	1.45	2.15	7.10	1.70	1.48
12	1.09	3.60	4.25	5.70	3.40	3.40	1.20	1.45	2.10	7.00	1.60	2.10
13	1.07	3.30	3.75	4.88	3.50	3.00	1.50	1.40	3.05	5.40	1.55	2.35
14	2.00	3.20	3.50	4.35	3.25	2.25	1.50	1.45	3.45	3.20	1.42	.90
15	1.90	2.95	3.30	3.52	2.60	2.20	1.20	1.55	3.55	2.50	1.45	1.05
16	1.80	2.85	3.00	2.85	6.00	2.35	1.50	.80	3.65	2.35	1.60	1.00
17	2.05	2.65	2.82	2.80	5.80	2.25	1.50	.80	2.50	2.40	1.60	1.00
18	2.02	2.50	2.80	2.95	5.00	2.12	1.40	1.20	2.20	2.85	1.60	1.55
19	2.18	2.38	2.75	2.75	4.00	2.00	1.30	1.10	2.40	2.20	1.60	1.00
20	2.30	2.40	2.88	2.62	4.25	1.90	1.25	6.50	3.00	2.10	1.60	1.00
21	2.32	2.40	2.80	2.45	5.55	1.95	1.00	9.50	4.25	8.35	1.68	1.10
22	2.40	2.68	2.85	2.60	4.30	2.12	1.00	7.50	3.40	5.85	1.68	1.10
23	2.40	3.40	3.25	3.00	4.18	2.95	.90	6.45	2.75	4.45	1.60	1.20
24	2.50	3.58	4.20	3.95	3.15	2.50	.95	5.05	3.30	3.55	1.72	1.30
25	2.75	3.35	4.95	7.50	3.55	2.15	1.20	3.05	6.75	3.15	1.30	2.00
26	2.25	3.05	6.05	7.32	4.15	2.00	1.55	3.05	5.75	2.30	1.30	2.00
27	2.50	3.00	7.80	7.35	4.65	2.15	2.50	2.90	5.15	2.00	1.40	2.20
28	2.40	3.00	6.80	7.80	4.70	1.00	2.65	2.50	4.55	2.35	1.40	2.20
29	2.35	2.80	5.70	7.85	3.75	2.05	2.55	1.95	3.40	2.50	1.40	2.35
30	2.50	.....	4.82	8.05	3.35	2.30	2.50	1.45	7.55	2.35	1.30	2.90
31	2.30	.....	4.12	.....	2.35	.....	2.50	1.25	.....	2.20	.....	3.40

NOTE.—Ice corrections made to gage heights and ice curve applied January 1 to March 22 and November 27 to December 31, 1904.

Mean daily discharge, in second-feet, of West Canada Creek at Twin Rock Bridge, N. Y., for 1904.

Day.	Jan.[a]	Feb.[a]	Mar.[ae]	Apr.[e]	May.[c]	June.[c]	July.[c]	Aug.[c]	Sept.[c]	Oct.[c]	Nov.[ac]	Dec.[a]
1	712	288	424	2,630	4,630	468	856	454	210	2,960	398	248
2	750	254	450	3,350	6,140	496	1,100	370	224	900	482	248
3	220	254	492	3,320	5,630	433	1,010	298	289	878	440	242
4	220	237	520	2,480	5,450	370	746	238	1,180	384	454	214
5	220	262	750	2,320	5,700	878	878	210	956	440	426	202
6	220	220	750	2,270	5,950	746	1,420	1,280	724	496	352	202
7	237	220	731	2,610	5,390	680	928	646	727	482	329	197
8	(b)	579	1,140	3,380	5,210	1,450	384	529	412	454	320	197
9	(b)	816	1,550	6,540	4,070	2,700	398	724	398	433	334	192
10	(b)	509	1,390	9,640	2,900	5,510	370	316	370	900	343	270
11	(b)	860	1,190	7,150	1,490	1,490	238	273	412	3,960	316	238
12	(b)	730	1,090	4,810	856	856	238	273	398	3,850	298	334
13	(b)	617	860	3,810	900	680	280	266	702	2,240	289	384
14	(b)	579	750	3,210	790	440	280	273	878	768	270	170
15	(b)	492	670	2,320	544	426	238	289	928	510	273	185
16	(b)	458	560	1,690	2,800	468	280	190	984	468	298	180
17	237	390	500	1,650	2,610	440	280	190	510	482	298	180
18	228	339	490	1,770	1,900	405	266	238	426	629	298	259
19	280	296	475	1,610	1,180	370	252	224	482	426	298	190
20	322	305	520	1,500	1,350	352	245	3,320	680	398	298	190
21	330	305	492	1,360	2,380	361	210	d6,860	1,350	5,390	311	200
22	356	398	a509	1,480	1,380	405	210	4,400	856	2,660	311	200
23	356	655	e2,055	1,820	1,300	663	200	3,270	595	1,490	298	210
24	390	721	3,040	2,760	746	510	205	1,940	812	928	320	224
25	475	636	3,900	7,260	928	412	238	702	3,580	746	252	343
26	305	926	5,260	7,010	1,280	370	289	702	2,570	454	252	343
27	390	904	7,710	7,040	1,630	412	510	646	2,030	370	256	384
28	356	904	6,260	7,710	1,670	210	561	510	1,560	468	256	384
29	339	492	4,810	7,790	1,040	384	527	361	856	510	256	426
30	390	.....	3,750	8,090	834	454	510	273	4,460	468	242	595
31	322	.....	2,960	.....	468	.....	510	245	.....	426	.....	790

[a] January 1 to March 22, and November 27 to December 31, from ice curve.
[b] Record not available.
[c] May 1 to November 26 from curve for obstructed channel.
[d] Estimated; above curve.
[e] March 23 to April 30, inclusive, from curve for unobstructed channel.

Estimated monthly discharge of West Canada Creek at Twin Rock Bridge, N. Y., for 1904.

[Drainage area, 364 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January, 22 days	750	220	348	0.956	0.782
February	926	220	505	1.39	1.50
March	7,710	424	1,808	4.97	5.73
April	9,640	1,360	4,013	11.00	12.28
May	6,140	468	2,553	7.01	8.08
June	5,510	210	795	2.18	2.43
July	1,420	200	473	1.30	1.50
August	6,860	190	984	2.70	3.11
September	4,460	210	1,019	2.80	3.12
October	5,390	370	1,160	3.19	3.68
November	482	242	319	.876	.978
December	790	170	278	.764	.881

EAST CANADA CREEK AT DOLGEVILLE, N. Y.

This creek rises in Hamilton County, flows southward between Herkimer and Fulton counties, and empties into Mohawk River at East Creek. A portion of the stream and drainage area is included on the Little Falls sheet of the United States Geological Survey Topographic Atlas. Observations are taken at High Falls, near Dolgeville, about 7 miles from the outlet of the stream. The gaging station is located at the dam of the Herkimer County Light and Power Company. Readings of the depth on the crest are taken from a vertical gage board attached to the bulkhead, 6 feet upstream, twice each day by Willard Hayward. The mean of the readings is used in computing the discharge. A record is also kept of the run of the water wheels and the elevation of water in the tailrace.

The dam is of rubble masonry 19 feet high and has a flat crest 6 feet in width and 190.25 feet long between abutments. The elevation of the upstream edge of the crest is 1 foot below that of the lip. The impounded water is conducted to the power house, 500 feet below the dam, through a wrought-iron flume 10 feet in diameter. The record since January 1, 1903, has been computed from a discharge curve based on United States Geological Survey experiments on a full-sized model of the dams made at Cornell University. The flow through the turbines for this period has also been computed from current-meter

measurements made in the tailrace of the electric-power plant, instead of from the manufacturers' rating tables for the water wheels, as formerly. The turbines are of a special Victor cylinder gate type; the two main wheels are each 36 inches in diameter and their speed is controlled by Lombard governors. Spruce Creek is the principal tributary of East Canada Creek. It enters East Canada Creek 1 mile above Dolgeville and drains an area of 50 square miles. Water is diverted from this stream at Diamond Hill and from Beaver Creek, one of its tributaries, and is carried to Little Falls through a vitrified conduit 9 miles in length. The water supply of Dolgeville is taken from Cold Brook, a tributary of East Canada Creek. No allowance for diversion for water supply has been made in computing the run-off for East Canada Creek.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Mean daily discharge, in second-feet, of East Canada Creek at Dolgeville, N. Y., for 1903 and 1904.

Day.	Jan.[a]	Feb.[a]	Mar.[a]	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1	669	1,530	3,020	2,510	415	95	1,510	250	736	174	283	93
2	826	1,630	2,320	2,080	394	99	1,220	246	578	182	277	162
3	917	1,130	1,970	2,110	297	80	815	185	457	149	232	219
4	1,210	1,160	1,560	2,590	263	80	662	355	347	97	214	159
5	881	1,640	1,140	1,840	306	100	527	1,250	245	974	196	177
6	939	1,300	1,010	1,500	95	85	561	913	[b]180	827	405	177
7	752	1,120	991	1,740	257	38	566	938	.....	523	298	151
8	667	865	1,030	2,660	217	112	561	657	229	861	257	129
9	573	641	3,290	2,080	252	199	428	673	123	5,580	262	175
10	583	623	3,200	2,080	[b]38	422	258	1,020	196	5,970	221	183
11	474	643	7,120	1,760	191	179	182	769	152	3,040	185	201
12	434	1,720	5,530	1,450	191	1,290	175	1,240	124	1,760	196	191
13	516	1,710	4,390	1,280	129	1,740	116	913	(b)	1,220	207	215
14	435	1,440	3,600	1,100	125	1,190	124	716	126	833	196	171
15	414	1,220	3,090	1,030	110	1,050	175	428	149	785	233	216
16	319	886	2,870	988	105	675	248	342	163	633	281	177
17	406	628	2,470	889	[b]66	605	219	307	112	523	571	202
18	409	591	2,290	788	121	671	190	177	172	1,770	852	175
19	229	485	2,770	741	139	694	296	211	121	1,320	557	199
20	287	583	3,530	696	105	578	363	533	[b]117	994	587	247
21	338	825	4,690	644	109	1,500	426	461	124	664	455	676
22	1,030	864	4,640	600	109	1,940	440	304	119	625	397	694
23	860	724	5,510	596	109	2,640	661	140	127	546	432	535
24	683	746	6,610	596	[b]66	3,610	724	159	125	500	384	478
25	595	600	4,130	557	125	1,800	465	740	134	423	371	368
26	851	478	2,720	510	95	1,970	384	2,200	120	381	329	400
27	468	378	2,080	510	101	1,420	390	1,480	[b]125	364	148	276
28	634	1,040	1,920	447	95	979	263	1,120	134	364	210	238
29	669	.....	1,580	447	95	914	248	954	134	412	163	220
30	1,290	.....	379	415	65	834	390	1,000	123	387	137	236
31	1,300	.....	2,810	.....	[b]61	.....	316	863	.....	222	.....	238

[a] Approximate. [b] Sunday.

Mean daily discharge, in second-feet, of East Canada Creek at Dolgeville, N. Y., for 1903 and 1904—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1904.												
1	170	121	165	1,310	3,870	334	288	188	160	1,590	344	172
2	207	135	225	1,510	3,040	297	272	261	160	1,020	314	143
3	189	145	235	1,700	3,040	297	221	266	271	731	279	105
4	195	133	428	1,430	2,930	267	206	188	418	712	871	70
5	194	124	425	1,610	2,590	408	216	150	344	504	647	162
6	158	146	415	1,610	2,080	688	221	203	261	450	450	143
7	196	189	423	1,860	1,600	616	252	151	225	302	204	134
8	171	313	673	2,920	1,300	408	216	144	188	307	245	166
9	174	356	808	4,790	1,060	1,420	146	155	176	241	243	137
10	229	363	808	5,440	838	1,300	189	188	165	862	223	121
11	160	335	761	4,090	766	804	184	133	166	2,380	225	59
12	178	311	665	3,120	476	547	166	123	145	1,659	223	121
13	185	306	596	2,310	394	413	307	123	150	1,179	251	137
14	174	273	492	1,780	352	362	199	21	160	920	276	167
15	177	257	359	1,420	579	325	151	123	385	751	215	157
16	146	177	341	1,300	999	381	162	128	283	523	223	178
17	114	206	364	1,040	843	289	164	122	266	441	158	137
18	124	165	291	999	650	242	795	160	126	435	121	74
19	132	178	282	920	650	206	325	149	166	419	132	140
20	150	183	292	726	847	174	162	3,103	162	412	131	140
21	164	183	297	771	775	216	141	2,737	329	4,229	168	125
22	188	179	282	722	608	247	136	1,481	183	3,681	162	148
23	176	241	626	1,250	519	199	131	1,574	161	1,990	149	180
24	129	241	950	2,040	496	151	107	1,039	283	1,293	157	78
25	158	215	1,330	3,970	493	141	167	688	809	901	162	98
26	160	195	1,910	3,680	493	136	245	576	1,255	773	141	76
27	183	212	2,330	3,390	498	141	245	165	867	1,782	136	173
28	172	233	2,170	4,470	530	155	266	274	828	646	98	1,285
29	167	187	1,650	4,100	509	155	736	245	809	494	516	1,062
30	160	.....	1,480	4,020	334	221	432	240	1,988	431	150	867
31	147	.....	1,440	.....	371	.....	297	175	.....	353	.....	896

Estimated monthly discharge of East Canada Creek at Dolgeville, N. Y., for 1903 and 1904.

[Drainage area, 256 square miles.]

Month.	Discharge in second-feet.			Run-off.		Rainfall.[c]
	Maximum.	Minimum.[a]	Mean.	Second-feet per square mile.	Depth in inches.	Inches.
1903.						
January	1,300		[b]666	2.60	3.00	2.30
February	1,720		[b]971	3.79	3.95	2.38
March	7,120		[b]3,041	11.88	13.70	6.75
April	2,660		1,241	4.85	5.41	1.63
May	415		156	.610	.703	.18
June	3,610		920	3.59	4.01	8.68
July	1,510		448	1.75	2.02	5.71
August	2,200		695	2.71	3.12	7.26
September	736		187	.730	.814	1.30
October	5,970		1,068	4.17	4.81	8.34
November	852		318	1.24	1.38	2.10
December	694		257	1.00	1.15	1.57
The year					44.12	48.20
1904.						
January	229		169	.660	.761	
February	363		217	.848	.915	
March	2,330		758	2.96	3.41	
April	5,440		2,343	9.15	10.21	
May	3,870		1,114	4.35	5.02	
June	1,420		385	1.50	1.67	
July	795		250	.977	1.13	
August	3,103		493	1.93	2.23	
September	1,988		396	1.55	1.73	
October	4,229		1,046	4.09	4.72	
November	871		254	.992	1.11	
December	1,285		247	.965	1.11	
The year	5,440		639	2.50	33.91	

[a] One day minimum controlled by pondage.
[b] Approximate, owing to ice obstruction.
[c] At Salisbury Inlet.

SCHOHARIE CREEK AT PRATTSVILLE, N. Y.

Schoharie Creek above Prattsville drains a rugged mountainous area almost entirely wooded. The watershed, embracing an area of 243 square miles, lies wholly within Greene County. The basin is surrounded by continuous mountain ranges, and intervening ridges divide the main stream from its principal tributaries, Batavia Kill, East Kill, and West Kill. A gaging station was established at the highway bridge in the village of Prattsville, November 7, 1902, by C. C. Covert; the gage datum is referred to the United States Geological Survey bench mark, an "O" marked on a bowlder on the right-hand end of the bridge on the downstream side; elevation 1,151 feet. A 15-foot weight and wire gage, having a boxed horizontal scale, is attached to the steel floor beams of the bridge on the upstream side. The elevation of the water surface when the gage reads zero is 1,130.03. The bridge has a single span of 185 feet. In extreme low water the current underneath the bridge is sluggish and meter measurements are made by fording the stream a short distance below the bridge. The great freshet of October 9–11, 1903, apparently changed the stream bed and cross section in the vicinity of the gage. Measurements made during 1903 and 1904 have been applied toward the construction of a new rating curve.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Discharge measurements of Schoharie Creek at Prattsville, N. Y., in 1904.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Sq. feet.	*Feet per sec.*	*Feet.*	*Sec.-feet.*
July 1	R. E. Horton	404	0.71	5.00	287
September 21	C. C. Covert	269	.26	4.45	71
September 21	do	65	1.08	4.45	[a]70
October 23	C. C. Covert and E. F. Weeks.	775	1.50	6.16	1,117
October 23	do	693	1.44	6.00	998
October 24	do	682	1.11	5.72	756

[a] Wading below station.

Mean daily gage height, in feet, of Schoharie Creek at Prattsville, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.56	5.34	5.85	5.59	6.42	5.61	5.00	4.50	4.35	4.60	4.80	5.10
2	5.56	5.21	5.70	7.39	6.09	5.21	4.65	4.50	4.35	4.50	4.80	5.10
3	5.96	5.71	7.55	6.14	5.88	4.98	4.52	4.50	4.35	4.45	4.75	5.35
4	5.96	5.81	5.95	5.76	5.68	4.95	4.48	4.50	4.30	4.40	4.70	5.40
5	5.96	5.76	5.50	5.64	5.58	4.78	4.40	4.45	4.50	4.40	4.68	5.40
6	5.96	6.21	5.35	5.79	5.43	4.83	4.35	4.40	4.42	4.40	4.70	5.30
7	5.96	8.36	8.23	5.94	5.33	5.13	4.38	4.38	4.35	4.25	4.70	5.20
8	5.86	6.85	7.75	5.89	5.23	5.05	4.38	4.32	4.35	4.35	4.70	5.15
9	5.86	5.90	6.15	6.49	5.23	7.58	4.32	4.30	4.35	4.28	4.70	5.10
10	5.71	5.55	5.65	6.74	5.18	6.78	4.32	4.70	4.35	4.32	4.70	4.80
11	5.64	5.30	5.55	6.24	5.18	5.93	4.40	4.95	4.35	4.35	4.70	4.70
12	5.58	5.27	5.40	5.99	5.11	5.57	4.40	4.80	4.32	4.62	4.70	4.90
13	5.51	5.70	5.20	5.74	5.03	5.35	4.40	4.70	4.30	4.90	4.70	4.90
14	5.51	5.80	5.25	5.56	5.01	5.27	4.35	4.70	4.32	4.80	4.78	4.60
15	5.51	5.55	5.07	5.42	5.28	5.12	4.32	4.70	4.52	4.70	5.00	4.25
16	5.48	5.55	5.05	5.32	5.88	5.00	4.35	4.65	4.95	4.65	4.85	4.40
17	5.46	5.55	5.05	5.26	5.61	4.92	4.30	4.62	4.68	4.60	4.80	4.90
18	5.46	5.50	5.00	5.22	5.43	4.82	4.72	4.60	4.48	4.60	4.75	5.00
19	5.44	5.55	5.05	5.34	5.18	4.74	4.68	4.52	4.40	4.55	4.80	5.10
20	5.36	5.85	5.65	5.19	5.68	4.72	4.40	4.75	4.30	4.50	4.90	5.10
21	5.36	5.83	5.20	5.19	5.58	4.70	4.35	4.98	4.42	8.90	5.55	5.10
22	5.38	6.95	5.46	5.14	5.33	4.62	4.40	4.85	4.35	7.50	6.00	5.10
23	7.88	6.00	6.74	5.14	5.21	4.62	4.35	4.70	4.28	6.15	5.70	5.18
24	6.61	5.95	6.04	5.09	5.21	4.57	4.30	4.60	4.30	5.72	5.50	5.90
25	5.76	5.85	6.52	5.22	5.13	4.52	4.35	4.50	4.38	5.45	5.45	5.65
26	5.54	5.70	8.54	6.44	5.21	4.47	4.40	4.48	4.38	5.30	5.15	5.40
27	5.36	5.85	6.92	6.09	5.68	4.42	4.35	4.40	4.40	5.20	5.10	6.57
28	5.31	5.85	6.24	8.49	5.28	4.42	4.35	4.40	4.40	5.10	5.10	7.68
29	5.36	5.75	5.64	7.69	5.13	4.42	5.20	4.40	4.40	5.09	5.15	5.92
30	5.26	.....	5.44	6.69	5.23	4.52	4.75	4.40	4.60	5.00	5.10	5.60
31	5.26	.....	5.46	.....	5.48	.....	4.60	4.35	.....	4.95	.....	5.50

Rating table for Schoharie Creek at Prattsville, N. Y., from November 9, 1902, to October 10, 1903.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
4.60	8	6.50	997	8.40	3,780	10.30	9,200
4.70	27	6.60	1,100	8.50	3,970	10.40	9,600
4.80	48	6.70	1,210	8.60	4,212	10.50	10,000
4.90	74	6.80	1,330	8.70	4,454	10.60	10,400
5.00	103	6.90	1,455	8.80	4,696	10.70	10,800
5.10	135	7.00	1,580	8.90	4,938	10.80	11,200
5.20	168	7.10	1,710	9.00	5,180	10.90	11,600
5.30	208	7.20	1,840	9.10	5,440	11.00	12,000
5.40	252	7.30	1,980	9.20	5,700	11.10	12,460
5.50	305	7.40	2,120	9.30	5,960	11.20	12,920
5.60	350	7.50	2,270	9.40	6,220	11.30	13,380
5.70	404	7.60	2,420	9.50	6,480	11.40	13,840
5.80	462	7.70	2,570	9.60	6,784	11.50	14,300
5.90	523	7.80	2,730	9.70	7,088	11.60	14,840
6.00	590	7.90	2,890	9.80	7,392	11.70	15,380
6.10	660	8.00	3,060	9.90	7,696	11.80	15,920
6.20	733	8.10	3,230	10.00	8,000	11.90	16,460
6.30	815	8.20	3,410	10.10	8,400	12.00	17,000
6.40	904	8.30	3,590	10.20	8,800		

Logarithmic extension used above 8.0 feet gage height.

