

STATEMENT.



ASHLAND, KY.. ^{7/6}

1928

M

E C Meand

IN ACCOUNT WITH

ASHLAND FLOWER SHOPPE

EVERYTHING IN FLOWERS

DESIGN WORK A SPECIALTY

205 WEST WINCHESTER AVENUE

PHONE 633

\$ 5.00

Paid

Ashland Flower Shop

Account is for your convenience.

Monthly payments requested.

January 19, 1923.

William G. Snow,
Secty. Class '88 M.I.T.,
112 Water St.,
Boston, Mass.

Dear Mr. Snow:-

Replying to your letter, January 17th 1922,
please note following:

Present Occupation: President Means Realty Co.
Chairman Ashland Water Works Commission

Business Address: Room 221 Second National Bank Building, Ashland, Ky.

Residence Address: 306 E. Lexington Ave., Ashland, Ky.

Family data:

- (1) Harriet Evelyn born 1895.
Prep School, The Misses Shipley, Bryn Maur
Pa. 1909-1912.
Graduated Smith College Class 1916.
In office State Food Administration Boston 1917.
In W. Y. C. A. work Camp Travis, Texas 1918.
Married 1920 Robert Richard Witt, Jr.,
A graduate of Washington-Lee University, Va.,
who saw service in Argonne Forest 1918 as
Major 44th C.A.C. Volunteer.
Now lives San Antonio, Texas.
One girl child Ellison Means Witt born 1921.
- (2) John Ringo Means born 1900
Prep School - St. Lukes, Wayne, Pa. 1913-1917.
Graduated Dartmouth College Class 1921.
Enlisted 1918 - 72nd Coast Artillery - Changed in
France to 1102nd Squadron Army Air Service -
Re-entered college after one year absence graduating
with class. Now lives Ashland, Ky. President
John R. Means Co., Commission brokerage.
Married January 27th 1923 Lucille Johnston of
Ironton, Ohio.

Yours truly,

ECM:VF

ELLISON COOKE MEANS: 88-111-1884-87. 3 years in Tech as special.

Married Ruby Ringo, Oct. 5, 1892.

Children: Harriet Evelyn

John Ringo.

"Means began service with the Low Moor Iron Company, of Virginia, as chemist and draughtsman, at Low Moor, Virginia, continuing same until January, 1890, during the latter part of service assisting the General Manager.

In January, 1890, accepted service as Secretary, with the Kentucky Iron, Coal and Manufacturing Company, at Ashland, Ky. In March, 1890, also assumed duties of Secretary of the Ashland Improvement Company. Continued the dual position until May 31, 1891.

In June, 1891, he entered the service of the Ashland Coal and Iron Railway Company, as Superintendent. The duties were those of a general superintendent in charge of railroad, lands, mines, machine shops, etc. Resigned 1900.

Was Vice-President Norton Iron Works, Ashland, Ky., '90 to '92; Treasurer Ashland Steel Company, Ashland, Ky., '90 to '92; President and Treasurer Ashland Artificial Ice Company, Ashland, Ky., '90 to '92; President Clinton Fire Brick Works, Ashland, Ky., '90 to '99; President Low Moor Iron Company, of Virginia, Low Moor, Va., '92 to 1915.

Non-resident member Westmoreland Club, Richmond, Va., American Society for Testing Materials.

In 1900-1901 was Vice-President Yellow Poplar Lumber Co., Coal Grove, Ohio.

Among offices held are: 1907, President Yellow Poplar Lumber Co.,
1908, President Virginia Pig Iron Association; 1908, Director Ashland
Iron & Mining Co., 1908, Director Ashland Coal & Iron Ry. Co.

In 1918 Means **wrote** as follows:

March 1901 to April 1915 - Residence, Low Moor, Virginia

Occupation, President & Gen'l Manager

The Low Moor Iron Co. of Va.

May 1915 to April 1916 - Travelling

May 1916 to - Residence Ashland, Kentucky.

Sept. 1916 to - Occupation - President, Means Realty Co.

Business Address - Room 121 - Second Nat'l Bank Bldg.,

Present Director: Ashland Coal & Iron Ry. Resigned Dec. 1921.

Ashland Iron & Mining Co. " " "

Ashland Fire Brick Co.

Means Realty Co.

Member: American Institute of Mining Engineers '88.

Ashland Country Club

Ashland Rotary Club - Director & President

Ashland Chamber of Commerce 2 " "

Boyd County Kentucky State Council of Defense

Kentucky State Committee Smileage Book Campaign

Boyd County, Kentucky Campaigns:

Red Cross Membership, Chairman Committee

Y. M. C. A. War Fund Committee

Boy Scouts Three Year Guarantee Fund Committee

Four Minute Men - Advisory Committee, etc.

1919-1932 Water Commissioner Ashland
Chairman 1921-1932

1923 - American Institute of Mining & Metallurgical Engineers
Bellefonte Country Club, Director.

(Was director & President Ashland Country Club 1922)

(Predecessor of Bellefonte Country Club)

University Club of Ashland.

Ashland Rotary Club.

Ashland Chamber of Commerce.

OGDEN HARDWARE COMPANY

PHONES-
STORE 227
OFFICE 500

INCORPORATED

ASHLAND, KY.,

192

Address

Terms; Cash 1st of month after date of purchase.

SOLD BY

ORDERED BY

DELIVERED BY

Quantity

ARTICLE

Amount

1	gal Buff Flattons	3.00
1/2	" " "	1.60
1	qt. white Flattons	.85
1	qt " Enameloid	1.60
1/2	gal Turps	.65
1	Paint Brush	.75
1	" "	1.75
		10.20

The San Antonio Country Club
has the honor of extending to
Mr. E C Means
the privileges of the Club House for the
period of ⁶⁰~~ten~~ days from Feb 7 1923
E C Targaut
Maurine Dabbert ^{Secretary} Asst.
Requested by Miss Lloyd The Arrow

THIS CARD DOES NOT PERMIT THE INTRODUCTION BY THE HOLDER OF ANOTHER GUEST TO THE CLUB.
THE PRIVILEGES OF THE GOLF COURSE WILL BE EXTENDED UPON THE PRESENTATION OF THIS
CARD TO THE MANAGER AND THE PAYMENT OF THE GOLF FEE.

REPORT ON
SEWERAGE
FOR THE
CITY OF ASHLAND, KENTUCKY
FEBRUARY 1922

ALFRED. BURDICK & HOWSON
ENGINEERS
CHICAGO



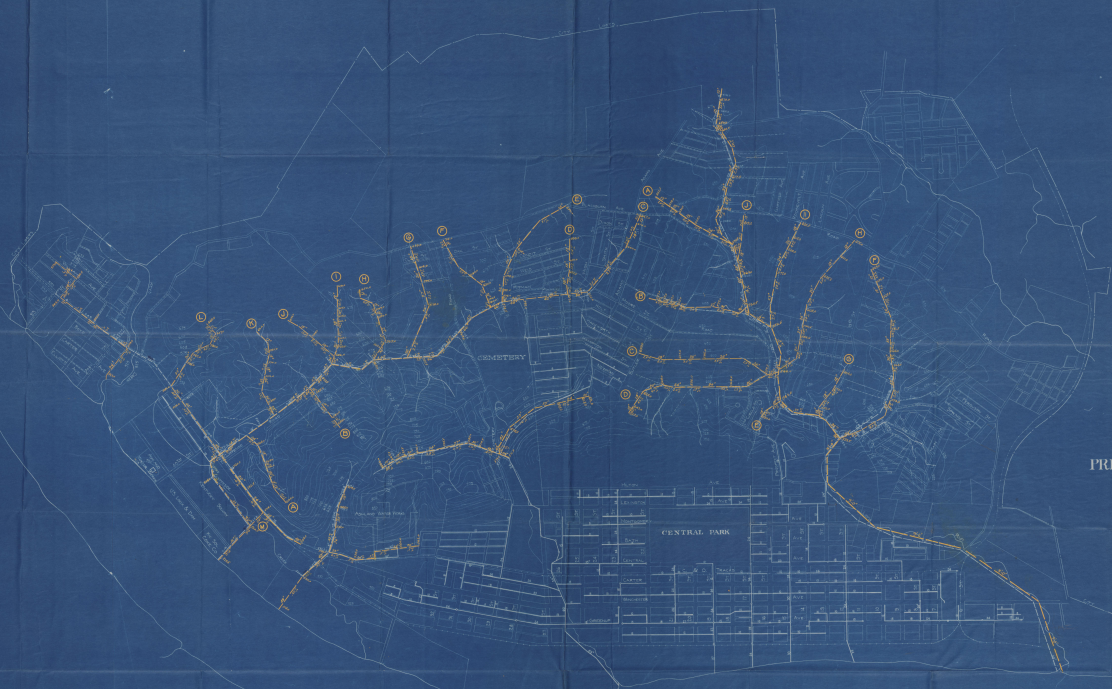
MAP OF
ASHLAND, KY. *Sanitary*
SHOWING
PRESENT AND PROPOSED SEWERS

TO ACCOMPANY THE REPORT OF
ALVORD, BURDICK & HOWSON
Engineers
Chicago
1923

SCALE
1" = 100' 0"

SANITARY SEWERS

Sheet No. 7

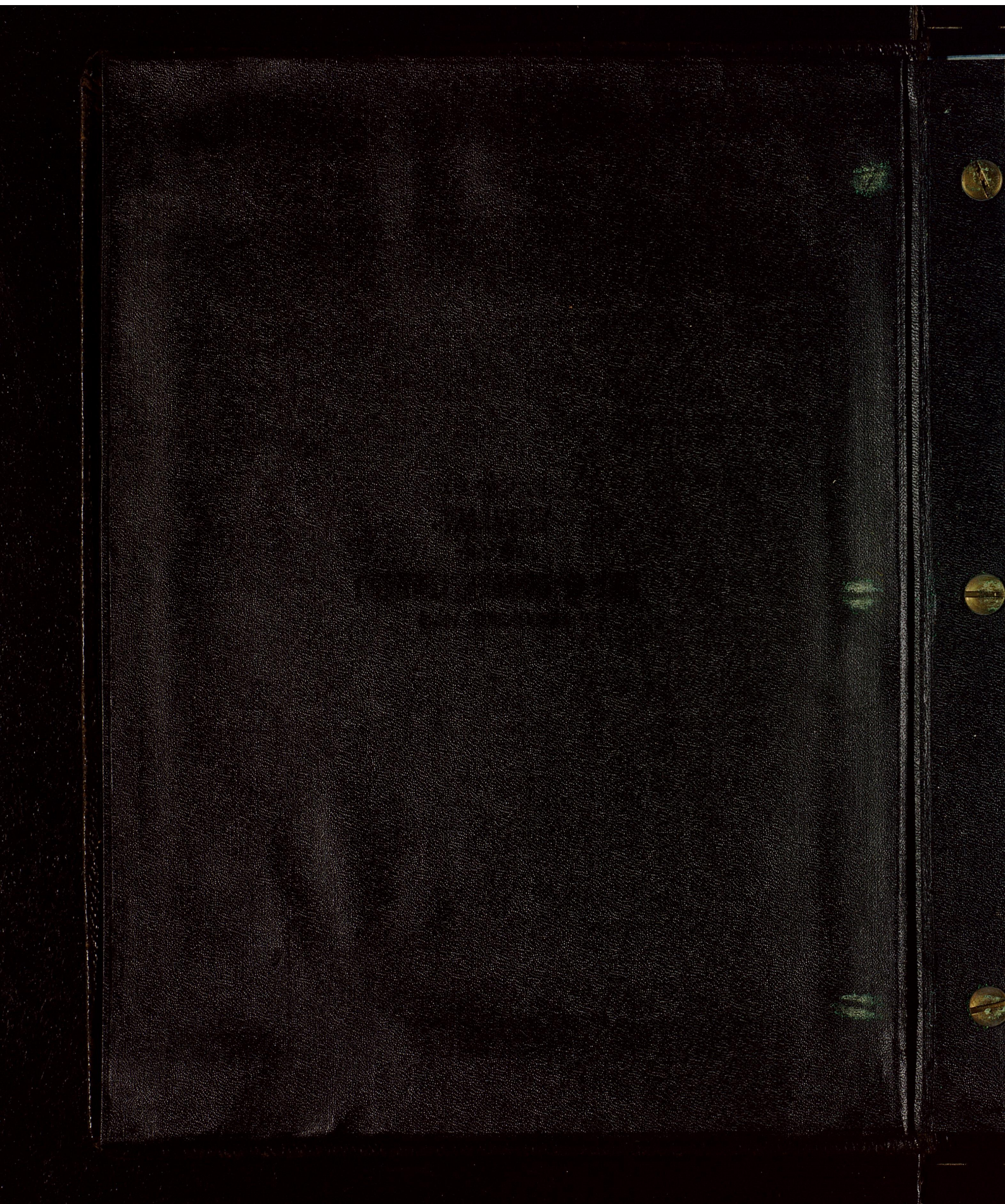


MAP OF
ASHLAND, KY.
SHOWING
PRESENT AND PROPOSED SEWERS

TO ACCOMPANY THE REPORT OF
ALFORD, BURDICK & HOWSON
Engineers Chicago 1903

SCALE

STORM SEWERS
(Note: Letters indicate manhole number)



REPORT ON
SEWERAGE
for the
CITY OF ASHLAND, KENTUCKY.

----*--*

February, 1923.

1

2nd. Population.

Hon. Mayor and City Council,
Ashland, Kentucky.

Gentlemen:

In accordance with your authorization of March 6, 1922, we have made a study of the Ashland sewerage problem and respectfully present herewith our report upon sewerage for the City of Ashland.

The topographic surveys upon which our studies are based were made during the summer of 1922 under the direction of your City Engineer, Mr. Thomas Boggess, and his assistants. Blue prints were furnished us showing the details of this survey. We were also furnished with a map showing the data pertaining to the existing sewer system.

Before taking up the detailed discussion of the various phases of the Ashland sewerage problem, we will briefly summarize the principal conclusions reached there-in, as follows:

1st. Improvements made necessary by growth.

Any material growth in population in a city is accompanied by the necessity for improvements and extensions of public utilities and public works.

4th. Facilities adequate when built become inadequate under increasing demands and sooner or later it becomes necessary to provide additional facilities to care for the present and at the same time anticipate the probable future needs.

The purpose of this report is to outline the best and most practicable means of providing sewerage for the present City of Ashland giving due consideration to the probable needs of the future

2nd. Population.

The city of Ashland has had a steady rate of growth except in the last ten years when the growth has been more rapid.

The population as given by the 1920 census was 14,729, and at the present time, 1923, is probably approximately 16,500. The future growth due to the rapid industrial expansion of that part of the Ohio Valley, will probably be more rapid and we estimate that the population will be not less than 23,000 in 1930, 35,000 in 1940, and 49,000 in 1950.

The City limits have recently been extended and the average density of population is low. It is probable that the city will more fully develop the area within the present boundaries and that increased population will not occupy a proportional increase in area.

3rd. Present Sewer System.

The present sewer system serves principally the main business section of the city and the adjacent residential district. South Ashland is also sewered and is now connected with the Ashland system of sewers.

The sewers thus far built are designed on the combined plan, carrying both storm and sanitary flow, except that part of the laterals are used for sanitary flow only. The existing sewers have proved to be adequate for usual conditions.

Because of the nature of the topography it is impossible to extend the existing sewers to serve other territory except in the case of the 26th Street 54 inch sewer. In other instances entire new systems will have to be constructed having separate outlets and independent of the existing systems.