Rating table for Schoharie Creek at Prattsville, N. Y., from October 11, 1903, to December 31, 1904.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
4.15	0	4.90	245	6.00	975	7.10	2,260
4.20	12	5.00	285	6.10	1,070	7.20	2,390
4.25	24	5.10	345	6.20	1,170	7.30	2,540
4.30	36	5.20	405	6.30	1,270	7.40	2,680
4.35	48	5.30	465	6.40	1,370	7.50	2,830
4.40	61	5.40	525	6.50	1,470	7.60	2,990
4.45	73	5.50	585	6.60	1,600	7.70	3,150
4.50	85	5.60	663	6.70	1,720	7.80	3,300
4.60	125	5.70	741	6.80	1,850	7.90	3,460
4.70	165	5.80	819	6.90	1,970	8.00	3,620
4.80	205	5.90	897	7.00	2,100		

Mean daily discharge, in second-feet, of Schoharie Creek at Prattsville, N. Y., 1902–1904

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1902.												
1												168
2												168
3												300
4												350
5												310
6												300
7												300
8												300
9											252	276
10											252	252
11											252	230
12											252	208
13											230	168
14											208	168
15											208	168
16											208	168
17											208	2,350
18											208	1,840
19											168	718
20											168	590
21											168	556
22											168	5,960
23											135	1,980
24											135	923
25											230	696
26											276	625
27											252	523
28											325	492
29											208	474
30											208	416
31												416
1903.												
1	366	556	2,610	1,120	188	38	433	97	1,710	88	345	285
2	377	393	1,190	718	176	38	340	74	733	97	285	345
3	682	1,160	833	718	176	38	252	74	462	88	265	345
4	774	1,330	675	860	168	38	168	80	325	88	255	345
5	492	774	639	660	161	38	168	474	290	88	245	330
6	404	625	625	590	135	31	168	492	290	103		265
7	404	625	523	590	135	31	161	450	252	97	275	245
8	393	523	815	696	135	31	135	276	243	733	255	245
9	377	492	2,080	1,580	135	61	109	208	188	(a)	255	235
10	377	433	1,580	904	119	44	103	217	168	7,390	245	205
11	404	404	3,320	696	129	74	103	176	176	3,685	235	205
12	404	1,460	1,910	590	103	2,850	88	168	168	2,050	235	205
13	377	733	1,310	511	97	1,840	74	142	142	1,530	225	205
14	377	462	1,050	462	103	815	74	135	142	1,170	205	936
15	404	416	1,310	1,270	103	1,910	74	103	109	936	205	819
16	404	660	1,050	950	103	1,840	61	103	135	741	215	741
17	377	696	923	860	88	860	61	103	142	682	540	741
18	377	(b)	774	696	74	625	69	103	511	702	800	663
19	377		696	577	74	462	88	103	276	682	975	663
20	377		660	492	61	377	103	1,050	168	570	702	2,830
21	404		749	450	61	1,645	377	815	161	496	465	2,610

a Above rating curve. b Frozen.

Mean daily discharge, in second-feet, of Schoharie Creek at Prattsville, N. Y., etc.—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
22	450	.....	3,410	393	61	1,520	340	696	135	465	405	1,220
23	361	.....	7,315	252	61	1,190	217	646	129	435	420	819
24	377	.....	3,780	350	61	2,460	161	511	119	450	405	741
25	355	.....	1,910	300	48	1,270	109	556	109	435	390	721
26	590	.....	1,270	300	48	815	97	696	103	420	435	624
27	523	.....	886	276	48	556	80	416	103	390	465	495
28	815	.....	660	243	48	433	74	860	119	390	.....	525
29	.....	.....	625	217	48	462	80	4,575	109	390	405	570
30	2,340	.....	523	200	48	718	142	2,770	103	360	315	682
31	749	.....	2,270	.....	44	.....	109	2,650	.....	345	.....	663
1904.												
1	624	495	(a)	663	1,400	663	285	85	48	125	205	345
2	624	(a)	.....	2,680	1,070	405	145	85	48	85	205	345
3	936	.....	.....	1,120	878	275	95	85	48	73	185	495
4	(a)	.....	.....	780	721	265	79	85	36	61	165	525
5	.....	.....	.....	702	643	195	61	73	85	61	155	525
6	.....	.....	.....	819	540	215	48	61	67	61	165	465
7	.....	.....	.....	936	480	360	54	54	48	24	165	405
8	.....	.....	.....	897	420	315	54	42	48	48	165	375
9	.....	.....	.....	1,470	420	2,950	42	36	48	31	165	345
10	.....	.....	.....	1,750	390	1,820	42	165	48	42	165	205
11	.....	.....	.....	1,220	390	917	61	265	48	48	165	165
12	.....	.....	.....	975	345	643	61	205	42	135	165	245
13	.....	.....	.....	780	300	495	61	165	36	245	165	245
14	.....	.....	.....	624	285	450	48	165	42	205	195	125
15	.....	.....	.....	540	450	360	42	165	95	165	285	24
16	.....	.....	.....	480	878	285	48	145	265	145	225	61
17	.....	.....	.....	435	663	255	36	135	155	125	205	245
18	.....	.....	.....	420	540	215	175	125	79	125	185	285
19	.....	.....	.....	495	390	185	155	95	61	105	205	345
20	.....	.....	(a)	405	721	175	61	185	36	85	245	345
21	.....	.....	405	405	643	165	48	275	67	(b)	624	345
22	(a)	.....	555	375	480	135	61	225	48	2,830	975	345
23	3,420	.....	1,780	375	405	135	48	165	31	1,120	741	390
24	1,600	.....	1,000	345	405	115	36	125	36	760	585	897
25	780	.....	1,500	420	360	95	48	85	54	555	555	702
26	624	.....	(b)	1,420	405	79	61	79	54	465	375	525
27	495	.....	2,010	1,070	721	67	48	61	61	405	345	1,560
28	465	.....	1,220	(b)	450	67	48	61	61	345	345	3,110
29	495	.....	702	3,150	360	67	405	61	61	285	375	917
30	435	.....	555	1,720	420	95	185	61	125	285	345	663
31	435	.....	555	.....	570	.....	125	48	.....	265	.....	585

a Stream frozen over; no record.

b Above rating table.

Estimated monthly discharge of Schoharie Creek at Prattsville, N. Y., 1902–1904.

[Drainage area, 240 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1902.					
November, 22 days	325	135	214	0.892	0.730
December	5,960	168	722	3.01	3.47
1903.					
January, 30 days	2,340	361	516	2.15	2.40
February, 17 days	1,460	393	691	2.88	1.82
March	7,315	523	1,547	6.45	7.44
April	1,580	200	617	2.57	2.87
May	188	44	98	.408	.470
June	2,850	31	770	3.21	3.58
July	433	61	149	.621	.716
August	4,575	74	639	2.66	3.07
September	1,710	103	261	1.09	1.22
October, 30 days	(a)	88	870	3.62	4.17
November, 28 days	975	205	374	1.56	1.62
December	2,830	205	662	2.76	3.18
1904.					
January, 12 days[b]	3,420	435	911	3.80	1.70
February[b]					
March, 10 days[b]	(a)	405	1,028	4.28	1.59
April, 29 days	(a)	345	947	3.95	4.26
May	1,400	285	553	2.30	2.65
June	3,070	67	415	1.73	1.93
July	405	36	89	.371	.428
August	275	36	118	.492	.567
September	265	31	66	.275	.307
October, 30 days	(a)	24	310	1.29	1.44
November	975	155	302	1.26	1.41
December	3,110	24	521	2.17	2.50

[a] Above rating table. [b] Stream frozen over January 4 to 22 and February 2 to March 20.

BATAVIA KILL NEAR PRATTSVILLE, N. Y.

Batavia Kill enters Schoharie Creek just above Prattsville. The gaging of this stream at Windon near the headwaters was made September 10, 1903, by F. H. Tillinghast. The discharge was 21 second-feet.

CATSKILL CREEK AT SOUTH CAIRO, N. Y.

The drainage basin of this stream receives the run-off from the north slope of the Catskill Range, and lies, for the most part, in the timbered highlands of Greene County. The stream enters tide water of Hudson River at Catskill. The topography of the drainage area is shown on the Durham, Coxsackie, and Catskill sheets of the United States Geological Survey Topographic Atlas. The stream flows over a rock bed through much of its course. The slopes of the drainage basin are precipitous; there are no lakes and little artificial storage.[a] The gaging station, which was established July 4, 1901, is located at the highway bridge in the village of South Cairo. The bridge has a single span of 194.5 feet between abutments. The stream channel is rock overlain in some places with earth. The stream stage is observed each morning and night from a weight and chain gage which is attached to the bridge, and whose elevation is referred to a "0" near outer corner on upstream side of bridge seat on right-hand abutment. The elevation of bench mark is assumed to be 100 feet, the elevation of water surface when gage reads zero is 78.71 feet. Special discharge measurements have been made in the winter to determine the calibration curve for the stream cross section in the presence of ice; a correction coefficient to be applied to the measured discharge as taken at 0.6 depth has also been obtained by means of numerous vertical-velocity curves. The erection of a dam a short distance below the gage for purposes of boating necessitates withholding a portion of the record for 1904 until additional measurements can be made.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Discharge measurements of Catskill Creek at South Cairo, N. Y., in 1904.

Date.	Hydrographer.	Area.	Mean velocity.	Gage height.	Discharge.[b]
		Sq. feet.	*Feet per sec.*	*Feet.*	*Second-feet.*
June 28[c]	R. E. Horton	45	1.10	2.62	50
September 16	Covert and Swancott	272	.32	2.90	88

[a] Water power of this stream is described in Report on Stream Gagings, contained in Supplement, Report of State Engineer and Surveyor of New York, 1902, pp. 260 to 264.
[b] Discharge affected by dam one-fourth mile below station.
[c] By wading 500 feet upstream.

Mean daily gage height, in feet, of Catskill Creek at South Cairo, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.[a]	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.29	4.56	3.50	5.24	5.04	3.38	3.00	2.45	2.30	2.40	3.10	3.65
2	4.17	4.46	3.45	7.19	4.59	3.23	2.80	2.40	2.20	2.40	3.00	3.35
3	4.32	4.31	3.50	5.69	4.54	3.23	2.50	2.40	2.10	2.40	2.90	3.20
4	4.17	4.66	5.55	4.59	4.39	3.13	2.50	2.40	2.40	2.40	2.80	3.30
5	4.17	4.56	6.05	4.74	4.18	4.23	2.55	2.40	2.20	2.50	2.85	3.25
6	4.12	4.26	5.40	4.84	4.03	3.58	2.40	2.40	2.20	2.40	2.90	3.10
7	4.07	4.28	8.20	4.94	3.88	3.43	2.35	2.30	2.20	2.40	2.90	3.00
8	3.92	6.98	7.90	4.89	3.73	3.83	2.30	2.30	2.30	2.40	2.80	2.90
9	3.87	4.51	5.85	5.29	3.58	9.15	2.40	2.40	2.30	2.30	2.70	3.00
10	3.82	4.86	4.83	5.24	3.53	6.75	2.50	2.40	2.30	2.30	2.70	2.75
11	3.72	4.58	4.20	4.89	3.48	5.25	2.40	2.50	2.30	2.40	2.60	2.40
12	3.62	4.31	4.30	4.69	3.33	4.67	2.40	2.60	2.30	2.50	2.60	2.20
13	3.57	3.52	4.20	4.49	3.28	4.17	2.30	2.45	2.20	2.60	2.60	2.30
14	3.47	4.24	4.30	4.29	3.13	4.02	2.30	2.45	2.30	2.70	3.00	2.40
15	3.52	4.08	3.90	4.14	3.28	3.92	2.30	2.50	3.10	2.60	3.00	2.40
16	3.47	4.01	3.65	4.09	4.51	3.72	2.30	2.40	2.70	2.50	3.40	2.60
17	3.36	3.88	3.20	4.19	4.13	3.52	2.30	2.35	2.50	2.50	3.40	2.75
18	3.36	3.86	3.80	4.39	3.88	3.42	2.45	2.40	2.30	2.50	3.40	2.65
19	3.36	4.01	3.90	4.59	4.08	3.27	2.40	2.40	2.30	2.50	3.35	2.70
20	3.36	3.88	5.20	4.14	4.13	3.02	2.40	2.30	2.30	2.60	3.15	2.80
21	3.36	3.61	5.05	3.89	3.88	2.92	2.40	2.30	2.30	4.75	3.80	2.80
22	3.44	4.26	4.95	3.89	3.63	2.92	2.30	2.30	2.30	5.30	4.70	2.80
23	5.14	4.87	7.10	3.94	3.48	2.92	2.30	2.40	2.30	4.55	4.60	3.00
24	5.26	4.73	6.40	3.84	3.33	2.72	2.20	2.40	2.30	4.15	4.60	3.10
25	4.51	3.90	6.80	3.94	3.23	2.62	2.30	2.40	2.30	3.95	4.45	3.10
26	4.36	3.63	8.35	3.94	3.73	2.62	2.30	2.40	2.20	3.80	4.05	3.20
27	4.54	3.50	7.35	4.32	4.23	2.52	2.40	2.35	2.30	3.70	3.85	3.40
28	4.96	3.30	5.55	8.54	3.63	2.52	2.40	2.30	2.30	3.60	3.80	6.15
29	4.96	3.35	4.40	6.76	3.33	2.50	2.75	2.20	2.30	3.35	3.80	4.90
30	4.96	.....	4.60	5.79	3.33	2.70	2.60	2.20	2.45	3.20	3.90	4.00
31	4.96	.....	4.59	.....	3.48	.....	2.55	2.20	.....	3.10	.....	3.80

[a] After June 1 gage heights affected by dam below station.

Rating table for Catskill Creek at South Cairo, N. Y., for open section from July 4, 1901, to June 1, 1904.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
2.20	16	4.20	401	6.40	1,900	10.40	11,764
2.30	20	4.30	449	6.60	2,106	10.60	12,700
2.40	24	4.40	498	6.80	2,328	10.80	13,700
2.50	28	4.50	546	7.00	2,550	11.00	14,700
2.60	37	4.60	602	7.20	2,822	11.20	15,780
2.70	45	4.70	657	7.40	3,094	11.40	16,860
2.80	55	4.80	712	7.60	3,406	11.60	18,000
2.90	63	4.90	768	7.80	3,758	11.80	19,200
3.00	72	5.00	824	8.00	4,110	12.00	20,400
3.10	88	5.10	885	8.20	4,562	12.20	21,920
3.20	104	5.20	946	8.40	5,014	12.40	23,440
3.30	120	5.30	1,006	8.60	5,498	12.60	25,000
3.40	136	5.40	1,067	8.80	6,014	12.80	26,600
3.50	152	5.50	1,128	[a] 9.00	6,530	13.00	28,200
3.60	182	5.60	1,206	9.20	7,178	13.50	34,000
3.70	213	5.70	1,285	9.40	7,826	14.00	39,800
3.80	243	5.80	1,363	9.60	8,524	14.50	45,600
3.90	274	5.90	1,442	9.80	9,272	15.00	51,400
4.00	304	6.00	1,520	10.00	10,020	15.50	57,200
4.10	352	6.20	1,710	10.20	10,892	16.00	63,000

[a] Extension by logarithmic diagram above 9.1.

Mean daily discharge, in second-feet, of Catskill Creek at South Cairo, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	Day.	Jan.	Feb.	Mar.	Apr.	May.
1	[a]	[a]	[a]	970	848	17	.....	.....	104	396	367
2	.....	.....	.....	2,810	596	18	.....	.....	243	493	268
3	.....	.....	.....	1,280	568	19	.....	.....	274	596	338
4	.....	.....	1,170	596	493	20	.....	.....	946	372	367
5	.....	.....	1,570	679	391	21	.....	.....	854	270	268
6	.....	.....	1,070	735	318	22	.....	.....	796	270	192
7	.....	440	4,560	791	268	23	909	.....	2,690	286	149
8	.....	2,530	3,930	763	222	24	982	.....	1,900	255	125
9	.....	552	1,400	1,000	176	25	552	.....	2,330	286	109
10	.....	746	729	970	161	26	478	.....	4,900	286	222
11	.....	590	401	763	149	27	[a]	.....	3,030	459	415
12	.....	454	449	652	125	28	.....	.....	1,170	5,340	192
13	.....	158	401	541	117	29	.....	.....	498	2,280	125
14	.....	420	449	444	93	30	.....	.....	602	1,360	125
15	.....	343	274	372	117	31	.....	.....	596	.....	149
16	.....	[a]	198	348	552						

[a] Stream frozen over during remainder of month.

Estimated monthly discharge of Catskill Creek at South Cairo, N. Y., for 1904.

[Drainage area, 263 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January, 4 days [a]	982	478	730	2.78	0.414
February, 9 days [a]	2,530	158	693	2.64	0.884
March, 28 days [a]	4,900	104	1,340	5.10	5.31
April	5,340	255	889	3.38	3.77
May	848	93	278	1.06	1.22

[a] Stream frozen over during remainder of month.

ESOPUS CREEK NEAR OLIVEBRIDGE, N. Y.

A ⅞-inch wire cable, 168-feet span, was erected across the stream 300 feet above Bishops Falls, May 25, 1903. A cantilever was also projected 18 feet over the stream from an abandoned bridge abutment. Upon this a weight and chain gage was placed. The stream was observed twice each day by Jesse B. Boice. This station is located near the site of a proposed storage reservoir. The bed of the stream is rock and the banks bold. No overflow takes place. The gaging station is in the heart of a precipitous timber-covered mountain drainage basin. There is no storage control of the stream above. The bench mark is a chisel draft at upstream corner of the right-hand abutment of the abandoned bridge. The elevation of water surface when gage reads zero is 81.86. This station site was selected by, and the cableway erected for, the engineers of the New York Water-Supply Commission, to show the relation between the discharge at this point and at Kingston. Owing to the formation of a gravel bar at the mouth of a tributary entering at the cableway the record was discontinued in July, 1904.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Discharge measurements of Esopus Creek near Olivebridge, N. Y., in 1904.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.[a]
		Sq. feet.	*Feet per sec.*	*Feet.*	*Sec.-feet.*
June 30	R. E. Horton	158	1.11	1.35	143

[a] Gravel Island, upstream angle varies.

Mean daily gage height, in feet, of Esopus Creek near Olivebridge, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	1.82	1.94	1.71	3.19	2.96	1.66	17	2.36	1.76	1.79	2.16	2.03	1.87
2	1.78	1.72	1.77	3.35	2.67	1.70	18	2.38	1.77	1.90	2.09	2.02	1.73
3	1.77	1.82	2.12	2.96	2.50	1.81	19	2.36	1.88	1.97	2.04	2.11	1.67
4	1.72	1.74	2.20	2.63	2.38	1.67	20	2.42	1.89	2.25	1.96	2.30	1.67
5	1.70	1.79	1.93	2.57	2.26	1.61	21	2.48	1.85	2.09	1.94	2.16	1.64
6	1.72	1.77	1.87	2.49	2.18	1.61	22	2.74	1.86	2.07	1.90	2.06	1.61
7	2.08	2.86	3.25	2.67	2.10	1.96	23	3.60	2.34	2.65	1.86	2.01	1.56
8	2.56	3.18	4.45	2.81	2.02	1.94	24	2.68	2.09	2.77	1.84	1.97	1.50
9	2.60	2.52	3.27	3.49	1.97	3.20	25	2.28	1.94	3.05	1.91	1.94	1.47
10	2.66	2.30	2.78	3.55	1.91	3.15	26	2.20	1.81	5.21	2.07	1.93	1.41
11	2.62	2.26	2.53	3.08	1.89	2.49	27	2.12	1.91	4.03	2.12	1.88	1.35
12	2.62	2.10	2.33	2.81	1.81	2.25	28	1.97	1.87	3.15	3.89	1.80	1.81
13	1.94	2.07	2.25	2.61	1.76	2.06	29	2.04	1.77	2.75	3.78	1.70	1.31
14	2.50	2.04	2.12	2.44	1.72	1.99	30	1.97	.....	2.52	3.21	1.70	1.44
15	2.38	1.96	2.05	2.30	2.06	1.87	31	1.96	.....	2.42	.....	1.67	.....
16	2.38	1.78	1.97	2.27	2.20	1.87							

Rating table for Esopus Creek near Olivebridge, N. Y., from May 25, 1903, to June 30, 1904.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
1.00	55	2.30	815	3.60	2,610	4.90	5,100
1.10	81	2.40	911	3.70	2,770	5.00	5,320
1.20	107	2.50	1,010	3.80	2,940	5.10	5,560
1.30	138	2.60	1,140	3.90	3,100	5.20	5,790
1.40	173	2.70	1,280	4.00	3,270	5.30	6,030
1.50	208	2.80	1,420	4.10	3,460	5.40	6,260
1.60	263	2.90	1,550	4.20	3,650	5.50	6,500
1.70	318	3.00	1,690	4.30	3,840	5.60	6,760
1.80	381	3.10	1,840	4.40	4,030	5.70	7,020
1.90	453	3.20	1,990	4.50	4,220	5.80	7,280
2.00	525	3.30	2,140	4.60	4,440	5.90	7,540
2.10	622	3.40	2,290	4.70	4,660	6.00	7,800
2.20	718	3.50	2,440	4.80	4,880		

NOTE.—Discharge for gage heights above 5 feet from logarithmic extension of rating curve.

Mean daily discharge, in second-feet, of Esopus Creek near Olivebridge, N. Y., for 1903 and 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1903.												
1						60	815	124	1,975	117	307	323
2						68	622	110	1,392	112	301	318
3						65	482	104	970	112	296	285
4						39	453	155	796	97	285	323
5						52	410	1,140	622	112	381	381
6						55	340	670	511	115	323	323
7						52	307	699	439	104	241	219
8						117	268	475	367	892	274	213
9						152	252	395	329	(a)	274	208
10						84	230	367	296	7,020	274	235
11						124	201	307	252	3,202	263	274
12						3,940	183	381	235	2,110	257	307
13						2,290	187	285	230	1,446	241	1,406
14						1,662	152	252	208	1,080	230	603
15						2,290	141	219	187	931	230	439
16						1,840	131	246	176	737	252	439
17						1,308	97	241	489	660	796	410
18						1,010	99	208	544	853	1,080	367
19						815	208	187	323	699	853	279
20						853	159	1,080	263	670	680	1,676
21						3,202	252	641	230	603	583	2,706
22						2,260	180	453	208	544	564	1,480
23						2,220	345	410	201	544	535	980
24						3,460	219	374	180	518	503	825
25					94	2,290	173	352	169	511	446	815
26					81	1,480	152	381	159	388	359	825
27					60	1,080	134	307	159	367	340	482
28					73	796	127	395	166	352	352	467
29					68	1,088	110	7,072	145	345	296	395
30					68	931	145	3,992	131	340	329	446
31					68		148	3,308		312		403
1904.												
1	395	482	323	1,975	1,634	296	296					
2	367	329	359	2,220	1,238	398	190					
3	359	395	641	1,634	1,010	388	159					
4	329	340	718	1,182	892	301	145					
5	318	374	475	1,101	776	268						
6	329	359	431	1,000	699	268						
7	603	1,498	2,060	1,238	622	496						
8	1,088	1,960	4,120	1,433	544	482						
9	1,140	1,036	2,095	2,425	503	1,990						
10	1,224	815	1,392	2,520	460	1,920						
11	1,168	776	1,049	1,810	446	1,000						
12	1,168	622	844	1,433	388	766						
13	482	593	766	1,154	352	583						
14	1,010	564	641	951	329	518						
15	892	496	573	815	583	431						
16	892	367	503	786	718	431						
17	873	352	374	680	554	431						
18	892	359	453	612	544	334						
19	873	439	503	564	632	301						
20	931	446	766	496	815	301						

(a) Above rating table.

Mean daily discharge, in second-feet, of Esopus Creek near Olivebridge, N. Y., etc.—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1904.												
21	990	417	612	482	680	285						
22	1,336	424	593	453	583	268						
23	2,610	853	1,210	424	535	241						
24	1,252	612	1,378	410	503	208						
25	796	482	1,760	460	482	197						
26	718	388	5,814	593	475	176						
27	641	460	3,327	641	439	155						
28	503	431	1,920	3,084	381	388						
29	564	359	1,350	2,906	318	141						
30	503		1,036	2,005	318	187						
31	496		931		301							

Estimated monthly discharge of Esopus Creek near Olivebridge, N. Y., for 1903 and 1904.

[Drainage area, 242 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
May 25–31	94	60	73	0.302	0.079
June	3,940	39	1,189	4.91	5.48
July	815	97	249	1.03	1.19
August	7,072	104	817	3.38	3.90
September	1,975	131	412	1.70	1.90
October, 30 days	(a)	97	863	3.57	3.98
November	1,080	230	405	1.67	1.86
December	2,706	208	608	2.51	2.89
1904.					
January	2,610	318	830	3.43	3.95
February	1,960	329	587	2.43	2.62
March	5,814	323	1,259	5.20	6.00
April	3,084	410	1,250	5.17	5.77
May	1,634	301	605	2.50	2.88
June	1,990	141	472	1.95	2.18

a Above rating table.

ESOPUS CREEK AT KINGSTON, N. Y.

A gaging station was established at the Washington Street Bridge on Esopus Creek, in Kingston, N. Y., July 5, 1901. The stage of the stream has been observed twice each day from a chain and weight gage attached to the bridge. In winter and at times when the stream

was more or less obstructed by ice special discharge measurements were made from which a rating curve applicable to periods when the stream was frozen have been derived. This gives a considerably smaller discharge at a given stage of the stream than does a regular rating curve for the cross section derived from the measurements in open section.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Discharge measurements of Esopus Creek at Kingston, N. Y., in 1904.

Date.	Hydrographer.	Area.	Mean velocity.	Gage height.	Discharge.
		Sq. ft.	*Ft. per sec.*	*Feet.*	*Second-feet.*
June 20	R. E. Horton	255	0.84	4.72	214
September 15	Covert and Swancott	506	2.28	7.18	[a] 1,161
September 19	do	269	1.04	5.15	281

[a] Approximate; stream rising rapidly.

Mean daily gage height, in feet, of Esopus Creek at Kingston, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.61	7.41	7.26	10.85	9.35	5.44	6.27	4.32	4.37	4.82	5.58	5.52
2	7.41	6.16	7.26	11.48	8.60	5.40	5.18	4.32	4.30	4.58	5.48	5.50
3	6.71	7.01	7.36	10.13	8.05	5.80	4.85	4.28	4.31	4.50	5.38	5.55
4	6.26	6.96	9.45	9.08	7.70	5.50	4.74	4.29	4.81	4.52	5.30	5.88
5	6.71	6.81	8.15	8.62	7.37	5.31	4.65	4.19	4.70	4.32	5.25	5.40
6	6.69	6.73	7.74	8.41	7.09	5.30	4.62	4.22	4.57	4.32	5.32	5.32
7	6.89	7.46	9.26	8.53	6.85	6.72	4.66	4.09	4.36	4.38	5.32	5.42
8	6.83	12.17	18.23	8.92	6.63	6.27	4.65	4.11	4.29	4.30	5.15	5.30
9	6.71	9.85	14.85	10.07	6.46	12.14	4.59	4.19	4.30	4.25	5.10	5.29
10	6.81	8.99	12.18	10.89	6.32	11.14	4.48	4.21	4.31	4.28	5.10	4.90
11	6.71	8.51	10.95	9.82	6.19	6.63	4.48	6.25	4.29	4.35	5.02	4.80
12	6.46	8.31	10.00	9.03	6.06	7.91	4.45	5.04	4.09	4.42	4.98	4.74
13	6.36	7.86	9.10	8.47	5.92	7.23	4.45	4.76	4.24	4.90	4.90	5.12
14	6.41	7.76	8.65	8.00	5.82	6.79	4.34	4.62	4.44	4.88	5.80	5.00
15	6.37	7.56	8.25	7.62	5.92	6.46	4.30	4.46	7.22	4.70	5.65	4.88
16	6.26	7.41	7.80	7.52	7.28	6.19	4.28	4.42	6.54	4.54	5.62	5.18
17	6.16	6.99	7.40	7.22	6.83	5.93	4.33	4.26	5.68	4.50	5.72	5.12
18	5.99	6.86	7.60	7.09	6.62	5.71	4.59	4.36	5.33	4.60	5.52	5.08
19	5.79	6.92	7.10	6.86	6.73	5.50	4.88	4.52	5.14	4.58	5.42	5.12
20	5.81	6.82	7.78	6.72	7.45	5.40	4.58	5.06	4.90	4.50	5.35	5.15
21	5.76	6.72	8.39	6.58	7.01	5.29	4.36	6.11	4.80	11.29	5.88	5.12
22	6.11	7.91	8.04	6.41	7.67	5.16	4.26	5.44	4.68	13.84	6.40	5.02
23	7.96	9.73	9.02	6.27	6.45	5.01	4.28	5.31	4.62	9.09	6.25	5.05
24	10.91	8.51	9.74	6.17	6.31	5.10	4.23	5.13	4.59	8.42	6.18	5.15
25	9.41	8.09	9.95	6.21	6.08	4.95	4.10	4.83	4.52	7.20	6.12	5.80
26	8.61	7.46	14.63	6.58	6.11	4.75	4.40	4.83	4.50	6.82	5.95	5.48
27	8.26	7.41	13.66	6.75	6.11	4.70	4.33	4.65	4.55	6.55	5.70	5.45
28	7.76	7.33	10.50	9.60	5.75	4.69	4.33	4.57	4.52	6.25	6.00	10.50
29	7.66	7.31	9.20	11.53	5.58	4.70	4.18	4.47	4.50	6.02	5.92	9.65
30	7.76	.....	8.40	9.85	5.51	4.72	4.82	4.44	4.70	5.85	6.00	8.71
31	7.55	.....	8.28	.....	5.58	.....	4.51	4.37	.....	5.70	.....	8.18

Rating table for Esopus Creek at Kingston, N. Y., from July 5, 1901, to December 31, 1904.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
3.50	8	6.60	741	11.20	3,620	17.20	9,940
3.60	22	6.70	782	11.40	3,800	17.40	10,180
3.70	36	6.80	823	11.60	3,980	17.60	10,420
3.80	49	6.90	864	11.80	4,160	17.80	10,660
3.90	63	7.00	905	12.00	4,340	18.00	10,900
4.00	77	7.10	950	12.20	4,528	18.20	11,220
4.10	94	7.20	995	12.40	4,716	18.40	11,540
4.20	110	7.30	1,040	12.60	4,909	18.60	11,840
4.30	127	7.40	1,085	12.80	5,107	18.80	12,120
4.40	143	7.50	1,130	13.00	5,305	19.00	12,400
4.50	160	7.60	1,179	13.20	5,499	19.20	12,720
4.60	180	7.70	1,227	13.40	5,693	19.40	13,040
4.70	200	7.80	1,276	13.60	5,888	19.60	13,340
4.80	220	7.90	1,324	13.80	6,084	19.80	13,620
4.90	240	8.00	1,373	14.00	6,280	20.00	13,900
5.00	260	8.20	1,480	14.20	6,484	20.20	14,240
5.10	285	8.40	1,587	14.40	6,688	20.40	14,580
5.20	309	8.60	1,700	14.60	6,894	20.60	14,920
5.30	334	8.80	1,820	14.80	7,102	20.80	15,260
5.40	358	9.00	1,940	[a]15.00	7,310	21.00	15,600
5.50	383	9.20	2,074	15.20	7,522	21.50	16,500
5.60	412	9.40	2,208	15.40	7,734	22.00	17,400
5.70	441	9.60	2,348	15.60	7,950	22.50	18,350
5.80	469	9.80	2,495	15.80	8,170	23.00	19,300
5.90	498	10.00	2,642	16.00	8,390	23.50	20,300
6.00	527	10.20	2,797	16.20	8,666	24.00	21,300
6.10	562	10.40	2,952	16.40	8,942	24.50	22,350
6.20	596	10.60	3,112	16.60	9,204	25.00	23,400
6.30	631	10.80	3,276	16.80	9,452	25.50	24,500
6.40	665	11.00	3,440	17.00	9,700	26.00	25,600
6.50	700						

[a] Logarithmic extension above 15 feet.

Mean daily discharge, in second-feet, of Esopus Creek at Kingston, N. Y., for 1904.

Day.	Jan.[a]	Feb.[a]	Mar.[a]	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	955	868	808	3,320	2,170	368	620	130	138	224	406	389
2	868	450	808	3,870	1,700	358	304	130	127	176	378	383
3	608	707	848	2,740	1,400	469	230	123	128	160	353	397
4	476	690	1,960	1,990	1,230	383	208	125	222	164	334	492
5	608	641	1,220	1,710	1,070	335	190	108	200	130	321	[b]277
6	608	616	1,020	1,590	946	334	184	113	174	130	339	257
7	674	888	1,840	1,660	844	790	192	92	137	140	339	277
8	649	3,710	(c)	1,890	753	620	190	95	125	127	297	257
9	608	2,210	5,410	2,700	686	4,480	178	108	127	119	284	257
10	641	1,680	3,710	3,360	638	3,570	157	112	128	123	284	180
11	608	1,400	3,000	2,510	593	753	157	614	125	135	264	163
12	529	1,300	2,310	1,960	548	1,330	152	270	92	147	256	146
13	502	1,070	1,740	1,620	504	1,010	152	212	117	240	240	217
14	516	1,020	1,480	1,370	475	819	133	184	150	236	469	197
15	509	932	1,270	1,190	504	686	127	153	1,004	200	426	180
16	476	868	1,050	1,140	1,030	593	123	147	716	168	418	237
17	450	707	868	1,000	835	507	132	120	434	160	447	217
18	410	658	955	945	742	443	178	137	341	180	389	217
19	365	682	747	848	794	383	236	164	294	176	363	217
20	365	649	1,270	790	1,110	358	176	274	240	160	346	237
21	354	616	1,580	783	910	331	137	565	220	3,700	492	217
22	436	1,090	1,390	669	1,210	299	120	368	196	6,120	665	197
23	1,120	2,130	1,950	620	683	262	123	336	184	2,000	613	197
24	2,900	1,400	2,450	586	634	285	115	292	178	1,600	589	237
25	1,930	1,190	2,600	600	555	250	94	226	164	995	569	365
26	1,460	888	6,920	733	565	210	143	226	160	831	512	297
27	1,270	868	5,940	803	565	200	132	190	170	720	440	277
28	1,030	838	3,030	2,350	455	198	132	174	164	613	527	[d]2,660
29	978	828	2,070	3,910	406	200	107	155	160	534	504	2,050
30	1,030	.....	1,590	2,530	386	204	224	150	200	484	527	1,510
31	932	.....	1,520	.....	406	.....	162	138	.....	440	.....	1,240

[a] Record from January 1 to March 20 from ice curve.
[b] Record from December 5 to December 31, inclusive, from ice curve.
[c] Above rating table.
[d] Record approximate. Ice jam below bridge December 28 to 31.

Estimated monthly discharge of Esopus Creek at Kingston, N. Y., for 1904.

[Drainage area, 324.5 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January	2,900	354	802	2.47	2.85
February	3,710	450	1,089	3.36	3.62
March, 30 days	6,920	747	2,112	6.51	7.26
April	3,910	586	1,725	5.32	5.94
May	2,170	386	818	2.52	2.91
June	4,480	198	701	2.16	2.41
July	620	94	178	.549	.633
August	614	92	201	.619	.714
September	1,004	92	227	.700	.781
October	6,120	119	688	2.12	2.44
November	665	240	413	1.27	1.42
December	2,660	146	466	1.44	1.66

WAPPINGER CREEK NEAR WAPPINGER FALLS, N. Y.

This station was established at the first highway bridge crossing Wappinger Creek above the village of Wappinger Falls, May 19, 1903.

Observations of the stage of the stream on a graduated vertical scale attached to the central bridge pier are taken twice each day by Lee Jackson. Wappinger Creek is tributary to Hudson River. The drainage basin comprises a hilly plateau 400 to 600 feet above tide, nearly rectangular in shape, and including numerous small lakes and marsh areas. Winding branched tributaries gather the run-off from the numerous hills which dot the area. At a point about 16 miles from the mouth of the stream the basin becomes much narrower and the differences of elevation are of less magnitude. The stream flows near the right-hand side of a valley 3 to 4 miles in width, gradually descending to Wappinger Falls, where it makes a sudden descent to nearly tide-water level, the elevation of the Wappinger Pond being about 78 feet.[a]

Drainage areas of Wappinger Creek.

Location.	Area, place to place.	Total area, square miles.
East Branch of Wappinger Creek above Stanfordville	40.0	40.0
East Branch above junction with West Branch	67.4	107.4
West Branch above mouth	33.8	33.8
Total area of East and West branches		141.2
Wappinger Creek above Van Wagner's	33.8	175.0
Wappinger Creek above Central Falls	14.7	189.7
Wappinger Creek above gaging station	4.78	194.4
Wappinger Creek above Wappinger Falls	7.81	202.2
Wappinger Creek above mouth	13.7	215.9

The bridge from which the gagings are made has two spans of 43.4 feet and 46.5 feet, respectively. The channel of the stream is sand and gravel, with some bowlders. The stream is straight for a distance of about 250 feet above the bridge and about 300 feet downstream from the bridge. The bench mark is a spike in the root of blazed tree, south side of road, 50 feet east of bridge. Assumed elevation is 100.00 feet. Elevation above datum plane of gage is 90.81 feet. But little power is developed on the stream. At Wappinger Falls a bleaching and dyeing establishment utilizes 22 feet fall.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

[a] The drainage basin is shown on the Poughkeepsie, Rhinebeck, Millbrook, and Clove sheets of the United States Geological Survey Topographic Atlas, from which the drainage area as given has been determined.

Discharge measurements of Wappinger Creek near Wappinger Falls, N. Y., in 1904.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Sq. feet.	*Ft. per sec.*	*Feet.*	*Sec.-feet.*
June 29	R. E. Horton	151	0.57	0.45	86
September 17	Covert and Swancott	325	1.35	2.04	438

Mean daily gage height, in feet, of Wappinger Creek near Wappinger Falls, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.20	3.70	2.90	2.75	2.00	1.15	2.20	0.45	−0.10	0.90	0.90	1.00
2	2.20	3.70	2.75	3.20	1.80	1.00	1.55	.15	− .10	.92	.88	1.22
3	2.20	3.70	4.20	2.85	1.55	.95	1.10	.15	− .05	.80	.85	1.30
4	.....	3.70	6.95	2.55	1.50	.95	.85	.15	− .05	.75	.82	1.40
5	.....	3.70	5.00	2.20	1.45	.95	.85	.15	.00	.72	.80	1.38
6	.....	2.80	3.70	2.00	1.35	1.55	1.10	.15	− .05	.70	.80	1.35
7	.....	3.45	3.65	2.05	1.25	1.55	.80	.15	− .05	.65	.80	1.30
8	.....	4.85	8.60	2.05	1.15	1.40	.65	.15	.05	.62	.78	1.30
9	2.20	3.30	7.65	2.05	1.15	4.75	.55	.10	− .05	.60	.75	1.30
10	2.20	3.10	7.05	2.05	1.05	3.95	.55	.15	.10	.58	.72	1.30
11	.....	3.10	6.30	2.05	1.05	3.10	.60	.45	.15	.52	.70	1.30
12	.....	3.10	4.70	1.95	.95	2.25	.65	.90	.05	1.00	.70	1.30
13	.....	3.10	4.65	1.90	.90	1.90	.60	.60	− .05	1.42	.70	1.30
14	.....	3.10	2.95	1.80	.85	1.65	.50	.45	.85	1.15	1.00	1.30
15	.....	3.10	1.75	1.75	.85	1.50	.45	.25	3.00	.95	1.30	1.30
16	2.20	3.10	1.55	1.65	.85	1.30	.45	.15	2.85	.78	1.22	1.30
17	2.20	3.10	1.45	1.65	1.05	1.15	.45	.15	1.95	.75	1.18	1.30
18	2.20	3.10	1.45	1.55	1.20	1.00	.80	.15	1.48	.72	1.12	1.30
19	2.20	3.10	1.55	1.40	1.20	.96	1.20	.15	1.28	.70	.95	1.30
20	2.20	3.10	2.65	1.35	1.15	.85	.70	.25	1.08	.65	.90	1.30
21	2.20	3.10	2.40	1.25	1.05	.85	.55	.25	1.00	1.75	.82	1.30
22	2.20	3.20	2.10	1.15	.95	.75	.50	.40	.85	2.95	.72	1.30
23	2.40	4.45	2.55	1.05	.90	.70	.45	.15	.78	2.20	.65	1.30
24	5.15	4.20	2.70	1.05	.85	.65	.45	− .25	.72	1.72	.60	1.30
25	4.10	3.45	2.50	1.05	.85	.65	.43	− .20	1.12	1.52	.78	1.40
26	3.75	2.95	2.55	1.10	1.40	.65	.35	.10	1.25	1.42	.98	1.30
27	3.70	2.80	2.70	1.15	2.95	.55	.35	.05	1.18	1.38	.90	1.58
28	3.70	2.90	2.30	2.90	2.00	.50	.35	.05	1.00	1.25	1.22	4.40
29	3.70	3.30	1.85	2.85	1.25	.60	.35	.05	.98	1.12	1.25	4.05
30	3.30	.....	1.95	2.35	1.25	.90	.35	− .05	.95	1.00	1.18	3.50
31	3.70	.....	1.95	.....	1.35	.....	.45	.00	.....	.95	.....	3.20

CROTON RIVER AT OLD CROTON DAM, NEW YORK.

Croton River drains an area of rough, irregular topography situated east of Hudson River, to which it is tributary at Croton Landing. A gaging record has been maintained, beginning January, 1868, at the old Croton dam. The record includes the amount wasted over the dam and the diversion to New York City for municipal supply through Croton aqueduct.[a] The following table shows the monthly mean dis-

[a] Full description of methods of gaging, and results for the years 1868 to 1899, inclusive, may be found in Supplement, State Engineer's Report for 1902. Report on Gagings of the Volume of Discharge of Streams, by Robert E. Horton, hydrographer, pp. 290-299, inclusive.

charge at the Croton dam from July, 1901, to September, 1903, inclusive. The data given has been deduced from a table of yield in gallons per square mile per day, given in Report of New York Water Supply Commission, page 220. The drainage area above the old Croton dam is 338.8 square miles, comprising 3.6 per cent water surface.

Estimated monthly discharge of Croton River at old Croton dam, New York, 1901–1903.

[Drainage area, 339 square miles.]

Month.	Mean discharge in second-feet.	Gallons per square mile per day.	Run-off.	
			Second-feet per square mile.	Depth in inches.
1901.				
July	393	749,000	1.16	1.34
August	1,119	2,131,000	3.30	3.80
September	644	1,232,000	1.90	2.12
October	752	1,432,000	2.22	2.56
November	359	685,000	1.06	1.18
December	1,308	2,491,000	3.86	4.45
1902.				
January	1,166	2,223,000	3.44	3.97
February	803	1,529,000	2.37	2.47
March	2,962	5,638,000	8.74	10.08
April	922	1,759,000	2.72	3.03
May	515	982,000	1.52	1.75
June	241	458,000	.711	.793
July	220	422,000	.649	.748
August	183	352,000	.540	.623
September	170	322,000	.501	.559
October	654	1,246,000	1.93	2.22
November	451	860,000	1.33	1.48
December	1,484	2,827,000	4.38	5.05
The year	.....	.....	2.40	32.77
1903.				
January	1,050	1,998,000	3.10	3.57
February	1,156	2,202,000	3.41	3.54
March	1,776	3,380,000	5.24	6.04
April	1,027	1,957,000	3.03	3.38
May	210	399,000	.619	.714
June	956	1,818,000	2.82	3.15
July	454	867,000	1.34	1.54
August	454	867,000	1.34	1.54
September	549	1,051,000	1.62	1.81

MISCELLANEOUS MEASUREMENTS IN HUDSON RIVER DRAINAGE BASIN.

The following miscellaneous measurements were made in the Hudson River drainage basin during 1904, by R. E. Horton.

Miscellaneous measurements in Hudson River drainage basin.

Date.	Stream.	Locality.	Gage height.	Discharge.
			Feet.	*Second-feet.*
May 18	Nine Mile Creek	Powell Bridge near Oriskany, N. Y.	[a] 21.04	39
September 13	do	do	[a] 22.17	20
August 25	Champlain Canal feeder.	Glen Falls, N. Y.	[b] 9.57	302

[a] Distance of water surface below the top of the outer downstream tie bar, 15 feet from the left end of the bridge.
[b] Distance of water surface below the top stone of the bridge seat at the left end, downstream side.

PASSAIC RIVER DRAINAGE BASIN.

Passaic River rises in Somerset and Morris counties, N. J. Above its confluence with Pompton River, its main tributary, it meanders through a flat country of Triassic red sandstone, to which in large measure must be attributed the turbidity of its waters. In contrast with the sluggish, muddy character of the Passaic, the Pompton is a rapid stream and its waters are clear. It drains parts of Sussex, Passaic, and Morris counties, and traverses for a large part of its course a country of hard, crystalline rocks and heavy forests, the general level of which is several hundred feet above that of the Passaic. At their confluence the Pompton enters with a current which carries it well toward the right bank of the Passaic, and at times of flood causes much backwater in the latter.

The flow of Passaic River is of special interest from the fact that several large cities in its drainage basin take their public water supply from it, and because of the valuable water-power privileges along its course, particularly at the city of Paterson. Several cities, including Paterson and Passaic, throw their sewage into this stream, and in the lower part of its course it becomes so polluted as to be offensive to property holders along its banks and to seriously interfere with the comfort and health of the inhabitants of several towns.

The highest recorded flood which has occurred on this drainage basin was that of October, 1903. The estimated discharge at Dundee dam was 35,800 second-feet. This flood is fully described in Water-Supply Paper No. 92. The flood began at 6.30 p. m. October 8, 1903, and lasted until midnight October 18, 1903, the maximum height being reached at 9 p. m. October 10, 1903. There was a total rainfall of 11.74 inches in thirty-six hours.

The United States Geological Survey maintained gaging stations in this basin in 1904 as follows: Passaic River at Millington, N. J.; Passaic River near Chatham, N. J.; Pompton River at Pompton Plains, N. J.; Ramapo River near Mahwah, N. J.; Wanaque River near Wanaque, N. J.; Rockaway River near Boonton, N. J.

PASSAIC RIVER AT MILLINGTON, N. J.