4th. Future Policy as to Type of Sewers..

Before proceeding with any elaborate construction program it is advisable to investigate thoroughly into the question as to the type of sewers to be constructed for each district. Should the sewers be built on a combined plan carrying both sanitary and storm flow, or on a separate plan with a sewer for each kind of flow? In the detailed discussion

In designing storm sewers a study must be made

which follows, the facts pertaining to this question have been fully set forth.

ESTIMATED It is our belief that those parts of Ashland now without sewers should be sewered on the separate system. Sanitary sewers can be provided now at a comparatively small expense and later when the built-up condition of the districts warrant it a comparatively large expenditure for storm sewers can be made.

District

13th St. District

Clyffeside

Normal

Water Works

25th St. District

5th. Basis of Design for Sanitary Sewers.

On account of the relatively small sewer sizes required for carrying sanitary flow it is advisable to provide capacity sufficient to care for the ultimate density of development. We have computed the sizes of the main sanitary sewers in this report on the basis of the following quantities:

- (a) Sanitary sewage entering at the rate of 30 gallons per day per foot of sewer, the equivalent of 3,600 gallons per day per acre.
- (b) Infiltration at the rate of 400 gallons per day per acre.

6th. Location of Sanitary Sewers.

The rough topography makes it necessary to lay out the main sewers along the creek banks. Thus all sections of the district can be effectively reached. However, we have kept the sewers below the creek beds to facilitate connection with the laterals on either side.

District

13th St. District

Clyffeside

Normal

Water Works

25th St. District

7th. Sizes and Costs of the Main Sanitary Sewers.

The main sewers in all districts range in size from 8 inches to 30 inches. We have kept the depths as small as practicable under the various conditions.

The summarized cost of the main sewer for each district is shown by Table A, together with sizes and total length. The details of these estimates are given in the main body of the report.

Note:

8th. Storm Sewers.

Storm sewers are much larger in size than sanitary sewers and accordingly more costly.

In designing storm sewers a study must be made

of rainfall and run-off conditions with a view to providing capacity for that intensity of rainfall which it is reasonable and proper to design.

TABLE A.

ESTIMATED COST OF SANITARY SEWERS

SUMMARY

<u>District</u>	<u>Length of Sewers</u>	<u>Range in Size</u>	<u>Cost</u>
13th St. District	18,660'	8" - 24"	\$43,920
Clyffeside	11,540'	8" - 30"	42,350
Normal	4,710'	8" - 24"	22,340
Water Works Hill	2,150'	8" - 20"	6,655
26th St. District	2,760'	8" - 30"	3,430
	39,820'	8" - 30"	\$118,695

TABLE B.

ESTIMATED COST OF STORM SEWERS.

SUMMARY

<u>District</u>	<u>Length of Sewers</u>	<u>Range in Size</u>	<u>Cost</u>
13th St. District	37,450'	12" - 9'-0"	\$443,185
Clyffeside	35,760'	12" - 9'-6"	393,170
Normal	3,440'	18" - 36"	33,600
Water Works Hill	4,430'	18" - 48"	49,915
26th St. District	5,240'	15" - 54"	27,240
	86,320'	12" - 9'-6"	\$947,110

Note: The above estimates do not include any allowances for rights of way or rock excavation, some of which will probably be encountered in construction.

which will ultimately be required for sewers to carry storm water will be required for many years.

13th. of rainfall and run-off conditions with a view to providing capacity for that intensity of rainfall for which it is reasonable and economical to design.

9th. Factors Influencing Storm Water Flow.

The amount of storm water flow for which storm sewers should be designed depends upon principally upon the following important factors:

- 1-Intensity of rainfall.
- 2-Frequency of various intensities.
- 3-Character of ground surface, perviousness, etc.
- 4-General slope of ground.
- 5-Area tributary.
- 6-Shape of area.
- 7-Type of development.

10th. "Rational Method" of Design Recommended.

There are several empirical formulae which may be used in storm sewer designs. However, the so-called "rational method" is widely used at the present time and in most cases gives very reasonable results. We have used this method in designing the storm sewers for Ashland, the detailed application of which is explained in the main body of the report.

11th. Location of Storm Sewers.

On the maps accompanying the report we have shown the storm sewers as following the creeks. It is our intention to locate the sewers in the creek beds in so far as is practicable and abandon the creek waterways. It is necessary to utilize the drainage courses in order to avoid excessive excavation, and some further saving in excavation will be effected by locating the sewers actually in the creek beds.

12th. Sizes and Costs of Main Storm Sewers and Branches.

The storm sewers as estimated in the various districts range in size from 12 inches to a maximum size of 9 feet 6 inches. We have kept the cuts as small as practicable.

Table B shows the summary of the estimates of cost for each district together with the various sizes and lengths. The details of the estimates are given in the main body of the report.

Fortunately little of the great expenditures which will ultimately be required for sewers to carry storm water will be required for many years.

13th. Basis of Estimates.

The estimates made in this report are based on present prices of material and labor, and average general conditions. It is our belief that the sewers listed can be completely constructed for the estimated costs, except for what rights-of-way and rock and other difficult excavation might add.

14th. Designs embodied in the Report.

On the maps accompanying the main body of the report we have shown the territory embraced by each proposed sewer district, the general alignment of the main sewers, the sizes, controlling elevations and grades.

15th. Location of Sewer Outlets.

At the present time all sewers discharge below the government dam in the Ohio River and so below the water works intake.

This practice should be continued. Sanitary sewage dumped into the river immediately above the water works would constitute menace to the purity of the water supply even though the supply is efficiently filtered. We have provided for the discharge of all sanitary flow below the dam.

Storm water run-off can be safely emptied into the river above the water works, as in itself it is not much worse than ordinary drainage. Measures must be taken in such a case, however, to keep all sanitary flow out of the storm sewer.

16th. Recommended Construction Program.

It is believed that the storm flow from practically all of the area now without sewers can be carried to the natural water courses and thence to the River for many years without serious inconvenience. Sewers to carry the storm water flow will be very expensive and their construction should be deferred until the development of the areas is very much further advanced.

Sanitary sewers should be provided as rapidly as population expansion demands. The policy of building separate sewers will permit the construction of a maximum mileage of sewers at a minimum of expense.

The funds available now which we understand to exceed \$200,000 will be sufficient to build all of the main sanitary sewers required at the present time and in addition nearly twenty miles of 8" laterals. In other words sanitary sewers can be made available to the entire area now in need of sewerage facilities.

For a complete discussion of our investigations and studies which have led to the above conclusions, together with complete estimates of costs of all the main sewers, we respectfully refer you to the following pages of our report.

the main part of town from the outlying country.

At the present time the city limits are very irregular, and they are likely to remain so, due to the fact that all expansion must take place along the river. Rectangular expansion is practically impossible because of the rough character of the topography.

The low parts of the city are subject to flooding from the Ohio River and for this reason most habitation keeps to the high ground. The natural drainage of the city is comparatively good except where certain water courses meet the Ohio.

POPULATION

The past and estimated future population of Ashland is shown on Exhibit No. 1. This exhibit was prepared in 1919 and compares the 1910 and 1920 censuses. It will be observed that the increase was not as rapid as in 1910. The population in 1920 was 11,000, which is a slight increase over the 10,800 counted in the 1910 U. S. Census. However, the difference is so

THE CITY OF ASHLAND:

The business district of Ashland and the immediately adjacent residential district occupy high ground above the Ohio River, and for the most part drain toward it. The remainder of the city is situated on high ground above deep ravines, the drainage of which is around the main part of the city. A divide, or ridge, practically separates the main part of town from the outlying country.

At the present time the city limits are very irregular, and they are likely to remain so, due to the fact that all expansion must take place along the ravines. Rectangular expansion is practically impossible because of the rough character of the topography.

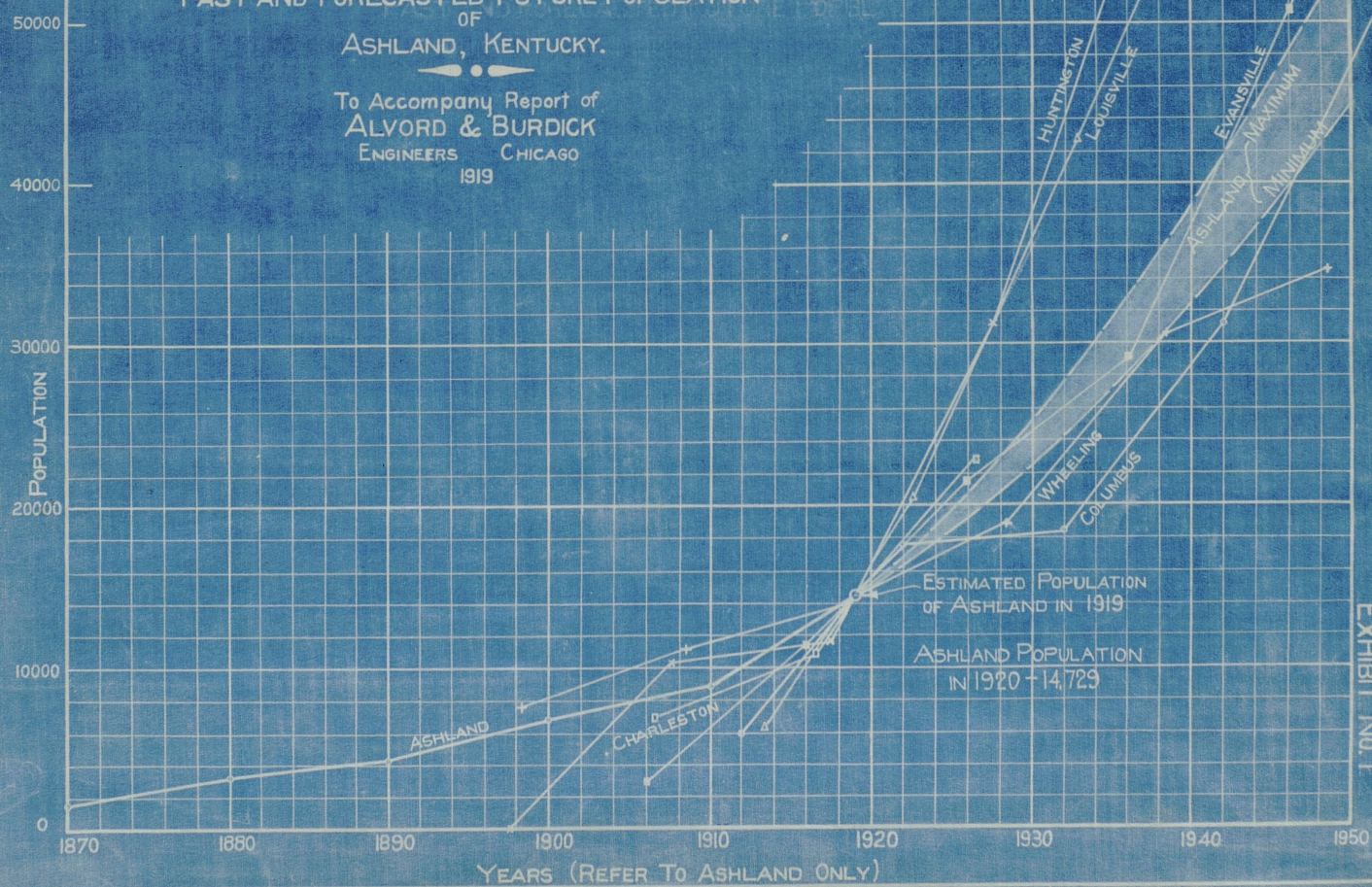
The low parts of the city are subject to flooding from the Ohio River and for this reason most habitation keeps to the high ground. The natural drainage of the city is comparatively good except where certain water courses meet the Ohio.

POPULATION:

The past and estimated future population of Ashland is shown on Exhibit No. 1. This exhibit was prepared in 1919 and accompanied our report on the Ashland Water Works. It will be observed that the forecast we made at that time based on a 1919 estimate of the population indicated a slightly larger population than was counted in the 1920 U. S. Census. However, the difference is so

DIAGRAM SHOWING
PAST AND FORECASTED FUTURE POPULATION
OF
ASHLAND, KENTUCKY.

To Accompany Report of
ALVORD & BURDICK
ENGINEERS CHICAGO
1919



small that we have used the curve unaltered in the present report. This small difference can in no way affect our design or conclusions.

The forecast curve shows that the present population of Ashland is approximately 16,500. We estimate it to be 23,000 in 1930, 35,000 in 1940 and 49,000 in 1950. Thus the present population will be doubled by 1940.

Such an increase in population will of course result in the settling up and developing more or less completely of the districts for which this report is considering sewers, as well as increasing the density of population in the existing districts.

PRESENT SEWER SYSTEM:

At the present time only the main part of the city of Ashland is at all sewered with the exception of the small district known as South Ashland. Just recently a large trunk sewer has been extended to intercept the sewage in this locality which was provided with sanitary sewers some years ago.

The city is sewered on the combined system, that is the sewers are designed to carry both sanitary sewage and storm water run-off. Certain small size laterals, however, are used for sanitary flow only.

Except for the trunk sewer on Twenty Sixth Street leading to South Ashland the sewers are all moderate in size. This Twenty Sixth Street sewer is a 63 inch sewer at its outlet, such a size being necessary because

it takes hill drainage and traverses relatively flat territory in crossing the main part of town. The sewer is adequate for the conditions for which it was designed.

The other existing sewers, while much smaller in size, have proved to be adequate for all ordinary storms. These sewers do not have to care for much hill water but have principally street and roof drainage on easy slopes. For this reason small sizes are entirely justified. Occasionally sewers may be overcharged, but it is considered better design to allow this to occur where excessive damage is not done, than to design against a rainfall of infrequent occurrence. At time of large storms the run-off can reach the Ohio directly without entering a sewer, so that flooding from this source is of short duration and of small consequence.

All the important sewers of the present system discharge into the Ohio River at the most convenient points, while a few less significant ones empty into Long Run a short distance above its mouth. All of the present sewage reaches the River below the dam and so is immediately diluted and carried off. Thus no nuisance exists and as the water works intake is located above the dam there is no local menace to the water supply.

Because of the nature of the topography of Ashland it is impossible to extend the existing sewers to include the large outlying districts, even if the existing sewers were adequate for such extensions. The ridge mentioned before, which separates the central portion of

Some of the conditions which indicate the desirability of designing a separate sewerage system are:

1st. Where storm water does not require extensive underground removal, or where it can be concentrated in a few shallow underground channels.

2nd. Where drainage areas are short and steep, facilitating rapid flow of the water over street surfaces to the natural water courses.

3rd. Where the sanitary sewage must be pumped and the additional cost of pumping even a small amount of storm water is great.

4th. Where the sanitary sewage must be pumped and the stormwater in the combined system either purified or by-passed. The one system will require enormous plant capacity and the other system will tend to be creative of a nuisance, due to the overflow of objectionable matter.

5th. When the sewers are being built in advance of the city development, the sanitary system provides a maximum of miles of sewers for a minimum expenditure. Storm sewers, if ever required, may be built later on when the development of the district is better able to bear the expense and rarely need cover over about half the area covered by the sanitary sewer.

6th. When an existing sewer is laid out at grades unsuited to receive sanitary sewage it may frequently be used as a storm sewer.