This station was established November 25, 1903, by F. H. Tillinghast. It is located at the lower highway bridge at Millington, N. J. The standard boxed chain gage is fastened to the wooden hand rail on the downstream side of the bridge. The pulley wheel is located at a point 24 feet from the right abutment. The length of the chain from the end of the weight to the marker is 14.17 feet. Bench mark No. 1 is a square chisel draft on the corner of the right abutment at the downstream side. Its elevation is 11.82 feet above gage datum. Bench mark No. 2 is the top of a nail 2 feet from the ground in an elm tree 150 feet east of the bridge. Its elevation is 13.57 feet above gage datum. Bench mark No. 3 is the top of the circular iron bridge chord or tension bar directly under the pulley. Its elevation is 8.97 feet above gage datum. Bench mark No. 4 is the top of the wooden rail of the bridge at the pulley. Its elevation is 13.44 feet above gage datum. Discharge measurements are made from the downstream side of the old wooden truss bridge, to which the gage is attached. The bridge has a span of 69.7 feet. The initial point for soundings is the vertical face of the right abutment on the downstream side. The channel is straight for 600 feet above and 200 feet below the station. The current has a moderate velocity. Both banks are high, without trees, and are not subject to overflow. The bed of the stream is composed of gravel, with a few scattered bowlders, and is permanent. The section is shallow. There is but one channel at all stages. The gage is read twice each day by Mary I. Bray.

The observations at this station during 1904 have been made under the direction of N. C. Grover, district hydrographer.

Discharge measurements of Passaic River at Millington, N. J., in 1904.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Ft. per sec.*	*Feet.*	*Sec.-feet.*
April 9	F. H. Tillinghast	65	90	1.48	2.12	133.
May 13	F. H. Brundage	57	37.2	1.02	1.36	37.8
June 4	J. C. Hoyt	63	63.	1.19	1.65	75.
August 1	do	55	27.	.77	1.20	21.
November 9	H. D. Comstock	62	44.	.88	1.42	38.

Mean daily gage height, in feet, of Passaic River at Millington, N. J., for 1904.

Month.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.22	2.60	3.00	3.45	2.30	1.95	1.25	1.28	1.25	1.30	1.60	1.42
2	2.15	2.55	2.92	4.00	2.45	1.82	1.15	1.58	1.20	1.30	1.50	1.35
3	2.15	2.50	3.00	3.50	2.20	1.78	1.10	1.85	1.20	1.30	1.48	1.32
4	2.12	2.50	3.45	2.90	2.02	1.60	1.10	1.58	1.20	1.30	1.52	1.25
5	2.10	2.45	3.18	2.52	1.88	1.60	1.03	1.60	1.20	1.30	1.48	1.88
6	2.08	2.42	2.98	2.28	1.72	1.62	1.10	2.05	1.12	1.30	1.42	1.88
7	2.05	2.45	3.90	2.20	1.68	1.65	1.20	2.00	1.10	1.25	1.40	1.58
8	2.00	2.98	7.18	2.12	1.65	1.68	1.65	1.95	1.18	1.20	1.40	1.52
9	2.00	2.90	6.05	2.15	1.55	1.65	1.72	1.98	1.12	1.35	1.40	1.40
10	2.00	2.65	3.95	2.35	1.50	1.62	1.38	1.90	1.12	1.32	1.40	1.38
11	2.00	2.60	2.62	2.25	1.52	1.52	1.35	2.52	1.10	1.30	1.52	1.40
12	2.00	2.55	2.28	2.08	1.45	1.38	1.28	2.58	1.10	1.72	1.52	1.48
13	2.00	2.50	2.18	2.00	1.35	1.32	1.38	2.40	1.10	1.90	1.70	1.50
14	2.15	2.45	2.08	1.90	1.40	1.25	1.22	2.12	1.60	1.85	2.42	1.50
15	2.15	2.42	1.98	1.78	1.52	1.28	1.15	1.88	4.92	1.68	2.45	1.50
16	2.15	2.40	1.95	1.70	1.48	1.22	1.12	1.65	4.80	1.55	2.22	1.52
17	2.15	2.35	1.90	1.60	1.45	1.20	1.08	1.52	4.30	1.42	2.10	1.55
18	2.15	2.35	1.90	1.60	1.42	1.20	1.20	1.40	3.75	1.40	1.92	1.65
19	2.15	2.35	2.25	1.60	1.45	1.20	1.25	1.35	3.25	1.40	1.78	1.65
20	2.12	2.35	3.00	1.55	1.55	1.18	1.15	2.32	2.80	1.40	1.70	1.65
21	2.10	2.35	2.82	1.55	1.38	1.15	1.15	2.75	2.40	2.35	1.68	1.65
22	2.15	5.92	2.75	1.50	1.38	1.15	1.08	2.60	2.08	4.05	1.60	1.65
23	4.78	6.72	3.05	1.50	1.30	1.10	1.08	2.40	1.80	3.40	1.52	1.68
24	5.90	6.45	2.98	1.40	1.30	1.10	1.08	2.25	1.62	3.10	1.50	1.70
25	5.00	5.12	2.85	1.42	1.30	1.05	1.12	1.95	1.58	2.72	1.50	1.78
26	3.88	3.50	2.75	1.42	1.30	1.05	1.10	1.65	1.50	2.40	1.45	1.90
27	2.80	2.75	2.78	1.75	1.15	1.10	1.10	1.48	1.45	2.18	1.40	1.95
28	2.68	2.82	2.51	2.45	1.18	1.10	1.10	1.40	1.42	1.92	1.65	2.18
29	2.65	3.35	2.35	2.55	1.20	1.12	1.52	1.32	1.35	1.80	1.60	2.28
30	2.65	.....	2.20	2.45	1.22	1.20	1.45	1.30	1.40	1.72	1.38	2.25
31	2.60	.....	2.38	.....	1.90	.....	1.25	1.25	.....	1.68	.....	2.25

NOTE.—River frozen from January 1 to March 8. February 22, highest reading, 7.00; March 8, highest reading, 7.50.
During the frozen period the gage heights are to the surface of the ice.

PASSAIC RIVER NEAR CHATHAM, N. J.

This station was established February 10, 1903, by the United States Weather Bureau, by which it is maintained. It is located at the second bridge, about 1½ miles upstream from Chatham, N. J. The original gage consists of a 2 by 12 inch board spiked to the upstream wing wall of the right abutment. On December 12, 1903, a standard chain gage was installed on the downstream side of the bridge; the length of the chain from the end of the weight to the marker is 15.59 feet. Bench mark No. 1 for the new gage is the corner of the top of the right abutment on the upstream side. Its elevation is 10.31 feet above the datum of the chain gage. Bench mark No. 2 is the upper surface of the upper chord directly over the gage pulley. Its elevation is 17.91 feet above gage datum. Bench mark No. 3 is the upper surface of the lower chord directly under the pulley. Its elevation is 9.19 feet above gage datum. Bench mark No. 4 is the top of the first bolt on the coping of the downstream wing wall, right hand abutment. Its elevation is 10.64 feet above gage datum. Discharge measurements are made from the single-span steel highway bridge, to which the gage is attached. The downstream side is marked every 5 feet. The initial point for soundings is the base of the right abutment. The channel is straight for 400 feet above and below the station and the current swift. At low water the current makes a small angle with the normal to the cross section, caused by a small island just below the bridge. Two hundred feet above the bridge is an old timber dam partly washed away. Both banks are high and wooded, and are not liable to overflow. The bed of the stream is composed of gravel, with occasional bowlders. The gage reader for the Weather Bureau is M. A. Butler.

The observations at this station during 1904 have been made under the direction of N. C. Grover, district hydrographer.

Discharge measurements on Passaic River near Chatham, N. J., in 1904.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Ft. per sec.*	*Feet.*	*Sec.-feet.*
April 9	F. H. Tillinghast	66	146	1.61	3.25	235
May 14	F. H. Brundage	64	80	.65	2.52	52
June 4	J. C. Hoyt	70	106	.96	2.80	102
August 1	do	70	76	.43	2.40	33
November 9	H. D. Comstock	70	92	.63	2.61	58

Mean daily gage height, in feet, of Passaic River near Chatham, N. J., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	[a] 3.00	3.80	5.60	3.90	3.40	3.00	2.10	2.40	2.40	2.50	2.70	2.40
2	2.70	3.60	5.20	4.70	3.50	3.00	2.10	2.50	2.40	2.50	2.70	2.40
3	2.70	3.40	4.70	4.50	3.40	2.90	2.10	3.20	2.40	2.40	2.60	2.40
4	2.70	(a)	6.00	4.10	3.20	2.80	2.10	3.40	2.30	2.40	2.60	2.40
5	2.70	(a)	5.90	3.70	3.10	2.70	2.10	3.10	2.30	2.40	2.50	2.30
6	2.70	3.40	5.20	3.40	2.90	2.70	2.10	4.40	2.30	2.40	2.50	2.30
7	2.70	3.70	4.60	3.30	3.80	2.80	2.20	4.20	2.30	2.30	2.50	2.30
8	2.70	5.50	6.80	3.30	2.80	2.70	2.70	3.70	2.22	2.30	2.50	2.30
9	2.70	5.10	6.00	3.30	2.70	2.80	3.10	3.30	2.22	2.30	2.60	(a)
10	2.70	(a)	5.60	3.50	2.70	2.70	3.00	3.00	2.22	2.30	2.60	(a)
11	2.70	(a)	[b] 5.00	3.30	2.70	2.60	2.80	4.60	2.20	2.30	2.70	(a)
12	2.70	(a)	4.00	3.30	2.60	2.60	2.60	4.20	2.20	2.70	2.90	(a)
13	3.10	(a)	3.50	3.20	2.60	2.50	2.40	3.90	2.10	3.50	3.20	(a)
14	3.50	(a)	3.40	3.00	2.50	2.40	2.50	3.50	2.10	3.30	3.80	(a)
15	3.40	(a)	3.30	2.90	2.60	2.40	2.40	3.20	6.00	2.90	3.70	(a)
16	3.20	(a)	3.20	2.90	2.80	2.30	2.30	3.00	5.50	2.80	3.50	(a)
17	3.00	(a)	3.00	2.80	2.70	2.30	2.30	2.80	5.20	2.80	3.10	(a)
18	3.00	(a)	3.00	2.80	2.60	2.30	2.40	2.50	5.00	2.70	3.00	(a)
19	3.00	(a)	3.50	2.70	2.60	2.30	2.50	2.30	4.30	2.70	2.90	(a)
20	3.00	(a)	3.70	2.70	2.70	2.20	2.40	2.70	4.20	2.60	2.90	(a)
21	3.20	(a)	3.40	2.70	2.80	2.20	2.30	4.00	3.60	2.60	2.80	(a)
22	4.00	6.70	3.70	2.60	2.70	2.20	2.30	3.90	3.40	4.60	2.80	(a)
23	[c] 4.50	7.50	3.90	2.60	2.60	2.20	2.30	3.70	3.00	4.50	2.70	2.50
24	7.60	[c] 7.90	3.90	2.60	2.40	2.20	2.30	3.50	2.90	4.30	2.70	2.70
25	7.20	7.60	3.70	2.60	2.40	2.10	2.30	3.20	2.80	3.90	2.70	(a)
26	6.70	7.50	3.60	2.60	2.40	2.10	2.30	3.00	2.70	3.60	2.70	(a)
27	6.10	6.50	3.60	2.80	2.30	2.10	2.30	2.70	2.70	3.20	2.60	(a)
28	5.00	5.60	3.50	4.00	2.30	2.10	2.20	2.60	2.60	3.00	2.50	3.50
29	4.50	5.70	3.40	3.90	2.30	2.10	2.60	2.50	2.50	2.90	2.50	4.00
30	4.00	.....	3.30	3.50	2.30	2.10	2.70	2.50	2.50	2.80	2.50	3.60
31	3.90	.....	3.20	.....	2.60	.....	2.60	2.40	.....	2.70	.....	3.30

[a] River frozen January 1 to March 10, inclusive; also December 9–22 and December 25–27, inclusive. Gage heights to surface of ice.
[b] River clear.
[c] Ice jam.

POMPTON RIVER AT POMPTON PLAINS, N. J.

This station measures the combined flow of Pequannock, Wanaque, Ramapo, and Pompton rivers. It was established March 7, 1903, by the United States Weather Bureau, by which it is maintained. It is located at a 254-foot timber dam situated about half a mile east of Pompton Plains railroad station. The dam constitutes a portion of the headworks of the Morris canal feeder at Pompton Plains. A cast-iron gage is bolted vertically to the framework of the lock gates at the entrance to the canal. The gage reader for the Weather Bureau is E. M. Le Fevre, who reads the gage every morning. The main portion and crest of the dam is timber 6 inches in width. The downstream face is vertical, and 2.7 feet below the crest is an apron. The upstream side of the dam is paved. Starting at a point 6 inches below the crest of the dam, the paving is placed downward and upstream at a slope of 6 inches in 3 feet. The rating table for this dam was constructed as follows: The Francis formula was used, modified by comparison with results of experiments made at Cornell University. The coefficients used were those derived from United States Geological Survey experiments, Cornell series 40, for a 6-inch broad-crested weir. This gives a varying coefficient for low heads up to a depth of 0.8 foot, at which height the nappe breaks clear from the horizontal face and the weir becomes practically sharp crested, giving the Francis formula, $Q=3.33\ lh^{\frac{3}{2}}$. The crest of the dam is slightly irregular, and in order to apply the weir formula to it an accurate profile was taken and the dam was divided into a number of approximately level sections. These sections comprised all elevations between certain limiting values, whether in juxtaposition or not. Each section was computed separately for all gage heights. By combining these the flow on the entire dam, which is 254.5 feet long, was obtained for each gage reading. The rating table shows the combined discharge of all sections for the same gage heights. To the flow over the dam must be added the flow through the Morris canal feeder, records of which are maintained. All the water in times of flood passes over the dam, except in very extreme cases, as the flood of October, 1903. Bench mark No. 1 is a square chiseled on the coping of the left upstream parapet wall of the head-gates to the feeder canal. Its elevation is 11.99 feet above gage datum. Bench mark No. 2 is a square chiseled on the outside edge of the upstream parapet wall at the entrance to the feeder. Its elevation is 12.10 feet above the zero of the cast-iron gage. This station was discontinued December 31, 1904.

The observations at this station during 1904 have been made under the direction of N. C. Grover, district hydrographer.

Mean daily gage height, in feet, of Pompton River at Pompton Plains, N. J., for 1904.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.90	.....	4.60	4.80	3.70	3.80	4.10	4.40	4.40
2	.....	5.50	.....	4.60	4.50	3.70	3.80	4.10	4.30	4.40
3	.....	5.20	.....	4.60	4.20	3.70	3.80	4.10	4.20	4.40
4	.....	5.00	.....	4.50	4.10	3.70	3.80	4.10	4.10	4.40
5	.....	.....	.....	4.50	4.00	3.70	3.80	4.10	4.00	4.40
6	.....	.....	.....	4.50	4.00	3.70	3.80	4.10	4.10	4.40
7	.....	.....	.....	4.40	4.00	3.70	3.80	4.10	4.10	4.40
8	7.50	.....	.....	4.40	4.00	3.70	3.80	4.10	4.10	4.40
9	6.40	.....	.....	4.80	4.20	3.70	3.80	4.10	4.10	4.40
10	5.80	.....	.....	4.80	4.00	3.70	3.90	4.10	4.10	4.40
11	5.20	.....	.....	4.50	4.00	3.90	3.90	4.10	4.10	4.40
12	4.80	.....	.....	4.40	4.00	3.80	3.90	4.10	4.10	4.40
13	.....	.....	.....	4.30	4.00	3.70	3.90	4.30	4.10	4.40
14	.....	.....	.....	4.30	4.00	3.70	3.90	4.10	4.70	4.40
15	.....	.....	.....	4.30	4.00	3.70	5.50	4.10	4.60	4.40
16	.....	.....	.....	4.20	4.00	3.70	5.00	4.10	4.50	4.40
17	.....	.....	.....	4.10	4.00	3.70	4.70	4.10	4.40	4.40
18	.....	.....	4.40	4.10	3.90	3.60	4.30	4.10	4.40	4.40
19	.....	.....	4.30	4.10	3.80	3.60	4.30	4.10	4.40	4.40
20	.....	.....	4.40	4.10	3.80	3.60	4.30	4.10	4.30	4.40
21	.....	.....	4.30	4.00	3.80	4.30	4.30	4.10	4.30	4.40
22	.....	.....	4.20	4.00	3.70	4.30	4.30	5.70	4.40	4.40
23	.....	.....	4.20	4.00	3.70	4.20	4.30	5.00	4.40	4.40
24	.....	.....	4.20	4.00	3.70	4.00	4.20	4.80	4.40	4.40
25	.....	.....	4.20	4.00	3.70	4.00	4.10	4.70	4.40	.....
26	.....	.....	4.30	3.90	3.70	3.90	4.10	4.60	4.40	.....
27	.....	.....	4.30	4.00	3.70	3.80	4.10	4.60	4.40	.....
28	.....	.....	4.30	4.00	3.70	3.80	4.10	4.60	4.40	4.70
29	.....	5.10	4.20	4.00	3.70	3.80	4.10	4.60	4.40	4.60
30	.....	4.90	4.20	4.00	3.80	3.80	4.10	4.50	4.40	4.50
31	4.90	.....	4.40	.....	3.70	3.80	.....	4.40	.....	4.50

NOTE.—Gage broken from January 1 to March 7, from March 13–30, from April 5–28, and from May 1–17. River frozen December 25 to 27, inclusive.

RAMAPO RIVER NEAR MAHWAH, N. J.

This station was established February 10, 1903, by the United States Weather Bureau, by which it is maintained. It is located at a concrete-arch highway bridge about 1 mile west of Mahwah, N. J. A standard chain gage is bolted to the hand rail on the downstream side of the bridge. The length of the chain from the end of the weight to the marker is 20.65 feet. Bench mark No. 1 is a square chiseled on the coping of the upstream parapet wall at the left bank. Its elevation is 17.72 feet above gage datum. Bench mark No. 2 is a square chiseled on the edge of the coping, 3.5 feet west of the gage pulley. Its elevation is 17.43 feet above gage datum. The gage reader for the Weather Bureau is M. F. Brooks. Discharge measurements are made from the upstream side of the concrete-arch highway bridge to which the gage is attached. The bridge has a single span of 68 feet between abutments. The initial point for soundings is the end post of the hand rail on the left bank. The channel is straight for 300 feet above and 200 feet below the bridge. The current is swift. About 200 feet

below the bridge there is a rift with about 1 foot fall. The right bank is low, and during high water the lowlands on this side of the river are flooded. The left bank is high, wooded, and not liable to overflow. The bed of the stream is composed of gravel and scattered bowlders, and there is but one channel.

The observations at this station during 1904 have been made under the direction of N. C. Grover, district hydrographer.

Discharge measurements of Ramapo River near Mahwah, N. J., in 1904.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Ft. per sec.*	*Feet.*	*Sec.-feet.*
April 2	F. H. Tillinghast	64	363	3.61	6.00	1,309
May 18	F. H. Brundage	57	210	.88	3.62	185
June 3	J. C. Hoyt	55	250	1.24	4.02	310
August 2	do	45	166	.16	2.65	27
November 11	Murphy and Comstock.	51	191	.48	3.26	92

Mean daily gage height, in feet, of Ramapo River near Mahwah, N. J., for 1904.

Day.	Jan.[a]	Feb.[a]	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.10	4.10	4.10	4.80	4.60	4.20	5.30	2.70	2.60	3.00	3.50	3.50
2	4.00	4.00	4.00	5.90	4.40	4.40	4.30	2.70	2.50	3.00	3.50	3.40
3	[b]4.00	4.00	4.00	5.30	4.20	4.40	3.80	2.90	2.60	3.00	3.50	3.40
4	[b]4.00	4.00	5.10	4.90	4.10	4.00	3.40	2.80	2.50	2.90	3.40	3.40
5	[b]4.00	.....	4.70	4.60	4.00	3.90	3.30	2.80	2.50	2.90	3.40	3.40
6	[b]3.90	4.00	4.20	4.50	3.90	3.70	3.20	2.80	2.50	2.80	3.50	3.30
7	[b]3.90	4.00	4.20	4.40	3.90	3.60	3.10	2.80	2.50	2.70	3.50	3.30
8	[b]3.90	4.20	7.10	4.40	3.80	3.60	3.40	2.80	2.50	2.70	3.40	3.30
9	[b]3.90	4.50	6.40	4.30	3.80	4.30	3.30	2.80	2.50	2.80	3.40	3.30
10	.....	4.50	5.40	4.70	3.70	4.50	3.10	2.70	2.90	2.80	3.40	3.30
11	.....	4.50	5.10	4.50	3.70	4.10	3.10	2.80	2.70	2.80	3.40	3.20
12	.....	4.20	4.90	4.40	3.70	3.80	3.10	2.90	2.60	2.80	3.40	3.20
13	.....	4.00	4.70	4.40	3.60	3.60	3.00	2.80	2.60	3.60	3.40	3.20
14	.....	3.80	4.50	4.20	3.60	3.50	2.90	2.80	2.50	3.40	4.00	3.20
15	.....	3.80	4.80	4.20	3.60	3.50	2.90	2.80	5.70	3.20	3.80	3.20
16	.....	.....	4.20	4.10	4.10	3.40	2.90	2.80	5.80	3.10	3.80	3.20
17	[b]3.80	.....	4.10	4.00	3.90	3.30	2.80	2.70	4.30	3.10	3.80	3.20
18	[b]3.80	.....	4.10	4.00	3.80	3.30	2.80	2.70	3.70	3.00	3.70	3.20
19	[b]3.80	3.70	4.10	3.90	3.70	3.20	3.00	2.70	3.50	2.90	3.70	[c]
20	[b]3.80	3.70	4.70	3.80	3.70	3.20	2.90	2.70	3.30	2.90	3.70	[c]
21	[b]4.00	[d]	4.70	3.80	3.60	3.00	2.80	3.50	3.30	3.00	3.70	[c]
22	[b]4.20	5.20	4.50	4.80	3.50	3.00	2.70	3.60	3.20	6.90	3.95	[c]
23	5.00	5.60	4.60	4.70	3.50	3.00	2.70	3.30	3.20	5.80	4.00	[c]
24	5.90	5.20	4.80	3.70	3.40	2.90	2.70	3.00	3.10	4.70	3.90	3.40
25	4.80	5.00	4.80	3.70	3.30	2.80	2.80	2.90	3.10	4.30	3.80	3.60
26	4.60	4.50	4.70	3.70	3.50	2.80	2.90	2.80	3.10	4.10	3.70	3.60
27	4.40	4.40	5.10	3.70	3.60	2.80	2.80	2.70	3.10	4.00	3.60	.....
28	4.40	4.10	4.70	4.60	3.60	2.80	2.80	2.70	3.10	3.80	3.60	4.10
29	4.40	4.30	4.50	5.30	3.40	2.80	3.00	2.70	3.00	3.70	3.60	4.60
30	4.40	.....	4.40	4.90	3.40	2.90	2.90	2.90	3.00	3.70	3.60	4.40
31	4.20	.....	4.40	.....	4.10	.....	2.80	2.80	.....	3.60	.....	4.10

[a] River frozen January 1 to February 29. [b] Gage heights estimated. [c] River frozen. [d] Ice 2 feet.