7th. A combined sewer must usually be of relatively larger capacity than a separate storm sewer for the same area, due to the fact that storm drain may be overloaded at intervals with no serious damage and only slight inconvenience, whereas if any sanitary flow is carried and the sewer is overflowed into the basements, great nuisance and complaint is occasioned.

8th. The separate system has greater advantages in districts where the population is not dense, and where the proportion of sewage to rain water will always be comparatively small.

9th. When storm water may be collected and conducted directly to a water-course or lake, and the construction of a long and costly outlet sewer is made unnecessary.

Among those conditions which indicate that the combined system is desirable, are the following:

1st. Where it is evident that both storm water drains and sanitary sewers must be fully and completely constructed throughout the entire district. The total cost for the separate system will be greater than the cost for the combined system.

2nd. Where no pumping or purification is required at present or is contemplated for the future.

3rd. Where the district is densely built up and the proportion of sanitary sewage to storm water run-off is large. There is a further advantage to combined sewers for a business district or a closely built section, in that surface washings which are present in comparatively large quantities, if carried into storm sewers will be deposited and will decompose, thereby causing a nuisance after the storm flow has ceased while the same material carried into a combined system will not be deposited in the sewer after the storm flow has stopped.

From the foregoing discussion of the relative merits of the two systems of sewerage, it is evident that the present sewers in Ashland were properly designed as combined sewers, In the main these sewers serve only the business district of the city and the well built-up surrounding territory. The sewer districts are compact and being located near the river require but short outlet sewers.

The new districts for which this report is considering sewers are largely undeveloped, and it is probable that complete development will not be reached for a long period of time. These new districts are located at relatively long distances from their outlets and main sewers would be

correspondingly costly. The construction of sewers will materially hasten the development of these outlying districts and will in a large measure add to their desirability as home sites, but even so the growth will be slow.

The districts are at the present time very well drained naturally, except along some of the main drainage courses. The uplands are high and precipitous, so that stormwater is not a serious problem on the more desirable properties. The storm water quickly runs off and finds its way to the steep water-courses and thence to the Ohio River. Along some of the creeks, especially near the Ohio River the country is flat and the drainage is poor, but such territory will probably not be developed for a considerable number of years.

In view of the conditions as outlined above the construction of large-size storm sewers is not justified at the present time. Sanitary sewers only, should be built now, and the large expense of storm sewers postponed until such time as their construction is warranted by the settlement and development of the districts under consideration. Sanitary sewers can be constructed at a comparatively small outlay of funds and the interest on the deferred investment for storm sewers will not only more than compensate for any loss due to duplication or replacement when storm sewers are built, but will probably largely if not entirely,

finance such construction. This report, however, considers storm sewers as well as sanitary, and routes have been laid out and estimates made for each type of sewer.

PERIOD COVERED BY DESIGN:

We have only computed the sizes and estimated the cost of the main sewer and the important branches for each district. It is good practice to design such mains for the somewhat far distant future, so that any present expenditure will not be superseded and lost when a district becomes more built up and larger carrying capacity in the sewers is required. In construction work where enlargement is practicable when the requirements make it desirable, it is proper to build for the present and near future only, but where enlargement is impracticable and reconstruction costly, structures should be built for a more remote future. This is the case with main sewers and for that reason we have designed them for a period when the districts will be moderately settled and developed.

SANITARY SEWERS MUST DISCHARGE BELOW WATER WORKS:

The Ashland Water Works station and intake are located about six hundred feet above

government dam #29 and water is pumped from the Ohio River. The intake is upstream from all existing sewer outlets and the water works plant is successful in securing by filtration and treatment a good safe water supply. It would be a mistake for the city of Ashland to do anything which would be a menace to this water supply, and therefore we consider it essential that no sanitary sewer be permitted to discharge above the government dam. Not only would such a practice if permitted constitute an additional menace to the water supply, but at times of low water objectionable deposits would be likely to occur in the pool above the dam and along the banks and thereby create a nuisance. All sanitary sewage should be discharged into the river below the dam where it can be immediately diluted and carried away.

Storm sewers can safely be discharged into the river at any convenient place above or below the water works intake, without creating any nuisance or menacing the water supply. Such flow occurs only at intervals and while of course the water is contaminated by street washings and other waste, yet the degree of contamination is very small compared with that of sanitary sewage, and probably is no worse than

the river itself. In fact, it will usually be less contaminated than the river water. However, if storm sewers are emptied into the river above the water works, precautions should be taken to see that no sanitary sewage whatever reaches the storm sewers. When it is desired to empty a storm sewer above the water works a separate system of sewerage should be adopted, and the sanitary flow taken care of by an outfall sewer or by pumping, unless it can be taken to another district or to an intercepting sewer.

SEWAGE FLOW:

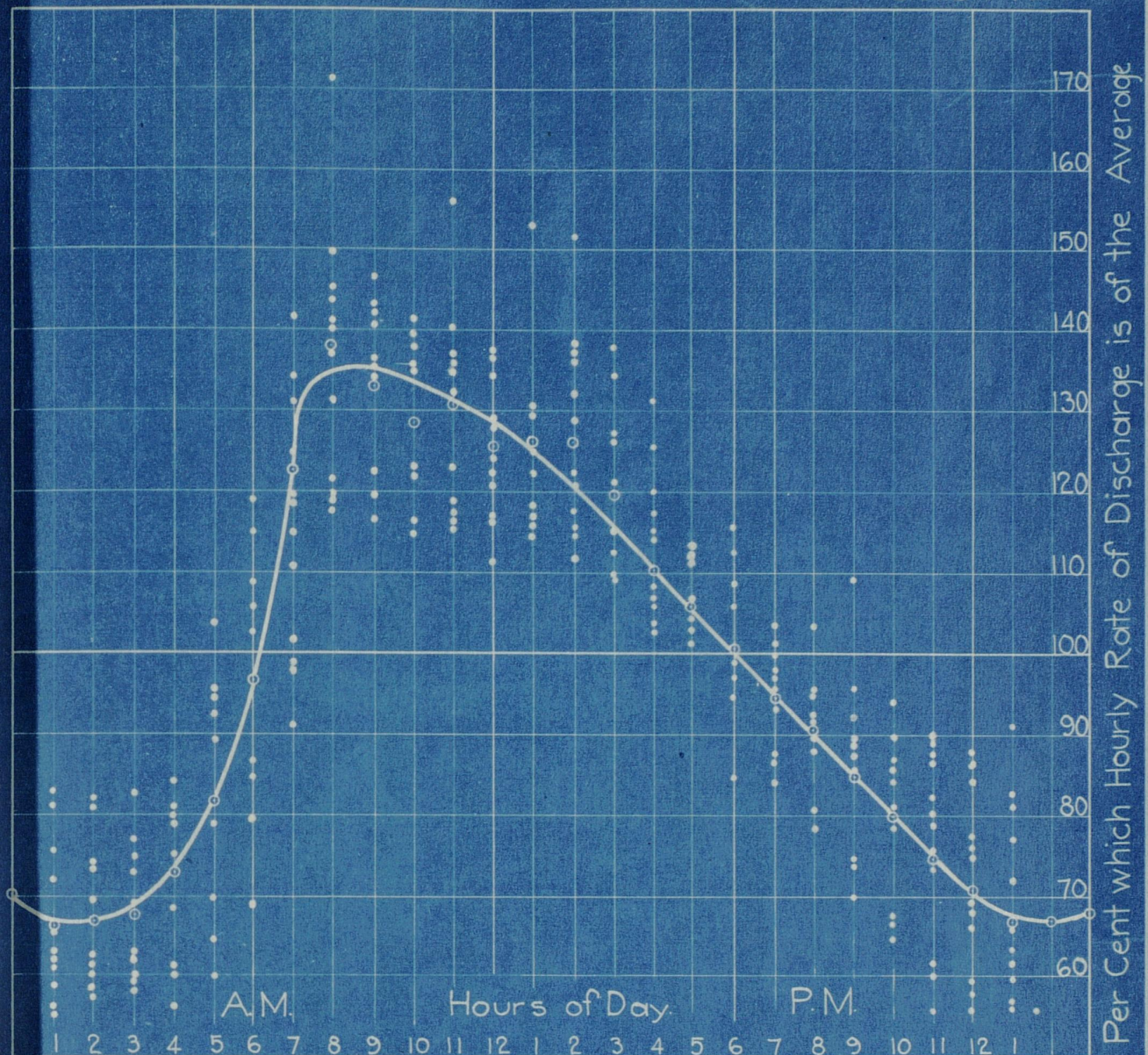
The quantity of sewage to be provided for in any system of sewers is a point of fundamental importance and should be given careful consideration. The rate of in-flow varies materially in different cities, and in large measure is a function of the water consumption. If the rate of water consumption is high, naturally the sewers will have a large amount of sewage to take care of. As there are no available data as to the quantity of sanitary flow arising from domestic sewers in Ashland, it is necessary to estimate the amount to be expected, using as a guide the rate of water consumption. In

addition some allowance will have to be made for ground water infiltration along the sewers.