Rating table for Ramapo River near Mahwah, N. J., from January 1, 1903, to December 31, 1904.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
2.50	11	3.70	230	4.90	565	6.10	1,380
2.60	25	3.80	250	5.00	610	6.20	1,480
2.70	40	3.90	270	5.10	660	6.30	1,580
2.80	56	4.00	295	5.20	715	6.40	1,680
2.90	73	4.10	320	5.30	775	6.50	1,780
3.00	91	4.20	345	5.40	835	6.60	1,880
3.10	110	4.30	370	5.50	900	6.70	1,980
3.20	130	4.40	395	5.60	970	6.80	2,080
3.30	150	4.50	425	5.70	1,045	6.90	2,190
3.40	170	4.60	455	5.80	1,120	7.00	2,300
3.50	190	4.70	490	5.90	1,200	7.10	2,410
3.60	210	4.80	525	6.00	1,290		

The above table is applicable only for open-channel conditions. It is based upon discharge measurements made during 1903 and 1904. It is not well defined. Above gage height 6.80 feet the rating curve is a tangent, the difference being 110 per tenth.

Estimated monthly discharge of Ramapo River near Mahwah, N. J., for 1903 and 1904.

[Drainage area, 118 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1903.					
February 10–28	660	230	341	2.89	2.04
March	1,880	250	571	4.84	5.58
April	2,190	210	534	4.53	5.05
May	190	40	96	.814	.938
June	1,980	25	400	3.39	3.78
July	1,045	40	183	1.55	1.79
August	525	40	162	1.37	1.58
September	835	73	198	1.68	1.87
October	5,380	73	801	6.79	7.83
November	715	210	281	2.38	2.66
December [a]	----------	----------	357	3.03	3.49

[a] Frozen December 17 to 22 and 30 to 31; monthly mean estimated.

Estimated monthly discharge of Ramapo River near Mahwah, N. J., etc.—Continued.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
1904.					
January [a]	----------	----------	260	2.20	2.54
February [a]	----------	----------	300	2.54	2.74
March	2,410	295	562	4.76	5.49
April	1,200	230	430	3.64	4.06
May	455	150	247	2.09	2.41
June	425	56	191	1.62	1.81
July	775	40	123	1.04	1.20
August	210	40	66	.560	.646
September	1,120	11	152	1.29	1.44
October	2,190	40	243	2.06	2.37
November	295	170	215	1.82	2.03
December [b]	----------	----------	182	1.54	1.78
Total	2,410	11	248	2.10	28.52

[a] Ice conditions during January and February, mean flow for month estimated.
[b] Monthly mean estimated.

WANAQUE RIVER AT WANAQUE, N. J.

This station was established December 16, 1903, by F. H. Tillinghast. It is located at the highway bridge just above the Erie Railway bridge and below the factory of the Wanaque River Paper Company. The standard chain gage is situated on the upstream side of the bridge. The gage pulley is located at a point 73 feet from the right abutment. The length of the chain from the end of the weight to the marker is 17.52 feet. Bench mark No. 1 is a circular chisel draft on the upstream side of the right abutment. Its elevation is 13.80 feet above gage datum. Bench mark No. 2 is a square chisel draft on the upstream edge of the last stone upstream of the right abutment wing wall. Its elevation is 14.21 feet above gage datum. Bench mark No. 3 is the upper edge of lower chord on the upstream side of the bridge, 1.1 feet from the down spout. Its elevation is 13.58 feet above gage datum. Discharge measurements are made from the upstream side of the single-span highway bridge, which has a length between abutments of 98.5 feet. The initial point for soundings is the face of the right abutment on the upstream side. The channel is straight for 300 feet above and 200 feet below the station. The current is sluggish at low water. The right bank is high, rocky, and wooded, while the left bank is low and without trees. All water

passes under the bridge at all stages. The bed of the stream is composed of gravel, with occasional bowlders. At ordinary stages the depth of the water at the gaging section is from 2 to 5 feet. The gage is read twice daily by J. Herbert Hunter.

The observations at this station during 1904 have been made under the direction of N. C. Grover, district hydrographer.

Discharge measurements of Wanaque River at Wanaque, N. J., in 1904.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
1904.		*Feet.*	*Sq. feet.*	*Ft. per sec.*	*Feet.*	*Sec.-feet.*
April 5	F. H. Tillinghast	86	362	1.01	2.81	367
May 17	F. H. Brundage	82	292	.52	2.04	153
June 3	J. C. Hoyt	84	338	.80	2.60	269
August 5	do		202	.054	.97	11
November 10	Hoyt and Murphy	84	232	.24	1.35	56
December 10	F. H. Tillinghast	85	308	.61	2.25	187

Mean daily gage height, in feet, of Wanaque River at Wanaque, N. J., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.10	2.20	2.40	2.30								1.56
2	2.09	2.20	2.38	2.30								1.52
3	2.90	2.20	2.30	2.45								1.52
4	2.90	[a]2.15	2.28	2.80								1.40
5	2.95	2.12	2.20	2.80								1.27
6	2.90	2.10	2.20	2.70								1.42
7	2.10	2.10	4.30	2.50								1.42
8	2.10	2.10	6.30	2.40								1.40
9	2.10	2.10	5.95	2.40								1.32
10	2.10	2.10	5.25	2.40								[b]1.29
11	2.10	2.10	4.60	2.40								1.34
12	2.10	2.10	3.85	2.40								1.39
13	2.10	2.10	3.15	2.30								1.32
14	2.10	2.10	2.70	2.22								1.30
15	2.09	2.10	2.40	2.18								1.45
16	2.10	2.20	2.40	2.00								1.57
17	2.10	2.20	2.40	2.00								1.58
18	[c]	2.20	2.40	2.00								
19		2.20	2.40	1.90								
20		2.20	2.40	1.90								
21		2.30	2.40	1.90								
22		3.15	2.50	1.90								
23		2.80	2.80	1.85								
24		2.72	2.85	1.85								
25	2.50	2.70	2.80									
26	2.50	2.60	2.70									
27	2.40	2.60	2.60								1.55	
28	2.40	2.50	2.40								1.62	
29	[d]2.30	2.50	2.40								1.65	
30	2.28		2.30								1.60	
31	2.20		2.30									

[a] River open. [b] River frozen. [c] Gage broken. [d] Ice 6 inches thick.

ROCKAWAY RIVER NEAR BOONTON, N. J.

This station was established March 15, 1903, by the United States Weather Bureau, by which it is maintained. It is located at Remine's bridge, about 3 miles downstream from Boonton. The gage is a vertical 2 by 12 inch board spiked to the face of the right abutment at its downstream end. It reads from 0 to 9 feet, and is graduated with copper staples. The bench mark is a square chiseled on the top of the upstream end of the right abutment. Its elevation above the gage datum is 9.14 feet. The gage reader for the Weather Bureau is Mrs. L. A. Van Derhoff. Discharge measurements are made from the downstream side of the single-span highway bridge, to which the gage is attached. The initial point for soundings is the face of the right abutment. The channel is straight for 300 feet above and below the station and the current is sluggish. Both banks are low, but will overflow only at very high water. The right bank is without trees; the left bank is wooded. The bed of the stream is composed of gravel with a few bowlders. There is a timber dam about 1 mile above the station. This station was discontinued February 2, 1904.

The observations at this station during 1904 have been made under the direction of N. C. Grover, district hydrographer.

Discharge measurement of Rockaway River near Boonton, N. J., in 1904.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Ft. per sec.*	*Feet.*	*Sec.-feet.*
May 16	F. H. Brundage	90	142	1.68	1.25	238

Mean daily gage height, in feet, of Rockaway River near Boonton, N. J., for 1904.

Day.	Jan.	Feb.	Day.	Jan.	Feb.	Day.	Jan.	Feb.	Day.	Jan.	Feb.
1	2.00	2.50	9			17			25	4.00	
2	2.00	2.50	10			18			26	3.90	
3			11			19			27	3.60	
4			12			20			28	3.50	
5			13			21			29	2.90	
6			14			22			30	2.50	
7			15			23	3.70		31	2.50	
8			16			24	3.50				

NOTE.—River frozen during January and February.

RARITAN RIVER DRAINAGE BASIN.

Raritan River, which is the largest stream in New Jersey, excepting the Delaware, rises in the highlands at the foot of Lake Hopatcong. The total area of the drainage basin is 1,105 square miles. The highlands consist mostly of trap rock and contain a large proportion of the wooded areas of the basin. Only about 10 per cent of the total

area is forested. The area outside the highlands consists of either trap rock or red sandstone. Of the 806 square miles of drainage area above the gaging station at Bound Brook, about 150 square miles are in the cultivated part of the highlands and on the trap ridges; the remainder is mostly on the low, level, red sandstone plain.

The valley of the Raritan is populous and highly cultivated, and a large amount of water power is utilized on its various branches. Raritan River throughout almost its entire length is in two parts, namely, the North and South branches. The North Branch is considered a valuable source for a gravity water supply. The upper portion is at an elevation ranging from 750 to 1,100 feet. Both the North and South branches rise close to each other, separated only by a slight divide. The other important branch is Millstone River, which differs from the other branches, having its rise in sand hills and flowing northwesterly through a sandy soil. It has a large ground storage. This stream is better suited for power than for water supply, being very muddy at high stages. All three branches are united above Bound Brook, N. J.

The United States Geological Survey maintained gaging stations in this basin during 1904 as follows: Raritan River (South Branch) at Stanton, N. J.; Raritan River at Finderne, N. J.; Raritan River at Bound Brook, N. J.; Raritan River (North Branch) at Pluckemin, N. J.; Millstone River at Millstone, N. J.

RARITAN RIVER (SOUTH BRANCH) AT STANTON, N. J.

This station was established July 2, 1903, by E. P. Roundey. It is located at the highway bridge about 500 feet from the Lehigh Valley Railroad station at Stanton, N. J. The standard chain gage is located on the lower chord of the bridge on the downstream side. The length of the chain from the end of the weight to the marker is 14.63 feet. Bench mark No. 1 is a square chiseled on the coping of the left abutment 1½ feet from the downstream end. It is 13.37 feet above gage datum. Bench mark No. 2 is the top of the upstream corner of the right abutment. It is 13.665 feet above gage datum. Bench mark No. 3 is a nail projecting one-quarter inch from downstream side of a large sycamore tree 210 below bridge and 6 feet above the ground. Elevation 11.024 feet above gage datum. Discharge measurements are made from the downstream side of the single-span highway bridge. The initial point for soundings is the face of the right abutment. The channel is straight for 800 feet above and 400 feet below the station. The current is swift. Both banks are low and liable to overflow. The bed of the stream is composed of gravel, and there is but one channel under the bridge. The gage is read twice each day by William Wilson, the station agent.

The observations at this station during 1904 have been made under the direction of N. C. Grover, district hydrographer.

Discharge measurements of Raritan River (South Branch) at Stanton, N. J., in 1904.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Ft. per sec.*	*Feet.*	*Sec.-feet.*
June 7	J. C. Hoyt	99	178	1.14	2.92	203
August 24	do	95	154	.98	2.77	151
November 8	H. D. Comstock	92	148	1.04	2.70	153

Mean daily gage height, in feet, of Raritan River (South Branch) at Stanton, N. J., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.24	3.90	4.98	4.68	2.88	2.72	2.25	2.62	2.24	2.58	2.81	2.89
2	4.18	3.91	4.58	4.45	2.85	2.71	2.23	2.44	2.24	2.66	2.84	2.90
3	4.09	3.91	5.85	3.58	2.81	2.72	2.19	2.28	2.24	2.58	2.80	2.88
4	4.12	3.80	5.40	3.36	2.78	2.69	2.20	2.89	2.26	2.54	2.79	2.86
5	4.16	3.74	4.65	3.28	2.71	2.72	2.21	2.61	2.21	2.56	2.80	2.86
6	4.12	3.84	4.14	3.21	2.71	2.78	2.19	2.75	2.21	2.55	2.84	2.84
7	4.18	4.50	7.70	3.20	2.71	2.86	2.62	2.62	2.29	2.51	2.84	2.80
8	3.98	4.32	5.72	3.18	2.70	2.72	3.08	2.65	2.29	2.55	2.82	2.81
9	4.10	3.98	3.70	3.45	2.70	2.86	2.98	2.68	2.30	2.54	2.80	2.87
10	4.05	3.84	3.42	3.44	2.70	2.72	3.18	2.91	2.29	2.49	2.74	2.90
11	4.08	3.78	3.29	3.24	2.64	2.49	2.98	2.79	2.26	2.51	2.80	2.96
12	4.10	3.75	3.14	3.15	2.64	2.49	2.66	2.86	2.30	3.27	2.85	2.98
13	4.10	3.71	3.14	3.11	2.61	2.58	2.95	2.79	2.30	3.04	2.84	2.98
14	4.22	3.68	3.04	3.11	2.61	2.54	2.68	2.69	3.07	2.85	2.82	3.01
15	4.25	3.58	2.92	3.08	2.88	2.38	2.48	2.69	7.78	2.79	2.80	3.03
16	4.10	3.54	3.09	2.92	2.80	2.26	2.44	2.62	5.70	2.77	2.84	3.02
17	4.08	3.50	3.16	2.91	2.65	2.13	2.31	2.51	3.84	2.69	2.84	3.06
18	3.98	3.20	3.92	2.90	2.68	2.22	2.45	2.36	3.35	2.59	2.85	3.10
19	3.80	3.28	4.48	2.82	2.84	2.25	2.36	2.31	2.96	2.47	2.88	3.12
20	3.80	3.22	4.45	2.89	2.70	2.24	2.26	3.45	2.91	2.51	2.97	3.20
21	3.88	3.12	3.56	2.84	2.64	2.29	2.19	3.19	2.81	6.34	3.10	3.19
22	4.10	9.55	3.38	2.80	2.58	2.29	2.15	2.86	2.79	5.44	3.09	3.20
23	8.92	7.35	3.62	2.79	2.55	2.25	2.25	2.99	2.72	4.02	3.05	3.22
24	4.95	6.15	3.38	2.78	2.54	2.33	2.24	2.76	2.68	3.82	3.02	3.22
25	4.46	5.96	3.28	2.77	2.62	2.25	2.56	2.71	2.64	3.71	3.02	3.21
26	4.10	5.45	3.32	2.78	2.59	2.20	2.56	2.72	2.62	3.69	3.04	3.25
27	4.02	4.98	3.25	3.20	2.59	2.31	2.51	2.60	2.64	3.46	2.99	3.20
28	3.98	5.85	3.16	3.34	2.62	2.21	2.51	2.52	2.69	3.31	2.92	3.24
29	3.89	5.26	3.07	3.05	2.54	3.42	2.32	2.30	2.71	3.12	2.93	3.21
30	3.95	.....	3.01	2.91	2.47	2.60	2.41	2.31	2.69	2.94	2.91	3.90
31	3.94	.....	3.42	.....	3.12	.....	2.29	2.29	.....	2.81	.....	3.70

NOTE.—River frozen from January 1 to March 3, when ice went out. Thickness of ice varied from 2 to 12 inches. March 7, highest record 11.04. River frozen December 8 to 29. Thickness of ice one-fourth to 6¼ inches. During the frozen periods the gage heights were taken to the surface of the ice.

Rating table for Raritan River (South Branch) at Stanton, N. J., from July 2, 1903, to December 31, 1904.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
2.10	42	2.90	194	3.70	505	4.40	840
2.20	56	3.00	226	3.80	550	4.50	890
2.30	71	3.10	260	3.90	596	4.60	940
2.40	87	3.20	296	4.00	643	4.70	990
2.50	104	3.30	335	4.10	691	4.80	1,040
2.60	122	3.40	376	4.20	740	4.90	1,090
2.70	142	3.50	418	4.30	790	5.00	1,140
2.80	166	3.60	461				

The above table is applicable only for open-channel conditions. It is based upon 8 discharge measurements made during 1903 and 1904. It is well defined between gage heights 2.7 feet and 4.4 feet. The table has been extended beyond these limits. Above gage height 4.4 feet the rating curve is a tangent, the difference being 50 per tenth. The curve is very uncertain above gage height 5 feet.

Estimated monthly discharge of Raritan River (South Branch) at Stanton, N. J., for 1904.

Month.	Discharge in second-feet.			Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.		Maximum.	Minimum.	Mean.
January [a]	----	----	----	July	289	49	108
February [a]	----	----	----	August	397	68	146
March	2,490	200	629	September	2,530	58	263
April	980	159	302	October	1,810	99	308
May	267	99	143	November	260	152	192
June	384	46	113	December [a]	----	----	----

[a] River frozen from January 1 to March 3 and from December 8–29, inclusive.

RARITAN RIVER AT FINDERNE, N. J.

This station was established June 27, 1903, by E. P. Roundey. It is located at the highway bridge, one-fourth mile from the New Jersey Central Railway station at Finderne, N. J. The standard chain gage is located on the downstream side of the right-hand truss on the lower chord. The length of the chain from the end of the weight to the end of the ring is 19.56 feet. Bench mark No. 1 is a cross chiseled on the coping of the downstream wing wall of the right abutment. Its elevation is 20.11 feet above gage datum. Bench mark No. 2 is the top of the outside connection plate near the zero of the gage scale. Its elevation is 20.14 feet above gage datum. The elevation of the top of the gage pulley is 19.21 feet above gage datum. Discharge measurements are made from the upstream side of the 2-span highway bridge. The initial point for soundings is the face of the right abut-

ment. The channel is straight for 300 feet above and 800 feet below the station. The current is swift. The right bank is low, wooded, and liable to overflow. The left bank will overflow only at extreme high water. The bed of the stream is composed of gravel. The channel is broken by the center pier of the 2-span bridge. The gage is read twice each day by Harry Siegel.

The observations at this station during 1904 have been made under the direction of N. C. Grover, district hydrographer.

Discharge measurements of Raritan River at Finderne, N. J., in 1904.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Ft. per sec.*	*Feet.*	*Sec.-feet.*
April 11	F. H. Tillinghast	196	322	3.35	4.80	1,080
May 12	F. H. Brundage	168	203	2.17	4.04	440
June 6	J. C. Hoyt	160	237	2.45	4.20	580
July 30	do	155	186	1.84	3.92	343
November 10	H. D. Comstock	163	210	1.98	4.10	416

Mean daily gage height, in feet, of Raritan River at Finderne, N. J., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	a4.75	a4.75	4.75	7.98	4.38	4.18	3.80	3.88	3.90	3.95	4.20	3.95
2	a4.85	a6.30	4.70	7.35	4.55	3.90	3.88	4.33	3.83	3.90	4.20	3.90
3	4.50	a6.15	4.90	5.08	4.35	4.02	3.63	4.10	3.85	3.98	4.12	4.00
4	4.90	a5.55	6.18	4.98	4.20	3.90	3.60	4.00	3.60	3.97	4.10	3.95
5	5.28	a5.08	5.20	4.80	4.20	3.92	3.62	4.25	3.65	3.95	4.10	3.95
6	5.55	4.90	4.62	4.58	4.15	4.18	3.63	5.30	3.68	3.92	4.10	4.00
7	5.15	5.40	7.55	4.68	4.10	4.32	3.68	4.20	3.65	3.88	4.28	3.90
8	5.05	6.90	11.05	4.65	4.00	4.15	5.20	4.13	3.72	3.85	4.02	4.00
9	5.05	5.05	5.85	4.82	4.00	4.35	4.45	4.00	3.65	3.80	4.02	3.85
10	5.05	4.35	4.90	5.30	4.02	4.15	3.95	5.62	3.68	3.92	4.00	3.82
11	5.10	4.35	4.80	4.80	4.02	4.00	4.20	7.25	3.65	3.92	4.08	3.85
12	5.10	4.15	4.65	4.65	4.00	3.85	3.95	4.60	3.65	5.85	4.10	3.82
13	5.00	4.10	4.40	4.52	4.92	3.85	4.08	4.25	3.65	4.85	4.48	4.10
14	7.98	4.10	4.45	4.35	4.88	3.80	3.88	4.85	3.65	4.35	7.52	4.20
15	6.88	4.10	4.45	4.35	3.70	3.70	3.75	4.32	14.90	4.25	5.00	4.18
16	7.10	4.00	5.05	4.32	4.10	3.65	3.60	4.12	6.88	4.12	4.78	4.22
17	6.68	4.30	4.55	4.20	3.95	3.62	3.52	4.05	5.15	4.00	4.92	4.20
18	7.50	4.42	4.60	4.20	3.95	3.58	3.62	3.90	4.78	4.02	4.90	4.10
19	7.20	4.75	5.30	4.15	3.97	3.55	3.80	3.93	4.65	3.93	4.40	4.10
20	7.20	4.90	4.95	4.15	4.25	3.60	3.70	6.98	4.42	3.88	4.30	4.00
21	7.20	4.75	4.90	4.10	4.08	3.62	3.60	5.75	4.32	8.38	4.30	4.05
22	5.65	a12.72	5.00	4.30	3.92	3.65	3.70	4.68	4.20	8.30	4.30	4.00
23	a12.70	7.62	5.45	4.00	3.85	3.60	3.68	4.40	4.30	5.30	4.30	4.20
24	7.68	5.58	5.08	4.05	3.92	3.60	3.55	4.25	4.12	4.95	4.20	4.20
25	5.00	5.65	4.92	4.10	3.82	3.52	3.65	4.20	4.10	4.70	4.15	4.20
26	4.90	4.82	5.07	4.30	3.85	3.48	3.78	4.05	3.98	4.68	4.10	4.20
27	4.45	4.45	5.10	4.90	3.72	3.55	3.65	4.03	3.97	4.50	4.00	4.80
28	4.35	4.78	4.95	5.45	3.80	3.55	3.85	4.00	4.00	4.30	3.88	8.25
29	4.70	5.65	4.85	4.80	3.62	3.60	5.05	3.95	4.00	4.30	3.85	7.30
30	a6.00	.....	4.75	4.62	3.60	3.98	3.98	3.88	3.98	4.18	4.50	6.92
31	a5.00	.....	4.95	.....	4.22	.....	3.80	3.90	.....	4.18	.....	6.42

a Ice gorge causes water to rise.

NOTE.—Highest reading September 15, 15.30; October 21, 12.65.

Rating table for Raritan River at Finderne, N. J., from June 27, 1903, to December 31, 1904.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*	*Feet.*	*Second-feet.*
3.50	125	5.00	1,255	6.40	2,825	8.60	5,650
3.60	171	5.10	1,355	6.50	2,945	8.80	5,930
3.70	219	5.20	1,460	6.60	3,065	9.00	6,210
3.80	272	5.30	1,565	6.70	3,190	9.20	6,500
3.90	330	5.40	1,675	6.80	3,315	9.40	6,800
4.00	393	5.50	1,785	6.90	3,440	9.60	7,100
4.10	461	5.60	1,895	7.00	3,565	9.80	7,410
4.20	534	5.70	2,005	7.20	3,815	10.00	7,730
4.30	612	5.80	2,120	7.40	4,065	10.50	8,580
4.40	695	5.90	2,235	7.60	4,325	11.00	9,430
4.50	783	6.00	2,350	7.80	4,585	11.50	10,280
4.60	875	6.10	2,465	8.00	4,845	12.00	11,130
4.70	969	6.20	2,585	8.20	5,110	12.50	11,980
4.80	1,064	6.30	2,705	8.40	5,380	13.00	12,830
4.90	1,159						

The above table is applicable only for open-channel conditions. It is based upon 12 discharge measurements made during 1903 and 1904. It is fairly well defined between gage heights 3.90 feet and 10.50 feet. The table has been extended beyond these limits. Above gage height 10 feet the rating curve is a tangent, the difference being 170 per tenth.

Estimated monthly discharge of Raritan River at Finderne, N. J., for 1904.

Month.	Discharge in second-feet.			Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.		Maximum.	Minimum.	Mean.
March	9,515	695	1,580	August	3,878	318	856
April	4,819	393	1,081	September	16,060	171	1,043
May	1,178	171	460	October	5,353	272	920
June	654	116	296	November	4,221	301	723
July	1,460	134	343	December	5,178	284	886

RARITAN RIVER AT BOUND BROOK, N. J.

This station was established September 12, 1903, by E. P. Roundey. It is located at the highway bridge just back of the Lehigh Valley Railway station at Bound Brook, N. J. The original gage consisted of a vertical 1¼ by 6 inch cypress board 12 feet long bolted to the upstream wing wall of the right abutment. It was carried away by the ice January 23, 1904. On February 2, 1904, a standard chain gage was bolted to the upstream side of the bridge 240 feet from the right abutment. The length of the chain from the end of the weight to the marker is 23.48 feet. Bench mark No. 1 is a square chiseled on top of the upstream wing wall of the right abutment. Its elevation is 19.45 feet above gage datum. Bench mark No. 2 is the top of the rail 2 feet beyond the pulley end of the gage. Its elevation is 23.77 feet above gage datum. Bench mark No. 3 is a point on the guard rail of the bridge 225 feet from the initial point for soundings. Its elevation is 20.75 feet above gage datum. Discharge measurements are made from the upstream side of the 3-span highway bridge. The initial point for soundings is the face of the right abutment. The channel is straight for 500 feet above and below the station, and the current has a moderate velocity. Both banks are high, subject to overflow only at very high stages, and are without trees. The bed of the stream is composed of gravel. The gage is read twice each day by Joseph K. Tantum.

The observations at this station during 1904 have been made under the direction of N. C. Grover, district hydrographer.

Discharge measurements of Raritan River at Bound Brook, N. J., in 1904.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Ft. per sec.*	*Feet.*	*Sec.-feet.*
April 11	F. H. Tillinghast	403	1,234	1.43	2.12	1,765
May 11	F. H. Brundage	404	1,006	.66	1.44	668
June 6	J. C. Hoyt	381	1,084	.81	1.55	879
July 30	do	378	1,016	.48	1.48	490
November 10	H. D. Comstock	384	1,052	.67	1.52	703

Mean daily gage height, in feet, of Raritan River at Bound Brook, N. J., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.80	(a)	2.25	4.00	.....	1.70	1.70	1.40	1.35	1.45	1.60	1.55
2	1.80	2.10	2.40	4.00	.....	1.70	1.70	1.75	1.40	1.40	1.55	1.45
3	1.80	1.85	2.35	2.70	.....	1.60	1.60	1.70	1.40	1.40	1.50	1.40
4	1.60	1.70	2.95	2.20	.....	1.50	1.50	1.55	1.40	1.40	1.50	1.40
5	1.50	1.60	1.90	2.10	.....	1.40	1.60	2.85	1.30	1.35	1.50	1.35
6	1.50	1.60	1.60	1.90	.....	1.55	1.60	3.40	1.30	1.30	1.50	1.35
7	1.50	1.85	3.85	2.00	.....	1.55	1.95	2.20	1.30	1.30	1.50	1.40
8	1.50	4.10	8.60	1.95	1.40	1.80	2.55	1.90	1.30	1.30	1.50	1.40
9	1.50	3.45	3.60	2.10	1.40	2.00	1.90	1.70	1.30	1.30	1.50	1.40
10	1.50	3.15	2.35	2.60	1.40	1.65	1.60	3.20	1.30	1.30	1.50	1.40
11	1.50	2.85	1.95	2.15	1.40	1.50	1.55	4.60	1.30	1.30	1.65	1.40
12	1.50	2.10	1.75	1.95	1.35	1.40	1.55	2.65	1.30	3.30	1.80	1.40
13	1.50	1.80	1.65	1.85	1.30	1.40	1.50	2.40	1.30	3.30	1.75	1.35
14	3.30	1.65	1.50	1.70	1.35	1.40	1.45	2.15	1.30	2.20	4.25	1.30
15	2.95	1.75	1.65	1.60	1.40	1.40	1.40	2.00	c10.10	1.80	2.95	1.40
16	2.40	1.65	1.80	1.60	1.45	1.35	1.40	1.75	5.45	1.70	2.40	1.40
17	2.30	1.65	1.80	1.60	1.40	1.30	1.40	1.65	3.70	1.60	2.15	1.30
18	2.30	1.65	1.80	1.60	1.40	1.30	1.35	1.55	2.35	1.55	1.95	1.35
19	2.20	1.60	2.90	1.50	1.30	1.30	1.40	1.45	2.15	1.55	1.90	1.30
20	2.10	1.60	2.65	1.50	1.45	1.25	1.35	4.50	1.90	1.45	1.85	1.30
21	2.00	1.50	2.35	1.45	1.50	1.20	1.25	4.70	1.75	4.35	1.70	1.30
22	2.00	b9.46	2.60	1.40	1.40	1.20	1.20	3.40	1.70	6.35	1.70	1.30
23	d7.90	5.25	2.80	1.40	1.30	1.20	1.25	2.55	1.60	3.25	1.65	1.30
24	(e)	4.25	2.40	1.40	1.25	1.15	1.30	2.05	1.60	2.60	1.60	1.40
25	(e)	2.65	2.10	1.40	1.20	1.10	1.25	1.80	1.60	2.30	1.60	1.60
26	(e)	2.30	2.45	1.40	1.20	1.15	1.25	1.65	1.60	2.05	1.60	2.10
27	(e)	2.05	2.50	2.45	1.20	1.15	1.20	1.60	1.60	1.95	1.55	1.80
28	(e)	2.40	1.90	.....	1.20	1.25	1.40	1.50	1.60	1.75	1.50	3.85
29	(e)	3.15	1.75	.....	1.20	1.50	2.15	1.45	1.50	1.70	1.45	3.90
30	(e)	.....	1.70	.....	1.20	1.75	1.40	1.40	1.45	1.70	1.60	3.15
31	(e)	.....	1.70	.....	1.65	.....	1.35	1.40	.....	1.60	.....	2.90

a River frozen except under gage.
b Ice gone out; river clear; highest reading 11.2 feet.
c Highest gage reading 11.7 during flood.
d Ice jam in morning; river clear in evening.
e Gage carried out by ice.

NOTE.—River frozen from January 1 to February 22. Thickness of ice varied from 2 to 12 inches. Gage height to surface of ice.

RARITAN RIVER (NORTH BRANCH) NEAR PLUCKEMIN, N. J.

This station was established September 9, 1903, by E. P. Roundey. It is located at the second bridge below Far Hills, N. J., on the road to Somerville, N. J., about 2 miles from Far Hills. The gage is a vertical 1¼ by 6 inch cypress board spiked to the upstream wing wall of the right abutment, reading from 0 to 10 feet. The gage is read twice each day by Thomas Moore. Discharge measurements are made from the single-span wooden highway bridge on the downstream side. The initial point for soundings is the face of the right abutment at its downstream end. The channel is straight for 400 feet above and 300 feet below the bridge. A small rift occurs in the channel about 200 feet above the bridge. The current is sluggish. Both banks are low and liable to overflow. The bed of the stream is composed of gravel. There is but one channel under the bridge. The bench mark is a

square chiseled on the top of the upstream wing wall of the right abutment. Its elevation is 10.38 feet above the zero of the gage.

The observations at this station during 1904 have been made under the direction of N. C. Grover, district hydrographer.

Discharge measurements of Raritan River (North Branch) near Pluckemin, N. J., in 1904.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Ft. per sec.*	*Feet.*	*Sec.-feet.*
May 12	F. H. Brundage	55	160	0.35	1.51	56
November 9	H. D. Comstock	55	172	.37	1.70	63

Mean daily gage height, in feet, of Raritan River (North Branch) near Pluckemin, N. J., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.50	3.00	2.30	2.85	2.00	2.30	1.65	1.95	1.40	1.80	1.80	1.95
2	2.50	3.20	2.80	2.50	2.10	2.30	1.40	1.70	1.40	1.70	1.80	1.75
3	2.50	3.20	2.60	2.30	1.80	2.35	1.40	1.52	1.40	1.60	1.80	1.60
4	2.50	3.20	2.30	2.05	1.80	2.10	1.40	2.65	1.40	1.60	1.80	1.50
5	2.50	3.20	1.90	2.00	1.70	2.15	1.30	2.05	1.40	1.60	1.80	1.50
6	2.50	3.20	1.90	2.00	1.70	1.65	1.30	1.70	1.40	1.60	1.80	1.50
7	2.50	3.45	5.25	2.00	1.55	1.90	2.00	1.50	1.40	1.50	1.75	1.70
8	2.50	3.70	3.00	2.00	1.50	1.50	2.80	1.50	1.40	1.50	1.70	1.70
9	2.50	3.30	2.45	2.10	1.50	2.05	1.65	1.50	1.40	1.85	1.70	1.70
10	2.50	3.20	2.25	2.10	1.55	1.70	2.00	2.80	1.40	1.65	1.70	1.70
11	2.50	3.20	2.20	2.10	1.60	1.58	1.70	2.65	1.40	2.80	1.80	1.70
12	2.50	3.20	2.08	2.20	1.55	1.48	1.75	2.15	1.40	1.85	1.70	1.70
13	2.65	3.20	1.95	2.10	1.50	1.40	1.70	1.90	1.40	1.70	2.85	1.70
14	3.00	3.20	1.80	2.05	1.50	1.40	1.40	1.83	3.55	1.70	2.50	1.70
15	2.70	2.80	1.80	1.90	1.60	1.40	1.50	1.68	(a)	1.70	2.18	1.70
16	2.70	2.80	1.80	1.90	1.70	1.40	1.30	1.60	.....	1.70	2.10	1.75
17	2.70	2.80	1.80	1.80	1.60	1.40	1.30	1.58	.....	1.60	2.00	1.95
18	2.70	2.80	2.00	1.80	1.60	1.35	1.65	1.50	3.00	1.60	2.00	2.20
19	2.70	2.80	2.00	1.70	1.80	1.30	1.50	4.40	2.90	1.60	2.00	2.20
20	2.70	2.80	2.10	1.70	1.90	1.30	1.35	3.00	2.60	1.52	2.95	2.20
21	2.70	2.80	2.10	1.70	1.60	1.40	1.30	1.90	2.50	4.55	2.90	2.20
22	2.75	6.15	2.10	1.70	1.52	1.40	1.30	1.78	2.40	2.80	2.88	2.20
23	[b] 6.26	3.55	2.10	1.70	1.50	1.40	1.30	1.70	2.30	2.55	2.80	2.20
24	4.70	4.25	2.10	1.70	1.50	1.40	1.45	1.63	2.30	2.25	2.78	2.20
25	2.90	3.95	2.10	1.70	1.50	1.30	1.65	1.60	2.30	2.05	2.70	2.30
26	2.85	3.52	2.15	1.70	1.50	1.30	1.60	1.60	2.30	1.95	2.70	2.30
27	3.00	3.50	2.15	2.25	1.40	1.28	1.30	1.60	2.20	1.90	2.70	2.35
28	3.00	3.25	2.05	2.15	1.30	1.20	1.65	1.55	2.20	1.90	2.55	2.55
29	3.00	2.55	1.80	2.00	1.30	1.65	2.20	1.48	1.90	1.90	2.35	2.75
30	3.00	.....	1.82	2.00	1.90	1.65	1.90	1.43	1.80	1.90	2.15	2.50
31	3.00	.....	2.45	.....	2.38	.....	2.00	1.40	.....	1.88	.....	2.50

[a] Gage washed away on 14th; put up again on 18th.
[b] Ice went out; greatest height, 6.8. River frozen again the 24th.

NOTE.—River frozen from January 1 to March 1, when ice went out. Thickness of ice varied from 6 to 12 inches. River frozen December 8–31. Gage heights to surface of ice.

MILLSTONE RIVER AT MILLSTONE, N. J.

This station was established June 26, 1903, by E. P. Roundey. It is located at a highway bridge near the blacksmith shop in the village of Millstone, N. J. The gage is a vertical 1¼ by 6-inch cypress board, spiked to the left abutment of the bridge on the downstream side. It reads from 0 to 10 feet, and is graduated with galvanized-iron staples. The bench mark is a cross chiseled on the coping near the end of the downstream wing wall of the left abutment. Its elevation is 11.11 feet above the zero of the gage. The gage is read twice each day by E. H. Wyckoff, the blacksmith. Discharge measurements are made from the upstream side of the single-span highway bridge, to which the gage is attached. The bridge has a span of 93 feet and is located about 1 mile above a dam. The gage heights may be influenced by this dam and also by backwater from Raritan River. The initial point for soundings is the face of the left abutment. The channel is straight for 500 feet above and 100 feet below the station. The current is sluggish at low water. Both banks are low, wooded, and liable to overflow. At extreme high water the right bank overflows for a considerable distance. The bed of the stream is composed of gravel. This station was discontinued December 31, 1904.

The observations at this station during 1904 have been made under the direction of N. C. Grover, district hydrographer.

Discharge measurements of Millstone River at Millstone, N. J., in 1904.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Ft. per sec.*	*Feet.*	*Sec.-feet.*
April 11	F. H. Tillinghast	93	372	1.60	1.19	596
June 26	J. C. Hoyt	93	293	.86	.27	251
July 30	do	93	268	.44	.05	118
November 10	H. D. Comstock	93	352	.70	.84	247

Mean daily gage height, in feet, of Millstone River at Millstone, N. J., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.55	0.58	1.85	3.12	1.02	0.68	−0.04	0.15	0.25	(a)	0.80	0.8
2	.35	.50	2.22	3.65	.68	1.38	− .01	.52	.22	(a)	.87	.7
3	.30	.50	1.72	2.25	.60	.75	− .04	.50	.25	(a)	.85	.7
4	.30	.50	2.02	1.38	.50	.50	− .08	.52	.25	(a)	.87	.7
5	.50	.50	1.08	1.08	.35	.40	− .01	1.15	.15	(a)	.85	.6
6	.50	.50	.42	.88	.28	.30	− .02	.85	.18	0.58	.87	.6
7	.50	1.80	2.45	.92	.25	.72	.08	1.88	.18	.60	.75	.6
8	.50	3.72	6.20	.88	.20	1.08	.48	1.60	.15	.55	.78	.6
9	.50	1.85	4.02	1.08	.20	1.32	.45	.75	.06	.60	.87	.6
10	.50	1.15	1.88	1.60	.20	.85	.38	.65	.12	.55	.87	.6
11	.50	.75	1.08	1.20	.18	.42	.25	2.78	.20	.48	1.25	.6
12	.50	.35	.75	1.02	.20	.22	.18	2.78	.04	3.25	1.30	.6
13	.52	.28	.62	.82	.10	.10	.40	2.58	.01	4.65	1.52	.6
14	2.10	.25	.52	.62	.12	.05	.40	2.60	.15	1.98	4.27	.6
15	1.70	.18	.40	.52	.30	.02	.25	1.22	7.32	1.40	3.32	.6
16	1.25	.20	.55	.52	.18	.05	.20	.82	7.42	1.20	2.32	.6
17	1.05	.20	.80	.38	.02	.05	.10	.62	5.02	.98	1.80	.6
18	.60	.20	.85	.32	−.10	.02	.12	.40	2.20	.92	1.40	.6
19	.50	.20	2.12	.35	.12	−.02	.08	.30	1.30	.85	1.22	.6
20	.50	.20	1.62	.30	.20	−.16	.10	6.20	.95	.85	1.15	.6
21	.50	.20	1.18	.28	.22	.12	.10	6.75	.72	4.10	1.10	.6
22	.50	7.16	1.40	.20	.30	.02	− .03	5.15	.55	6.40	.98	.6
23	b6.88	6.90	1.65	.20	.10	.05	− .02	2.62	.48	3.55	.92	.6
24	6.20	c5.02	1.38	.10	.05	.00	− .03	1.90	.45	2.30	.92	.7
25	4.02	2.60	1.12	.15	.05	.00	.02	.88	.42	1.62	.90	.9
26	1.78	2.05	1.38	.18	.10	.03	− .07	.70	.25	1.32	.85	.9
27	3.02	.68	1.38	1.80	.02	.10	.02	.60	.32	1.25	.78	1.2
28	2.10	1.52	.92	2.68	f−.05	.01	.35	.52	.30	1.07	.68	4.0
29	1.45	2.00	.68	2.08	−.04	−.02	.20	.42	(a)	1.00	.68	2.8
30	.98	.....	.65	1.52	.01	−.08	.10	.38	(a)	.92	.88	2.3
31	.70	.....	1.05	.....	.50	.....	.10	.22	.....	.87	.....	2.0

a Below gage; drawn off to repair dam. b Caused by ice jam. c Ice gone out of river.

Note.—River frozen January 1 to February 23; also December 11 to 31. Ice 3 to 6 inches thick. Gage heights to surface of ice.

DELAWARE RIVER DRAINAGE BASIN.

Delaware River rises on the slope of Mine Mountain, near the southwestern line of Schoharie County, New York, flows southwesterly across central Delaware County to Deposit, where it is joined by Oquaga Creek, a large tributary draining eastern Broome County. The upper drainage area is relatively long and narrow, with numerous short lateral tributaries. It is rugged and to a considerable extent wooded. There are low water-power dams near Hamden and Delhi. At Deposit the stream turns abruptly to the southeast, forming the boundary line between New York and Pennsylvania, until Port Jervis is reached. Here it encounters the foot of the Shawangunk Range, and its direction of flow is again turned to the southwest. Below Port Jervis the Delaware forms the division between Pennsylvania and New Jersey, and ultimately empties into Delaware Bay below Philadelphia.

Above Hancock the main stream is known as the West Branch of Delaware River, to distinguish it from the smaller East or Pepacton Branch.

The West Branch of the Delaware is sometimes called the Mohawk. It should not be confused with Mohawk River, a tributary of Hudson River. The East Branch of the Delaware flows parallel to the West Branch across southern Delaware County, but its drainage area is broader and its tributaries longer and more branching than those of the West Branch. Many of the tributaries head in small lakes and ponds.

From Hancock to Port Jervis, a distance by river of 76 miles, the Delaware flows in a broad, shallow channel with numerous slight rifts and a relatively rapid current. Several large tributaries enter in this section of the stream, notably Mongaup and Callicoon creeks and Neversink River from the New York side, and the Lackawaxen River from Pennsylvania.

The drainage area of Delaware River above Port Jervis lies about four-fifths in New York and one-fifth in Pennsylvania.

Neversink River rises in southwestern Ulster County, two branches uniting to form the main stream near Sullivan County line. The stream then flows southerly, crossing eastern Sullivan County, and enters Delaware River at Port Jervis. Its fall is rapid and often precipitous, and its drainage basin contains numerous small lakes.

Measurements of flow of Delaware River were made during the latter half of June, 1891, by Prof. Dwight Porter and students at Delaware Watergap, Pa. The results show a flow of from 2,000 to 2,200 second-feet. This was said to be the lowest June stage for five years. Measurements were made during the drought of 1895 by Prof. L. M. Haupt at Point Pleasant, Pa., near the intake of the Delaware and Raritan Canal feeder. The discharge above the bridge was 1,657 second-feet and below the bridge 1,328 second-feet. Delaware River was measured by E. G. Paul, June 4, 1899, at Martins Creek, Pa., 7 miles above the mouth of Lehigh River, and a discharge of 2,724 second-feet was found.

Stations were maintained in this basin during 1904 by the United States Geological Survey as follows: Delaware River (West Branch) at Hancock, N. Y.; Delaware River (East Branch) at Hancock, N. Y.; Delaware River at Lambertville, N. J.; Lehigh River at South Bethlehem, Pa.; Musconetcong River near Bloomsbury, N. J.

Aside from these stations, measurements have been made for several years by John E. Codman, hydrographer of the water department of the city of Philadelphia. The stations maintained by Mr. Codman are located on the following streams, all in the vicinity of Philadelphia: Perkiomen, Tohickon, and Neshaminy creeks, and Schuylkill River.

DELAWARE RIVER (WEST BRANCH) AT HANCOCK, N. Y.