Using the water consumption per capita as a guide we have adopted a rate of 100 gallons per capita per day as the average amount of sanitary sewage to be expected from residential territory. However, if sewers are not to be overtaxed, with resultant flooding, they must be larger than would be necessary to take the average flow. The rate of sewage fluctuates hourly due to the simultaneous and similar habits of urban population and varies throughout the day somewhat as shown by Exhibit No. 2.

The points shown on the diagram are the results of actual gagings at the cities named, and it is evident that all cities show about the same amount of variation from hour to hour. The curve is the average of all the gagings, and forms an approximate guide as to the relative amount of flow to be provided for in a sewer.

In order to avoid overflowing and backing up of sewers, it is necessary to design against the rate of flow at the maximum hour which it will be noted is shown on the diagram to be about 135% of the average. At Ashland, therefore, the sanitary sewers have been proportioned to carry approximately one hundred and thirty-six gallons per capita per day. Sanitary sewers at Ashland are small in size and are accordingly designed for ultimate conditions which assume one sewer connection for each fifty-foot lot, the equivalent



RACINE, WIS. SEPT 17-19, 1913

WORCESTER, MASS. NOV. 13, 1909, MAR. 21-27, 1910

MARLBORO, MASS. TYPICAL AVERAGE

TORONTO, CANADA. 1891, 1900, 1908

GLOVERSVILLE, N.Y. OCT. 30, 1906, SEPT. 12, 1907

EAST ORANGE, N.J. MAR. 16-17, 1910

BIRMINGHAM, ENG. AVERAGE 1906-1907

MILWAUKEE, WIS. OCT. 24-28, 1910

Full line is average of all gagings. Points shown thus •

DIAGRAM SHOWING HOURLY VARIATION IN SEWAGE FLOW

To Accompany Report of
ALVORD, BURDICK & HOWSON
Engineers Chicago
1923

of 750 gallons per connection or thirty-six hundred gallons per acre per day.

In addition to the amount of sanitary sewage, there provision must be made for infiltration. In the absence of definite local data, some assumption must be made, based on the experience in other cities having more or less similar conditions. At Madison, Wis. where all sewage has been pumped for a long period of years, it has been found that from high level districts where the soil was relatively impervious, and good surface grades were available, the infiltration amounted to between three and four hundred gallons per acre per day. In the lower districts with flatter grades, higher ground water planes and pervious soil, the infiltration amounted to between seven and eight hundred gallons per acre per day.

Based on the Madison data, together with a general knowledge of Ashland slopes and soil conditions, and the range of infiltration rates in other cities where sewers have been constructed under somewhat similar conditions, it is our conclusion that a rate of four hundred gallons per acre per day is a fair and reasonable estimate of the amount of infiltration to expect in outlying sewer districts at Ashland.

The total amount of flow, then, to be provided for with the sanitary sewers, is four thousand gallons per acre per day.

CAPACITY OF STORM SEWERS:

The design of storm sewers is governed by the amount

This method involves the use of the following factors:
 of storm water run-off to be taken care of by the sewers.

(1) An estimate of the time required for the flow to reach the sewer. This is a quantity ordinarily far in excess of the sanitary flow, and consequently much larger sewers are required. There are no precise methods available by which run-off can be accurately computed, though there are several formulae in use which give fairly good results, if used with sound reason and good judgment. In all such formulae certain assumptions must be made, based on the character of certain local conditions, and therefore it is impossible to proportion a sewer so that its capacity will be exactly correct. In other words, the design of the sewer depends a great deal upon the judgment of the engineer, and it is only by experience and a knowledge of conditions in cities where designs have been checked, that a design can be made which will be properly adequate and yet not excessively liberal with its attendant burdensome cost.

APPLICATION OF THE "RATIONAL METHOD"
 The method of figuring storm water run-off which seems to give the most reasonable results, taking all factors into consideration, is that known as the "rational method". With this method, the amount of flow is expressed by the formula: $Q = CiA$, in which

Q is the amount of run-off reaching the sewers, expressed in cubic feet per second.

C is a coefficient, expressing the percentage of run-off for the area under consideration.

i is the intensity of rainfall during a period of rainfall equal to the so-called "time of concentration".

A is the area in acres of the district being considered.

This method involves the use of the following factors:

- (1) An estimate of the time required for the rainfall to reach the sewers and flow therein to the successive points of concentration to be considered, which time is called the "time of concentration".
- (2) A rainfall curve showing the rainfall intensities for various periods of time corresponding to the time of concentration, for which it is considered good economy to provide.
- (3) A value of the coefficient "C", which expresses in percent of run-off the imperviousness of the surfaces within the district under consideration.
- (4) The area in acres of the district tributary to the points of concentration, considered progressively.

From the foregoing, it is evident that this method takes into consideration the various factors affecting the amount of run-off, namely, the shape and area of the watershed, the fall, perviousness, and intensity of rainfall. Therefore this method can be properly employed on any watershed, with reasonable assurance that the results will be dependable.

APPLICATION OF THE "RATIONAL METHOD".

The time of concentration is composed of two parts, the "inlet time", or time for the water to reach the sewer, and the time of flow in the sewer.

The time of flow in the sewer is capable of accurate calculation, as approximate grades for the sewer can be ascertained from the topographic maps, and the proper size of pipe and corresponding velocity of flow determined.

Inlet time cannot be computed, but must be assumed. Much may depend upon the selection of this factor,

and where such is the case, care must be exercised to secure as fair a value as possible. The inlet time varies from five minutes in districts with steep slopes and impervious surfaces, to about twenty minutes in districts with flatter slopes and pervious surfaces.

In small districts with comparatively steep slopes, the total time of concentration is small, so that the inlet time is a large percentage of the total time. Thus, much depends upon the accuracy with which this value is chosen. Poor judgment in selecting this value might result in sewers which would prove to be inadequate, or even of excessive capacity. However, in large flat districts where the inlet time is but a small percentage of the total time of concentration, little damage can be done by selecting an erroneous value for it, except perhaps at the very extremities of the district.

From the foregoing, it is evident that the rational method of storm sewer design is better adapted to large districts than to small ones, and that where the time of flow in the sewers is less than about thirty minutes, extreme care and good judgment must be used in the proper selection of a value for inlet time.