This station was established October 15, 1902, by P. M. Churchill, assisted by C. C. Covert. It is located about one-half mile southwest of the Erie Railroad station at Hancock, N. Y., and about 1 mile above the junction of the East and West branches of the Delaware. The original wire gage was attached to the upstream side of the bridge. It was replaced July 20, 1903, by a standard chain gage, which was installed by F. H. Tillinghast. The location and the gage datum were not changed. The length of the chain from the end of the weight to the marker is 30.44 feet. The gage is read twice each day by David Pulver, the collector of tolls at the bridge. Discharge measurements are made from the downstream side of the bridge at which the gage is located. The bridge has a single span of 235 feet. The initial point for soundings is the top of the face of the left abutment on the downstream side. The bridge floor is marked at intervals of 5 feet with black paint. The channel is straight for 400 feet above and for 800 feet below the bridge. The current is swift. Both banks are high and rocky and are not subject to overflow. The bed of the stream is composed of earth and cobblestones. The bench mark is a circular chisel draft on the upstream corner of the left abutment. Its elevation is 24.25 feet above gage datum. The elevation of the top of the pulley is 30.54 feet above gage datum.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Discharge measurements of Delaware River (West Branch) at Hancock, N. Y., in 1904.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Sq. feet.	*Feet per sec.*	*Feet.*	*Second-feet.*
July 15	C. C. Covert	326	0.55	3.05	180
September 11	Covert and Swancott	408	.92	3.39	375

Mean daily gage height, in feet, of Delaware River (West Branch) at Hancock, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.82	7.47	9.71	5.79	4.98	3.49	3.26	3.65	3.45	4.35	3.85	3.90
2	5.87	8.52	9.91	6.59	4.76	3.32	3.11	4.15	3.50	4.10	3.75	3.55
3	5.37	7.97	10.06	5.64	4.56	3.39	2.94	4.90	3.55	3.90	3.75	3.35
4	5.17	7.67	11.81	5.21	4.56	3.42	3.11	4.50	4.15	3.80	3.65	3.35
5	4.57	7.42	12.41	5.13	4.27	3.81	3.11	4.10	4.20	3.75	3.55	3.30
6	5.42	7.07	11.44	5.13	4.27	3.71	3.21	5.50	3.90	3.55	3.55	3.35
7	5.77	7.82	11.39	5.46	4.02	3.46	3.01	4.20	3.70	3.45	3.60	3.45
8	5.77	14.43	11.66	5.76	3.97	3.66	3.06	3.90	3.50	3.35	3.50	3.25
9	5.72	13.26	11.81	5.83	3.92	4.41	3.08	3.75	3.40	3.45	3.40	3.80
10	5.22	11.96	10.04	6.23	3.67	4.11	3.11	3.90	3.35	3.50	3.45	4.25
11	5.42	11.86	8.69	5.73	3.57	3.96	3.06	4.35	3.40	3.50	3.40	4.75
12	5.32	11.61	8.27	5.33	3.42	3.74	3.14	4.12	3.35	3.75	3.45	4.70
13	5.12	11.81	6.91	5.03	3.57	3.48	3.06	3.80	3.10	3.90	3.40	4.70
14	5.07	10.96	6.34	4.78	3.37	3.46	3.30	3.70	3.20	4.65	3.60	4.60
15	4.42	11.01	6.14	4.53	4.27	3.46	3.10	3.80	4.40	4.40	3.40	4.50
16	4.87	10.51	5.71	4.40	4.12	3.61	4.50	3.85	4.10	4.25	3.55	4.60
17	5.02	10.06	5.81	4.43	4.12	3.68	3.80	3.55	3.55	4.05	3.35	4.25
18	4.97	10.06	5.89	4.28	4.17	3.31	3.65	3.60	3.55	3.90	3.30	4.65
19	4.67	10.01	5.87	4.03	3.97	3.26	3.60	3.60	3.55	3.90	3.35	4.45
20	4.52	10.06	5.84	3.98	4.57	3.14	3.40	4.10	3.35	3.80	3.45	4.55
21	4.72	10.06	6.09	4.03	4.32	3.21	3.30	4.75	3.15	5.30	3.90	4.40
22	4.87	10.31	5.69	4.08	4.19	3.01	3.20	4.35	3.10	7.50	4.50	4.25
23	6.32	11.11	7.81	3.98	3.92	3.06	3.10	5.40	3.10	5.95	4.40	4.45
24	7.32	11.76	9.42	3.93	4.07	3.11	3.05	4.70	3.20	5.35	4.45	4.65
25	5.62	10.56	8.84	3.98	3.77	3.16	3.00	4.85	5.00	5.00	4.25	4.85
26	5.12	10.46	13.05	4.03	3.87	3.16	3.35	4.25	4.40	4.85	4.10	4.45
27	6.27	10.01	7.54	4.16	3.62	2.94	4.15	4.05	4.50	4.55	3.95	4.95
28	8.62	9.91	6.04	5.06	3.52	2.71	3.60	3.88	4.45	4.15	3.60	7.30
29	8.32	10.06	5.39	5.20	3.37	3.06	4.20	3.72	3.90	4.15	3.55	5.75
30	8.32	.....	5.24	5.10	3.37	2.84	3.90	3.80	4.65	3.95	4.05	5.05
31	7.92	.....	5.04	.....	3.47	.....	3.80	3.50	.....	3.95	.....	4.60

NOTE.—Ice conditions January 1 to March 7; also December 9 to 27. Gage heights to surface of ice.

DELAWARE RIVER (EAST BRANCH) AT HANCOCK, N. Y.

This station was established October 14, 1902, by P. M. Churchill and C. C. Covert. It is located at the highway bridge one-half mile southeast of the Erie Railroad station at Hancock, N. Y., and 1 mile above the junction with the West Branch of Delaware River. The Erie Railroad bridge is just below the station. The standard chain gage with inclosed scale is attached to the lower chord of the second span from the left end of the bridge on the upstream side. It was installed to replace the old wire gage July 21, 1903, by F. H. Tillinghast. The gage datum was not changed. The length of the chain from the end of the weight to the marker is 32.43 feet. The gage is read twice each day by D. B. Van Etten. Discharge measurements are made from the downstream side of the 5-span iron highway bridge to which the gage is attached. The bridge has a total span of 425.5 feet between abutments. The initial point for soundings is the face of the right abutment at the top. The channel is straight for 600 feet above and for 300 feet below the station. The current is swift. Both banks are of medium height, and are not subject to overflow. The bed of the stream is composed of rocks and gravel and is not subject to change. There are three channels at low water and five channels at high water. The bench mark is a circular chisel draft on the top of the left abutment on the downstream side. It is marked "B. M." Its elevation is 27.93 feet above gage datum. The elevation of the top of the gage pulley is 32.40 feet above gage datum. During low water the elevation of the water surface at the station is lower than the water surface at the station on the West Branch of the Delaware, but there is no danger of the gage heights being affected by backwater from the West Branch, as there is considerable fall between the gaging station and the junction of the branches.

The observations at this station during 1904 have been made under the direction of R. E. Horton, district hydrographer.

Discharge measurements of Delaware River (East Branch) at Hancock, N. Y., in 1904.

Date.	Hydrographer.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Sq. ft.	*Ft. per sec.*	*Feet.*	*Second-feet.*
July 14	C. C. Covert	586	0.98	3.26	578
September 11	Covert and Swancott	528	.77	3.04	408

Mean daily gage height, in feet, of Delaware River (East Branch) at Hancock, N. Y., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.67	5.32	4.71	5.64	5.23	3.47	3.28	3.75	3.28	3.85	3.80	4.45
2	4.97	4.77	4.81	6.99	4.96	3.39	3.26	3.75	3.28	3.62	3.70	4.32
3	4.32	4.62	4.96	6.24	4.73	3.37	3.08	3.98	3.22	3.55	3.62	4.12
4	4.17	4.52	4.86	5.64	4.56	3.37	2.96	3.78	3.35	3.48	3.60	4.22
5	4.17	4.47	5.51	5.33	4.42	3.38	2.95	3.58	3.32	3.40	3.52	3.90
6	4.17	4.42	5.79	5.43	4.25	3.54	2.95	3.48	3.18	3.32	3.60	4.05
7	4.35	[a]6.81	7.54	6.03	4.15	3.58	2.97	3.38	3.12	3.30	3.58	4.15
8	4.62	8.26	19.49	6.18	4.05	3.94	3.05	3.25	3.08	3.22	3.48	4.05
9	4.49	8.21	13.99	7.13	3.95	4.18	2.97	3.20	3.10	3.20	3.40	3.90
10	4.49	7.21	12.54	7.38	3.85	4.18	2.95	3.45	3.15	3.20	3.40	3.75
11	4.77	6.91	12.74	6.83	3.77	3.94	2.90	4.35	3.08	3.20	3.40	4.05
12	4.42	6.01	12.79	6.68	3.72	3.76	2.97	4.02	2.98	3.32	3.40	4.35
13	4.22	5.61	12.79	6.28	3.65	3.64	3.30	3.70	2.90	4.05	3.35	4.40
14	4.22	5.36	12.64	5.53	3.55	3.48	3.22	3.55	2.92	3.95	3.48	4.35
15	4.42	5.31	12.69	4.78	3.69	3.46	3.08	3.55	3.28	3.78	3.42	4.45
16	4.57	5.01	12.64	4.80	4.07	3.54	3.80	3.42	3.85	3.68	3.50	4.55
17	4.87	4.71	12.44	4.58	3.95	3.41	3.58	3.32	3.42	3.60	3.45	4.65
18	4.77	4.61	12.24	4.48	3.85	3.31	3.45	3.60	3.22	3.52	3.40	4.70
19	4.67	4.51	12.14	4.38	3.85	3.26	3.65	3.52	3.12	3.50	3.40	4.70
20	4.92	4.61	12.34	4.28	3.99	3.18	3.40	3.80	3.10	3.45	3.40	4.70
21	5.22	4.56	12.24	4.16	3.92	3.16	3.22	4.70	3.05	9.02	3.60	4.70
22	5.57	4.66	13.34	4.20	3.79	3.14	3.12	4.15	2.98	9.10	4.25	4.65
23	5.52	5.11	14.49	4.23	3.67	3.08	3.08	4.52	2.92	6.38	4.18	4.65
24	[b]9.32	5.01	15.74	4.10	3.72	3.06	3.05	4.18	3.00	5.50	4.15	4.55
25	10.57	4.76	15.39	4.23	3.65	3.01	3.00	3.95	3.50	5.00	4.10	5.15
26	9.32	4.61	17.04	4.23	3.57	2.98	3.18	3.88	3.60	4.75	4.02	4.85
27	10.17	4.41	9.24	4.53	3.59	2.91	3.42	3.75	3.58	4.48	3.88	5.05
28	10.12	4.61	6.49	5.13	3.55	2.88	3.35	3.58	3.48	4.28	3.75	7.10
29	9.07	4.61	5.59	5.68	3.45	2.94	5.96	3.48	3.40	4.12	4.80	5.80
30	8.07	.....	5.39	5.46	3.39	3.06	4.52	3.40	3.78	4.00	5.10	5.05
31	5.42	.....	5.19	.....	3.45	.....	4.00	3.32	.....	3.88	.....	4.80

[a] January 24–30, back water from ice jam. [b] February 7–13, back water from ice jam.

NOTE.—River frozen from January 10 to March 21; also December 11–28. Gage heights to surface of water in hole cut in ice.

DELAWARE RIVER AT LAMBERTVILLE, N. J.

This station was established at the covered toll bridge on July 23, 1897, by E. G. Paul. The datum of the chain gage was 2 feet below that of the United States Weather Bureau gage painted on the first bridge pier, and was referred to a copper bolt set in the sill of the extreme south door at the east side of the station of the Pennsylvania Railroad; elevation, 27.82 feet. This bench mark is No. 9 of the Pennsylvania Railroad and has an elevation of 72.69 feet above sea level. The bridge to which this gage was attached was carried away in the flood of October 10–11, 1903. After that date and until July 22, 1904, gage heights were read from a temporary gage on one of the piers. On the latter date a standard chain gage was attached to the new steel bridge which occupies the site of the old toll bridge and set to the same datum as the original chain gage; length of chain, 30.46 feet. At the time this gage was installed a second bench mark was established on the top of the bolt in the fifth course below the

coping on the upstream face of the left abutment; elevation, 14.82 feet. Measurements are made from the lower side of the bridge. The initial point for soundings is on the left bank. The channel above and below is straight. The current is sluggish for a short distance near the left bank. The bed is of gravel and sand and does not change. A dam, located about a mile below the station, may change slowly and thus affect in time the stage of water at the station. The gage is read twice daily by Charles H. Naylor, collector of tolls.

The observations at this station during 1904 have been made under the direction of N. C. Grover, district hydrographer.

Discharge measurements of Delaware River at Lambertville, N. J., in 1904.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Ft. per sec.*	*Feet.*	*Sec.-feet.*
July 22	R. J. Taylor	910	3,614	0.90	2.98	3,249
November 7	E. C. Murphy	1,030	4,747	1.33	3.94	6,305

Mean daily gage height, in feet, of Delaware River at Lambertville, N. J., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	5.45	3.85	3.20	3.10	3.80	3.10	3.65	4.35	4.00
2	.....	.....	.....	8.05	3.75	3.20	3.50	3.55	3.05	3.60	4.20	4.10
3	.....	(a)	(b)	7.80	3.45	3.20	3.35	3.40	3.05	3.90	4.10	4.05
4	.....	.....	.....	6.50	3.10	3.05	3.25	3.30	3.10	3.75	4.05	3.95
5	(a)	c 7.30	.....	5.30	2.95	2.90	3.10	3.55	3.05	3.55	3.95	3.90
6	.....	c 6.30	.....	4.95	2.85	2.95	3.05	3.60	3.00	3.50	4.00	3.75
7	.....	.....	5.30	4.75	2.65	3.05	3.00	3.40	3.10	3.40	3.90	3.80
8	.....	(a)	9.45	4.85	2.60	2.80	3.45	3.30	3.20	3.40	3.80	3.65
9	.....	.....	7.70	5.30	2.50	2.70	4.20	3.35	3.00	3.40	3.80	3.55
10	(a)	7.00	8.05	5.60	2.50	3.10	4.00	3.30	2.95	3.30	3.70	3.60
11	.....	8.30	6.40	5.65	2.55	3.25	3.70	4.10	3.20	3.20	3.70	(a)
12	.....	.....	5.20	5.10	2.65	3.15	3.55	3.45	2.95	3.90	3.70	.....
13	.....	(a)	4.55	4.60	2.60	2.85	3.70	3.95	2.80	3.70	3.80	.....
14	.....	.....	4.15	4.15	2.60	2.70	3.50	4.15	3.50	3.90	4.40	.....
15	(a)	7.90	3.80	3.85	2.65	2.65	3.00	3.80	6.95	4.20	4.35	.....
16	.....	.....	3.75	3.50	2.80	2.50	3.00	3.45	5.15	4.30	4.25	.....
17	.....	.....	3.45	3.35	2.80	2.40	3.00	3.25	4.75	4.05	4.20	.....
18	.....	(a)	3.40	3.05	3.05	2.30	3.05	3.15	4.60	3.90	4.10	.....
19	.....	.....	3.40	3.00	3.25	2.20	3.40	3.05	4.20	3.75	4.05	.....
20	(a)	.....	3.85	2.90	3.35	2.20	3.40	3.40	3.90	3.60	4.00	.....
21	.....	d 10.00	3.85	2.90	3.35	2.20	3.00	3.95	3.60	4.85	3.90	.....
22	.....	d 15.05	3.95	2.85	3.35	2.10	3.20	3.95	3.50	7.60	4.05	.....
23	e 5.00	d 13.50	4.25	2.70	3.20	2.00	2.80	4.30	3.35	9.15	4.40	.....
24	e 4.45	d 11.75	4.20	2.60	2.95	2.00	2.80	4.05	3.20	7.10	4.70	.....
25	e 4.30	.....	5.75	2.50	2.85	2.00	2.75	4.20	3.20	6.25	4.60	.....
26	e 5.00	.....	f 6.45	2.50	2.80	2.00	2.80	4.00	3.10	5.60	4.55	.....
27	.....	.....	f 9.75	2.80	3.20	2.80	2.95	3.65	3.10	5.20	4.45	.....
28	.....	(b)	8.30	3.15	3.50	2.80	3.45	3.55	3.75	5.00	4.30	.....
29	(a)	.....	6.20	3.60	3.35	2.80	3.40	3.40	3.70	4.80	4.20	e 7.90
30	.....	.....	5.15	3.95	2.95	2.90	3.45	3.30	3.75	4.70	4.00	9.40
31	.....	.....	4.80	.....	3.15	.....	4.10	3.20	.....	4.50	.....	5.70

a River frozen at pier. From January 1 to 23 frozen across.
b Ice jam at pier February 25 to March 7.
c Ice jam three-fourths mile below bridge is cause of rise.
d Ice jam cause of rise.
e River open.
f Upper Delaware ice cause of rise.

LEHIGH RIVER NEAR SOUTH BETHLEHEM, PA.

This station, which was established September 22, 1902, by Prof. Mansfield Merriman, of Lehigh University, is located at New Street Bridge, between Bethlehem and South Bethlehem, Pa. The standard chain gage is attached to the hand rail near the right bank on the lower side of the bridge. The length of chain from the end of the weight to the marker is 43.77 feet. The datum of the gage is referred to bench mark No. 72 of the Lehigh Valley Railroad, which is an iron pin set in the south pier of New Street Bridge; elevation, 22.32 feet. This bench mark is 232.87 feet above sea level. Discharge measurements are made from the bridge to which the gage is attached. This bridge has nine spans, but the river is confined to three, except at high stages. The right bank is high and will not overflow, but on the left bank the river overflows at high stages and joins Monocacy Creek, which is tributary to Lehigh River a few rods below the station. The initial point for soundings is the face of the pier on the right bank. The channel is straight for several hundred feet above and below the station. The bed is composed of sand and gravel, which is free from vegetation and is permanent. The velocity is fair. The gage is read once daily by Harry E. Edmonds.

The observations at this station during 1904 have been made under the direction of N. C. Grover, district hydrographer.

Discharge measurements of Lehigh River near South Bethlehem, Pa., in 1904.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Ft. per sec.*	*Feet.*	*Sec.-feet.*
July 21	R. J. Taylor		760	1.10	2.29	838
November 7	H. D. Comstock	293	923	1.38	2.69	1,276

Mean daily gage height, in feet, of Lehigh River near South Bethlehem, Pa., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.80	3.00	3.30	6.60	3.00	2.80	2.60	2.50	2.20	2.40	2.80	2.80
2	2.80	2.80	3.40	6.75	3.00	2.80	2.50	2.40	2.20	2.30	2.80	2.70
3	2.50	2.80	4.00	5.70	2.90	3.00	2.40	2.60	2.30	2.30	2.80	2.60
4	2.90	2.70	4.52	4.70	2.80	2.70	2.30	2.70	2.10	2.30	2.70	2.50
5	2.70	2.80	3.50	4.50	2.80	3.20	2.20	2.60	2.20	2.30	2.70	2.50
6	2.70	2.90	3.50	4.30	2.70	3.20	2.10	2.50	2.10	2.30	2.70	2.60
7	2.70	2.90	10.26	4.30	2.60	3.10	2.60	2.30	2.20	2.30	2.70	2.60
8	2.80	4.10	9.15	4.30	2.60	3.00	3.95	2.40	2.10	2.30	2.60	2.60
9	2.70	3.90	6.60	4.40	2.60	3.10	3.10	2.40	2.10	2.30	2.60	2.50
10	2.60	3.50	5.80	4.30	2.60	3.90	3.10	2.40	2.40	2.30	2.60	2.50
11	2.60	3.10	5.30	4.00	2.70	.....	2.90	3.00	2.20	2.30	2.60	2.50
12	2.70	3.00	4.60	3.90	2.60	.....	2.70	2.60	2.10	2.50	2.60	2.50
13	2.80	2.90	4.30	3.80	2.40	3.80	2.70	2.40	2.10	2.70	2.60	2.50
14	2.80	2.80	4.10	3.70	2.40	.....	2.55	2.40	2.35	2.70	3.20	2.40
15	2.70	2.80	4.00	3.50	.....	3.10	2.30	2.50	3.50	2.70	3.20	2.50
16	2.60	2.80	3.90	3.40	3.00	3.00	2.25	2.40	3.70	2.60	3.10	2.50
17	2.50	2.70	3.70	3.30	2.80	2.90	2.20	2.30	3.20	2.60	2.90	2.40
18	2.40	2.70	3.70	3.20	2.70	2.70	2.40	2.30	2.80	2.50	2.80	2.40
19	2.40	2.60	3.60	3.10	2.70	2.60	2.70	2.20	2.80	2.40	2.80	2.50
20	2.70	2.60	4.30	3.10	2.70	2.50	2.60	2.40	2.70	2.40	2.70	2.50
21	2.40	2.60	4.30	3.10	2.60	2.50	2.20	3.15	2.60	2.50	3.20	2.50
22	2.80	6.53	4.20	3.10	2.60	2.50	2.20	2.90	2.60	6.30	3.10	2.30
23	6.40	4.65	4.30	3.00	2.50	2.50	2.10	3.00	2.50	4.70	3.10	2.40
24	5.40	4.30	4.40	3.00	2.50	2.40	2.30	2.80	2.50	4.10	3.00	2.60
25	4.15	4.10	4.70	2.90	2.50	2.40	2.40	2.60	2.30	3.80	2.90	2.60
26	3.80	3.30	5.30	2.90	2.60	2.40	2.60	2.50	2.30	3.60	2.80	2.80
27	3.70	3.25	5.10	3.00	2.70	2.30	3.60	2.40	2.30	3.40	2.80	2.70
28	3.30	3.10	4.90	3.20	2.60	2.20	3.20	2.30	2.30	3.20	2.80	3.50
29	3.30	3.30	4.30	3.20	2.40	2.35	3.00	2.30	2.30	3.10	2.80	4.40
30	3.20	.....	4.10	3.10	2.40	2.60	2.80	2.30	2.50	3.00	2.80	3.60
31	3.10	.....	4.10	.....	2.80	.....	2.60	2.20	.....	2.90	.....	3.40

MUSCONETCONG RIVER NEAR BLOOMSBURY, N. J.

This station was established July 4, 1903, by E. P. Roundey. It is located at the first highway bridge over Musconetcong River above the village of Bloomsbury, N. J. The 1903 gage was a vertical 1¼ by 6-inch cypress board spiked to the right abutment near the downstream end. It read from 0 to 10 feet, and was graduated with galvanized-iron staples. A standard chain gage was installed at this station on April 12, 1904, by F. H. Tillinghast to the same datum as the staff gage; length of chain, 12.46 feet. The bench mark is a square chiseled on the top of the right abutment at its downstream end. Its elevation is 9.63 feet above the gage datum. Discharge measurements are made from the downstream side of the two-span highway bridge to which the gage is attached. The initial point for soundings is the end of the hand rail on the right bank. The channel is straight for 200 feet above and 100 feet below the station. The current is swift, and both banks are low and liable to overflow. The

bed of the stream is composed of gravel. The channel is broken by the central pier of the two-span bridge, and at high stages part of the water flows around the bridge. Gage readings are taken twice each day by Michael Kieffer.

The observations at this station during 1904 have been made under the direction of N. C. Grover, district hydrographer.

Discharge measurements of Musconetcong River near Bloomsbury, N. J., in 1904.

Date.	Hydrographer.	Width.	Area of section.	Mean velocity.	Gage height.	Discharge.
		Feet.	*Sq. feet.*	*Ft. per sec.*	*Feet.*	*Sec.-feet.*
June 7	J. C. Hoyt	64	118	1.56	1.48	184
July 23	R. J. Taylor	64	119	.80	1.14	95
August 24	J. C. Hoyt	64	100	1.07	1.22	106
November 8	H. D. Comstock	60	108	1.35	1.29	147

Mean daily gage height, in feet, of Musconetcong River near Bloomsbury, N. J., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.75	1.72	1.78	.....	1.55	1.31	1.13	1.18	1.05	1.10	1.30	1.48
2	1.68	1.60	1.80	.....	1.51	1.25	1.15	1.08	.95	1.08	1.25	1.25
3	[a]2.18	1.72	2.55	.....	1.41	1.28	1.08	1.08	.95	1.15	1.25	1.42
4	2.42	1.70	1.98	.....	1.38	1.28	1.03	1.05	1.00	1.10	1.30	1.48
5	2.20	1.68	1.82	[b]	1.33	1.28	1.03	1.90	1.02	1.12	1.28	1.25
6	2.08	1.60	1.75	.....	1.41	1.35	1.03	1.12	1.00	1.12	1.28	1.22
7	1.92	1.85	4.75	.....	1.28	1.38	1.03	1.05	1.00	1.15	1.28	1.25
8	1.68	1.95	.....	.....	1.43	1.31	1.53	1.10	.95	1.18	1.22	1.28
9	1.68	1.65	.....	.....	1.35	1.33	1.48	1.02	1.00	1.15	1.22	1.20
10	1.62	1.65	[b]	[b]	1.33	1.33	1.35	1.08	.90	1.12	1.15	1.20
11	1.60	1.62	.....	.....	1.33	1.28	1.33	1.35	.98	1.08	1.22	1.15
12	1.52	1.55	.....	1.98	1.31	1.25	1.21	1.18	1.10	1.32	1.22	1.28
13	1.62	1.52	.....	1.75	1.31	1.18	1.18	1.12	.90	1.22	1.28	1.25
14	1.82	1.50	.....	1.63	1.28	1.18	1.15	1.18	4.05	1.15	1.55	1.25
15	1.65	1.52	[b]	1.53	1.43	1.13	1.05	1.12	3.35	1.12	1.32	1.25
16	1.58	1.35	.....	1.55	1.41	1.13	1.03	1.08	2.22	1.15	1.45	1.22
17	1.55	2.62	.....	1.55	1.38	1.13	.98	1.08	1.85	1.12	1.40	1.22
18	1.50	1.85	.....	1.58	1.33	1.08	1.11	1.05	1.55	1.08	1.40	1.18
19	1.40	1.40	.....	1.75	1.35	1.08	.98	.98	1.50	1.08	1.32	1.25
20	1.38	1.45	[b]	1.38	1.43	1.11	1.11	1.20	1.32	1.12	1.32	1.22
21	1.50	1.40	.....	1.35	1.31	1.05	1.05	1.28	1.32	2.35	1.40	1.22
22	2.35	[c]5.58	.....	1.31	1.33	1.05	1.01	1.20	1.25	2.55	1.45	1.20
23	4.55	2.45	.....	1.28	1.28	.93	1.05	1.25	1.20	2.20	1.40	1.20
24	2.70	2.55	.....	1.28	1.25	1.05	1.02	1.20	1.18	1.90	1.40	1.22
25	2.30	1.98	[b]	1.33	1.21	1.11	1.12	1.12	1.18	1.60	1.35	1.20
26	2.05	1.80	.....	1.31	1.23	.93	1.12	1.05	1.20	1.52	1.40	1.22
27	1.98	1.72	.....	1.51	1.23	1.13	1.10	1.05	1.15	1.42	1.32	1.42
28	1.88	1.98	.....	1.63	1.21	1.05	1.10	1.08	1.18	1.40	1.30	1.80
29	1.82	1.78	.....	1.61	1.18	1.18	1.05	1.08	1.12	1.35	1.28	1.58
30	1.78	.....	[b]	1.53	1.13	1.18	1.12	1.02	1.18	1.35	1.40	1.52
31	1.72	.....	.....	.....	1.38	.....	1.08	1.00	.....	1.30	.....	1.45

[a] Ice gorging below. [b] Gage rod washed out. [c] Rain and melting snow causes rise.

TOHICKON CREEK AT POINT PLEASANT, PA.

Tohickon Creek drains an area of 102 square miles in Bucks County, north of Philadelphia. It flows in an easterly course, entering Delaware River about 8 miles above Lambertville, N. J. In a statement by Rudolph Hering, printed in the report of the Philadelphia water department for 1885, page 350, is given a classification of the drainage area of Tohickon Creek, from which it appears that 76 square miles is cultivated and improved and 26 square miles untillable and wooded. Measurements of the discharge of the creek are made near its mouth at Point Pleasant. Rain gages are located within the drainage basin at Quakertown, also at a point about 3 miles north of Bedminster, and near Point Pleasant.

Tables of daily discharge in second-feet, for the years 1883 to 1899, inclusive, are published in Water-Supply Paper No. 47, page 81. Daily records of gage height were not kept during 1900. The following figures of discharge for 1904 were furnished by Mr. John E. Codman, hydrographer of the Water Department of Philadelphia.

Mean daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pa., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	128	111	247	1,494	68	358	26	27	17	46	33	38
2	162	107	357	1,215	61	255	29	76	15	38	27	32
3	162	108	490	304	49	297	23	110	15	31	26	31
4	169	110	458	166	35	238	12	75	10	35	31	31
5	177	111	183	111	31	600	11	45	9	27	27	31
6	169	99	81	85	31	482	12	87	12	21	23	31
7	154	453	1,616	104	27	1,119	12	38	10	18	23	31
8	154	685	1,736	133	21	422	151	19	10	16	23	31
9	154	190	447	270	21	157	74	18	12	14	26	27
10	154	89	203	307	23	94	81	384	11	15	28	23
11	142	65	111	173	20	67	79	1,415	7	17	30	23
12	131	58	74	169	23	56	157	398	4	217	36	23
13	295	56	37	89	23	44	265	106	10	199	63	20
14	782	51	58	68	15	33	74	1,331	1,459	106	417	17
15	1,104	49	55	59	22	23	40	593	4,395	61	440	17
16	1,144	49	112	49	35	24	28	138	868	45	487	20
17	798	49	153	44	34	23	23	72	404	39	460	23
18	454	49	344	42	27	18	19	42	99	35	226	23
19	241	36	595	39	26	13	20	31	58	29	148	83
20	158	23	740	39	22	15	26	517	41	33	148	125
21	131	23	318	35	16	15	33	749	32	2,004	154	69
22	489	2,090	343	31	14	19	31	286	31	1,035	126	31
23	3,133	632	425	27	17	47	26	184	31	261	90	31
24	1,098	272	301	23	15	37	20	119	31	124	76	51
25	232	218	127	22	10	21	18	59	25	78	67	71
26	175	128	341	30	10	15	39	43	19	60	58	71
27	155	76	322	66	9	13	31	34	21	53	45	238
28	144	39	151	112	8	13	27	26	23	41	44	556
29	132	173	104	109	7	16	77	27	18	36	49	431
30	120	.....	82	79	18	25	44	25	49	38	44	154
31	116	.....	334	.....	715	.....	30	20	.....	36	.....	113

Estimated monthly discharge of Tohickon Creek at Point Pleasant, Pa., for 1904.

[Drainage area, 102.2 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January	3,133	116	412	4.03	4.65
February	2,090	23	214	2.09	2.25
March	1,736	55	354	3.46	3.99
April	1,494	22	183	1.79	2.00
May	715	7	46.9	.459	.529
June	1,119	13	152	1.49	1.66
July	265	11	49.6	.485	.559
August	1,415	18	229	2.24	2.58
September	4,395	4	258	2.52	2.81
October	2,004	14	155	1.52	1.75
November	487	23	116	1.14	1.27
December	556	17	80.5	.788	.908
The year	4,395	4	188	1.83	24.96

NESHAMINY CREEK AT FORKS, PENNSYLVANIA.

The drainage basin of Neshaminy Creek is immediately south of that of Tohickon Creek and of a portion of that of Perkiomen Creek. The stream flows in a general southeasterly and southerly course, entering Delaware River at a point about 12 miles above Philadelphia. The point of measurement is at the forks of Big and Little Neshaminy creeks. The drainage area at this point is 139 square miles, of which 128 are cultivated and improved and 11 miles untillable and wooded. The daily discharges from 1884 to 1900 are given in Water-Supply Paper No. 47, pages 90 to 98. The table of daily discharge for 1904 was furnished by Mr. John E. Codman.

Mean daily discharge, in second-feet, of Neshaminy Creek at forks, Pennsylvania, for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	119	144	768	1,549	83	153	26	55	53	47	93	54
2	92	135	463	632	72	124	24	79	50	42	85	54
3	88	125	369	288	63	113	21	65	52	38	81	54
4	88	125	321	195	51	84	18	44	47	37	78	54
5	88	125	243	161	47	334	17	34	41	35	75	54
6	88	518	80	148	43	414	22	396	38	39	69	54
7	88	2,274	3,137	179	40	2,502	118	91	34	33	68	51
8	88	864	1,637	194	38	360	1,314	46	29	27	71	48
9	92	125	277	513	38	189	149	36	28	29	72	48
10	105	125	135	564	39	147	17	1,143	31	30	75	48
11	105	125	103	235	38	135	130	1,546	31	33	169	48
12	105	115	91	188	35	107	80	256	31	2,577	125	45
13	344	89	73	164	34	80	82	243	31	361	408	41
14	1,060	72	71	137	33	72	73	1,012	132	167	1,558	41
15	955	72	75	118	40	68	43	268	3,911	120	540	41
16	532	63	194	104	42	57	39	135	323	101	492	41
17	189	54	232	93	37	48	37	102	176	92	419	41
18	154	54	755	86	36	45	32	87	135	85	238	41
19	125	54	995	85	33	42	31	72	113	77	201	41
20	105	63	383	80	33	39	30	1,596	94	72	188	41
21	105	118	205	75	33	41	29	482	84	3,560	176	41
22	1,592	4,007	385	71	29	94	27	224	76	502	152	36
23	4,696	304	473	67	31	80	23	233	68	262	138	31
24	1,336	182	253	61	28	33	20	162	59	198	125	31
25	380	134	208	63	19	30	22	120	54	174	111	52
26	470	105	329	72	20	26	235	97	55	155	105	157
27	450	89	328	103	18	21	203	86	55	136	83	246
28	314	237	181	131	15	22	48	79	51	115	59	1,090
29	213	613	143	117	15	27	48	73	46	105	54	565
30	189	.....	125	98	19	28	37	64	47	101	54	200
31	154	.....	380	.....	246	.....	30	58	.....	97	.....	153

Estimated monthly discharge of Neshaminy Creek at forks, Pennsylvania, for 1904.

[Drainage area, 139 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January	4,696	88	468	3.37	3.88
February	4,007	54	383	2.76	2.98
March	3,137	71	433	3.12	3.60
April	1,549	61	219	1.58	1.76
May	246	15	43.5	.320	.369
June	2,502	21	184	1.32	1.47
July	1,314	17	97.6	.702	.809
August	1,596	34	290	2.09	2.41
September	3,911	28	199	1.43	1.60
October	3,560	27	305	2.19	2.52
November	1,558	54	205	1.47	1.64
December	1,090	31	114	.820	.945
The year	4,696	15	245	1.76	23.98

SCHUYLKILL RIVER NEAR PHILADELPHIA.

This river receives the drainage of the portion of southeastern Pennsylvania lying between Lehigh River on the north and Susquehanna River on the south. It flows in a general southeasterly course, emptying into Delaware River, the city of Philadelphia being located at the junction of these streams. Records of the height of the river at Fairmount pool have been kept for many years, but not in such form as to be useful in computing daily discharges. In 1898, however, careful estimates were prepared by Mr. John E. Codman, in charge of hydrographic work, Bureau of Water, city of Philadelphia, the results being given in the Twentieth Annual Report, Part IV, page 97.

The figures for daily discharge in the following table represent the total flow of the stream, computed from the amount wasted over the flashboards at Fairmount dam, the pumpage from the river, the leakage, and also the quantity used for power at Fairmount.

The following figures for 1904 were furnished by Mr. John E. Codman:

Mean daily discharge, in second-feet, of Schuylkill River near Philadelphia, Pa., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,303	1,445	9,045	6,469	1,292	7,092	771	1,595	994	1,360	1,495	1,258
2	1,303	1,445	8,934	12,470	1,292	4,294	771	1,595	994	1,360	1,495	1,258
3	1,303	1,445	6,429	8,434	1,292	5,048	771	1,595	994	1,360	1,495	1,258
4	1,303	1,445	8,850	5,634	1,292	4,453	771	1,607	994	1,360	1,495	1,258
5	1,303	1,445	5,129	6,572	1,292	2,991	771	1,595	994	1,360	1,495	1,258
6	1,303	1,445	3,092	3,391	1,292	4,138	771	1,595	994	1,360	1,495	1,258
7	1,303	2,439	11,860	3,120	1,292	12,850	771	1,595	994	1,360	1,495	1,258
8	1,303	6,187	36,180	3,120	1,292	4,136	871	1,595	994	1,360	1,495	1,258
9	1,303	3,187	14,320	3,484	1,292	3,270	803	1,595	994	1,360	1,495	1,258
10	1,303	2,024	7,539	4,003	1,292	3,002	771	1,595	994	1,360	1,495	1,258
11	1,303	1,445	5,239	3,391	1,292	3,630	771	5,339	994	1,360	1,495	1,258
12	1,303	1,445	3,994	2,887	1,292	2,743	771	3,500	994	4,002	1,495	1,258
13	1,426	1,445	4,084	2,453	1,292	1,818	771	1,595	994	1,873	1,535	1,258
14	2,910	1,445	2,755	2,034	1,292	1,730	771	2,568	5,456	1,483	5,173	1,258
15	3,215	1,445	2,498	2,034	1,292	1,729	771	3,137	29,490	1,360	5,264	1,258
16	2,064	1,445	2,426	1,866	1,292	1,729	771	1,673	4,044	1,360	3,678	1,258
17	1,303	1,445	2,483	1,774	1,292	1,729	771	1,595	994	1,360	2,930	1,258
18	1,303	1,445	3,675	1,774	1,292	1,729	771	1,595	994	1,360	1,857	1,258
19	1,303	1,445	6,135	1,774	1,292	1,729	771	1,595	994	1,360	2,454	1,258
20	1,303	1,445	5,925	1,774	1,292	1,729	771	3,354	994	1,360	2,375	1,258
21	1,303	1,445	4,756	1,774	1,292	1,729	771	3,981	994	11,350	2,375	1,258
22	3,938	22,810	4,475	1,774	1,292	1,729	771	3,034	994	10,780	2,211	1,258
23	27,210	21,420	4,650	1,774	1,292	1,729	771	3,679	994	4,927	1,822	1,258
24	14,050	6,587	3,963	1,774	1,292	1,729	771	3,506	994	2,909	1,671	1,258
25	7,003	5,058	3,397	1,774	1,292	1,729	771	1,758	994	1,961	1,642	1,258
26	3,753	4,591	3,585	1,774	1,292	1,501	771	1,595	994	1,419	1,495	1,258
27	5,369	2,558	3,945	1,774	1,292	1,325	771	1,595	994	1,360	1,495	1,258
28	1,946	2,654	3,585	1,774	1,432	1,325	803	1,595	994	1,360	1,495	3,531
29	1,433	4,474	3,061	2,034	1,292	1,325	771	1,595	994	1,360	1,495	4,200
30	1,303	.....	2,691	1,866	1,292	1,325	771	1,595	994	1,360	1,495	3,063
31	1,303	.....	3,112	.....	5,997	.....	771	1,595	.....	1,360	.....	3,045

NOTE.—The above is the total flow of the river in second-feet.

Estimated monthly discharge of Schuylkill River near Philadelphia, Pa., for 1904.

[Drainage area, 1,915 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January	27,210	1,303	3,196	1.67	1.92
February	22,810	1,445	3,742	1.95	2.10
March	36,180	2,426	6,187	3.23	3.72
April	12,470	1,774	3,218	1.68	1.87
May	5,997	1,292	1,448	.756	.872
June	12,850	1,325	2,901	1.51	1.68
July	871	771	776	.405	.467
August	5,339	1,595	2,176	1.14	1.31
September	29,490	994	2,194	1.15	1.28
October	11,350	1,360	2,278	1.19	1.37
November	5,264	1,495	2,013	1.05	1.17
December	4,200	1,258	1,542	.805	.928
The year	36,180	771	2,639	1.38	18.69

NOTE.—The above is the total flow of the river.

PERKIOMEN CREEK AT FREDERICK, PA.

Perkiomen Creek drains an area lying northwest of the city of Philadelphia. It flows in a southerly direction, emptying into Schuylkill River about 7 miles above Norristown and about 18 miles above Philadelphia. The point of measurement of discharge is located at Frederick about 12 miles above the mouth, and is also above two large tributaries known as West Swamp Creek and Northeast Branch of Perkiomen. Both of these tributaries have been measured—the first at Zieglerville and the second near Schwenkville. The drainage area of the Perkiomen above the point of measurement is given by Rudolph Hering as 152 square miles, of which 111 are cultivated and improved and 41 untillable and wooded. Measurements of this creek were begun on August 20, 1884. Water-Supply Paper No. 35 contains tables of the daily discharge for the entire period from 1884 to 1899, inclusive. The records of daily discharge for 1904, as furnished by Mr. John E. Codman, are given in the following table:

Mean daily discharge, in second-feet, of Perkiomen Creek at Frederick, Pa., for 1904.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	54	121	670	1,763	133	305	208	44	53	82	80	97
2	97	154	613	921	107	398	91	58	46	58	74	92
3	87	119	694	365	93	594	67	106	46	60	68	86
4	133	124	818	252	74	288	45	96	46	65	62	69
5	131	106	211	214	64	503	38	60	46	57	55	78
6	124	88	174	201	62	381	39	269	60	61	51	95
7	126	283	3,581	212	55	2,583	164	126	55	63	59	88
8	128	1,351	2,629	228	53	406	333	63	36	52	67	88
9	126	243	391	279	55	231	157	46	34	46	64	86
10	121	167	216	294	69	183	157	490	33	46	59	78
11	114	114	178	231	70	158	167	1,376	34	54	75	75
12	106	103	152	198	60	131	104	258	47	159	84	75
13	106	103	132	167	52	100	76	130	52	258	147	75
14	765	61	128	138	53	88	72	1,885	1,594	106	634	66
15	537	71	128	118	75	84	63	367	5,460	76	462	72
16	340	118	171	99	123	61	49	172	457	63	451	100
17	233	67	211	98	94	60	45	121	224	59	460	98
18	226	57	299	97	67	64	44	94	148	62	306	82
19	226	55	1,095	92	54	52	50	70	126	61	233	95
20	148	69	892	79	65	55	75	570	100	58	261	102
21	139	79	349	65	69	153	84	768	76	3,821	290	92
22	1,087	3,815	337	61	64	384	61	250	71	820	238	92
23	4,465	563	447	59	65	112	45	334	67	293	194	92
24	671	497	320	60	58	66	42	167	64	202	176	150
25	247	359	256	61	45	45	42	120	58	163	156	214
26	205	189	353	68	35	43	53	92	69	142	128	199
27	224	105	360	130	37	41	128	64	75	124	102	312
28	164	129	228	186	37	40	99	60	70	103	108	1,006
29	116	376	180	183	36	66	66	60	70	87	113	659
30	118	.....	180	163	52	88	62	58	83	80	101	320
31	124	.....	289	.....	1,117	.....	54	58	.....	84	.....	214

Estimated monthly discharge of Perkiomen Creek at Frederick, Pa., for 1904.

[Drainage area, 152 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Second-feet per square mile.	Depth in inches.
January	4,465	54	371	2.44	2.81
February	3,815	55	334	2.20	2.37
March	3,581	128	538	3.54	4.08
April	1,763	59	236	1.55	1.73
May	1,117	35	99.8	.657	.757
June	2,583	40	259	1.70	1.90
July	333	38	89.5	.589	.679
August	1,885	44	272	1.79	2.06
September	5,460	33	313	2.06	2.30
October	3,821	46	241	1.59	1.83
November	634	51	179	1.18	1.32
December	1,006	66	163	1.07	1.23
The year	5,460	33	258	1.70	23.07

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PUBLICATIONS OF UNITED STATES GEOLOGICAL SURVEY.

[Water-Supply Paper No. 125.]

The publications of the United States Geological Survey consist of (1) Annual Reports; (2) Monographs; (3) Professional Papers; (4) Bulletins; (5) Mineral Resources; (6) Water-Supply and Irrigation Papers; (7) Topographic Atlas of United States, folios and separate sheets thereof; (8) Geologic Atlas of United States, folios thereof. The classes numbered 2, 7, and 8 are sold at cost of publication; the others are distributed free. A circular giving complete lists may be had on application.

Most of the above publications may be obtained or consulted in the following ways:

1. A limited number are delivered to the Director of the Survey, from whom they may be obtained, free of charge (except classes 2, 7, and 8), on application.

2. Every member of Congress is allotted a certain number, from whom they may be obtained, free of charge, on application.

3. Other copies are deposited with the Superintendent of Documents, Washington, D. C., from whom they may be had at practically cost.

4. Copies of all Government publications are furnished to the principal public libraries in the large cities throughout the United States, where they may be consulted by those interested.

The Professional Papers, Bulletins, and Water-Supply Papers treat of a variety of subjects, and the total number issued is large. They have therefore been classified into the following series: A, Economic geology; B, Descriptive geology; C, Systematic geology and paleontology; D, Petrography and mineralogy; E, Chemistry and physics; F, Geography; G, Miscellaneous; H, Forestry; I, Irrigation; J, Water storage; K, Pumping water; L, Quality of water; M, General hydrographic investigations; N, Water power; O, Underground waters; P, Hydrographic progress reports.

Series P.—The hydrographic progress reports contain the results of stream measurements. A report is issued for every calendar year, containing the results of data collected during that year. These reports were first published as a part of the Director's annual report or as a bulletin; they are now published as water-supply and irrigation papers. The following is a list, by years, of the publications containing the progress reports of stream measurements. A detailed index of these reports (1888-1903) is published as Water-Supply Paper No. 119.

1888. Tenth Annual Report, Part II.
1889. Eleventh Annual Report, Part II.
1890. Twelfth Annual Report, Part II.
1891. Thirteenth Annual Report, Part III.
1892. Fourteenth Annual Report, Part II.
1893. Bulletin No. 131.
1894. Bulletin No. 131; Sixteenth Annual Report, Part II.
1895. Bulletin No. 140.
1896. Water-Supply Paper No. 11; Eighteenth Annual Report, Part IV.
1897. Water-Supply Papers Nos. 15 and 16; Nineteenth Annual Report, Part IV.
1898. Water-Supply Papers Nos. 27 and 28, Twentieth Annual Report, Part IV.
1899. Water-Supply Papers Nos. 35, 36, 37, 38, and 39, Twenty-first Annual Report, Part IV.
1900. Water-Supply Papers Nos. 47, 48, 49, 50, 51, and 52; Twenty-second Annual Report, Part IV.
1901. East of Mississippi River, Water-Supply Papers Nos. 65 and 75.
West of Mississippi River, Water-Supply Papers Nos. 66 and 75.
1902. East of Mississippi River, Water-Supply Papers Nos. 82 and 83.
West of Mississippi River, Water-Supply Papers Nos. 84 and 85.

1903. East of Mississippi River, Water-Supply Papers Nos. 97 and 98.
West of Mississippi River, Water-Supply Papers Nos. 99 and 100.
1904. East of Mississippi River, Water-Supply Papers Nos. 124, 125, 126, 127, 128, and 129.
West of Mississippi River, Water-Supply Papers Nos. 130, 131, 132, 133, 134, and 135.

The Geological Survey and the Reclamation Service have suboffices in different parts of the United States, from which hydrographic and reclamation work in the respective localities is carried on and where data may be obtained on application. These offices are located as follows:

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Correspondence should be addressed to

THE DIRECTOR,
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WASHINGTON, D. C.

JULY, 1905.

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Author.

U. S. Geological survey.

. . . Report of progress of stream measurements for the calendar year 1904. Prepared under the direction of F. H. Newell by R. E. Horton, N. C. Grover, and John C. Hoyt. pt. II. Hudson, Passaic, Raritan, and Delaware River drainages. Washington, Gov't print. off., 1905.

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Reference.

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