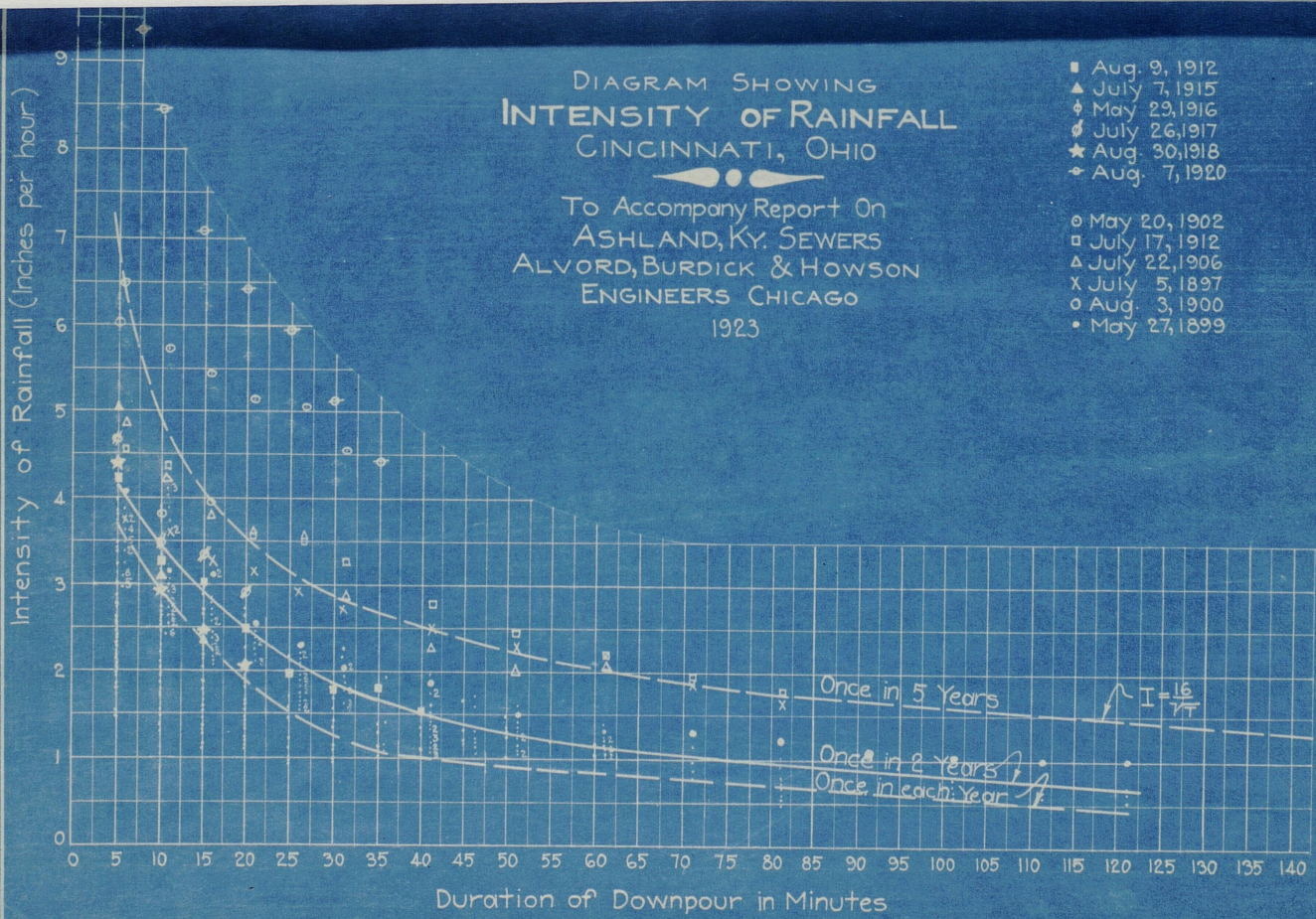
With the total time of concentration determined, the rate of rainfall for which the sewers are to be proportioned must be selected from a rainfall intensity curve corresponding to this time of concentration.

RAINFALL INTENSITY:

In order to determine what intensity of rainfall may be expected after a certain lapse of time, a rainfall intensity curve must be prepared. This is done by using the United States Weather Bureau records of excessive precipitation for the locality under consideration. Records may not be available for a particular city, but a representative record can usually be found for some near-by station which will serve the purpose almost as well, and perhaps even better if it should be a longer record. The length of the record should be as great as possible.

For Ashland we have used the weather bureau record for Cincinnati, there being a twenty-three year record available for that station. This record will indicate in a very satisfactory way, the excessive rainfall conditions for that general locality.

From these records we have prepared Exhibit No. 3, which shows three intensity curves. The lower curve of the three shows intensities of rainfall which as indicated by the record may be expected each year. The next higher curve shows those intensities which may be expected to occur on the average of one in two years. The top curve shows the intensities which may be expected to occur once in approximately five years. The points plotted are actual rates of rainfall which occurred at Cincinnati from 1897 to 1920.



The five year intensity curve is the curve adopted by the City of Cincinnati for use in the design of all storm sewers in the Suburban districts. The rational method of storm sewer design is employed.

Before proceeding with the design of the storm sewers it is necessary to select the rainfall intensity curve showing the size storm for which it is considered advisable to design. It would be very burdensome in cost as well as uneconomic to proportion sewers to carry the greatest storm which may be expected to occur. Occasional flooding during the greatest storms with a nominal amount of damage and inconvenience would be much cheaper than to prepare for the storm of comparatively rare occurrence. Therefore the size of storm to provide for varies with the type of district and the nature of its development, and the more damage occasional flooding would cause, the larger the storm for which it is wise to provide sewer capacity.

Thus, for the outlying Ashland districts, something less than the five year storm is justified. These districts will probably never be highly developed, but will develop ultimately into good residential territory, where but little damage will be done by occasional flooding of the sewers and streets during the larger storms, and Furthermore, the natural drainage is in most cases unusually good, so the water will not stand long at any

point. The lowlands might be overflowed during extra heavy storms, but such occurrence, it is believed, will cause but slight damage. Therefore it is our conclusion that the two year intensity curve, or that rainfall which may be expected to occur on an average of once in two years, provides a reasonable basis upon which to economically design storm sewers for the suburban districts at Ashland. These intensities in tabular form are as follows:

Minutes	Intensity (Inches per Hour)
5	4.10
10	3.40
15	2.90
20	2.50
25	2.15
30	1.80
40	1.50
50	1.30
60	1.20
70	1.05
80	.95
90	.85
100	.80
120	.70

RUN-OFF:

Having determined the time of concentration and the rainfall intensity curve to be used in the design

proper value for "C", and great care should be taken therein.

For the outlying districts of Ashland, we have assumed such a degree of future development with its accompanying pavements and impervious roofs, that a value of "C" equal to .30 will be generally applicable. No doubt it will be several years before this condition prevails universally throughout these districts, but main storm sewers are too costly to be replaced when conditions change, except in isolated instances, and therefore such sewers must be designed in so far as is practicable for those conditions which will obtain, beyond which there will be but small further change. We believe the value of .30 to be sufficiently conservative and yet properly adequate for the degree of development which may be reasonably expected to take place in these outlying districts.

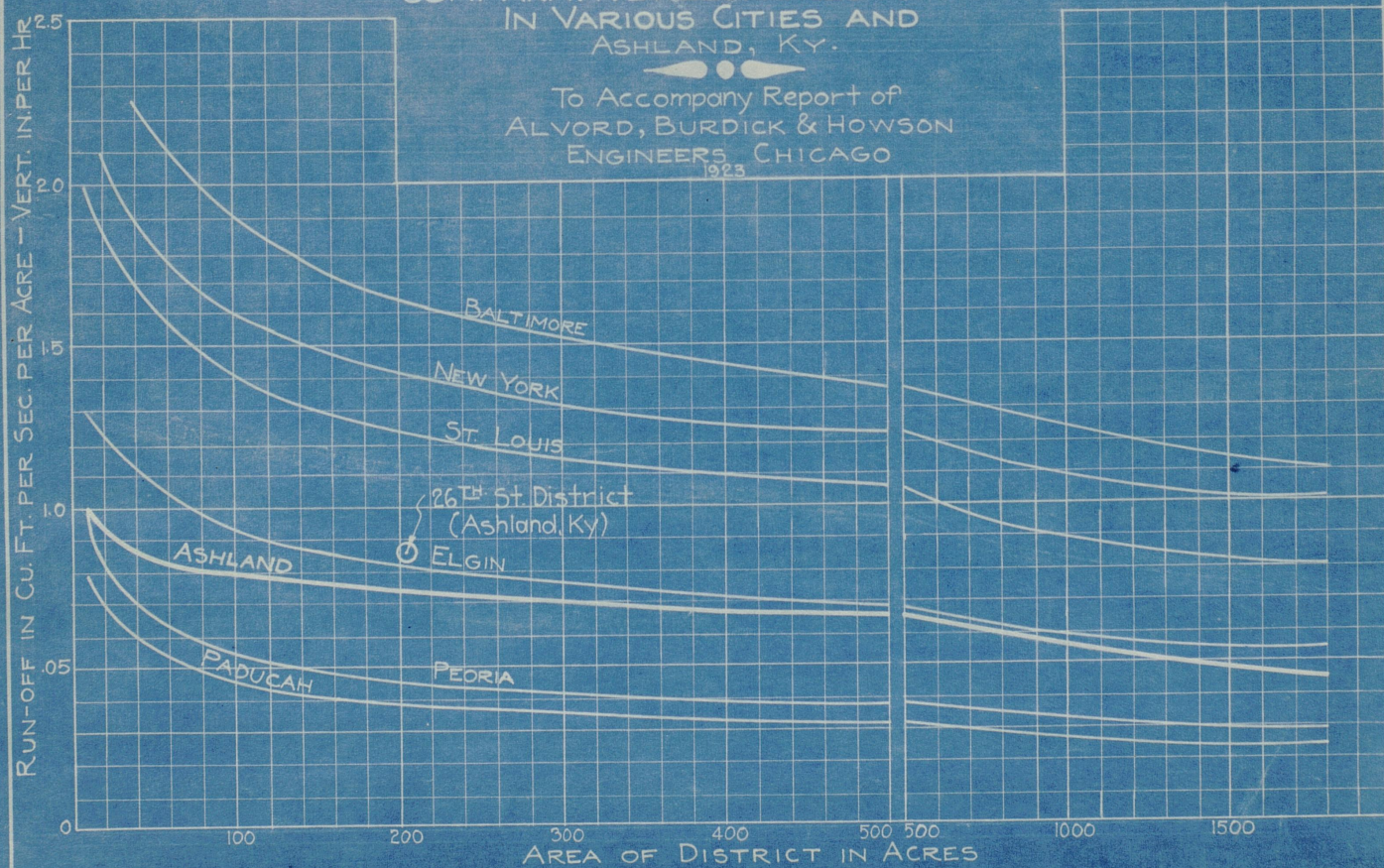
With the value of "C" adopted, and the rainfall intensity determined, together with the area of the district in acres, the run-off can be computed by the use of the formula mentioned before : $Q = CiA$.

Using the values adopted above, we have prepared a run-off curve shown on Exhibit No. 4. This curve shows the run-off in cubic feet per second per acre for the total area in acres, and forms a very convenient way of using the rational method in storm sewer design.

DIAGRAM SHOWING
COMPARATIVE ALLOWANCES FOR RUN-OFF
IN VARIOUS CITIES AND
ASHLAND, KY.

To Accompany Report of
ALVORD, BURDICK & HOWSON
ENGINEERS, CHICAGO

1923

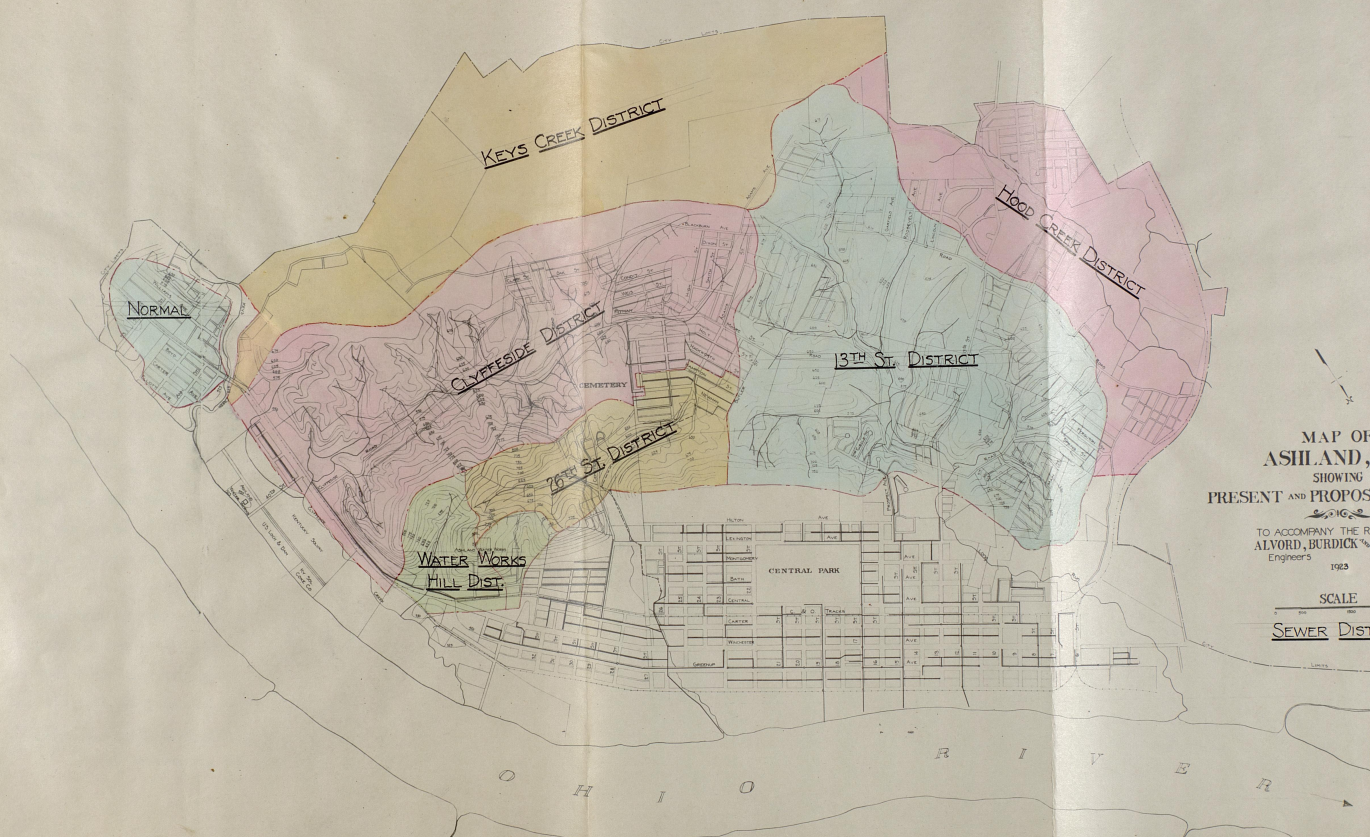


COMPARISON WITH OTHER CITIES:

Upon this same diagram (Exhibit No. 4) we have drawn the run-off curves which have been adopted by several other cities, and a direct comparison can be made with the curve we have adopted for Ashland. In view of this comparison, the Ashland curve does not appear to be excessive, nor is it a minimum.

COMPARISON WITH EXISTING SEWERS:

Most of the existing sewers in Ashland drain areas which are radically different in topography and development than those districts which this report is considering. It is therefore, not logical to expect a close approximation between our adopted allowance for the outlying Ashland districts and the existing sewers in the main part of the city. However, we have computed the approximate capacities of the principal existing sewers and with one exception, the capacities of the existing sewers are less than would be indicated as necessary by using our adopted run-off curve. This is to be expected, because of the much flatter slopes which exist in the downtown districts than in the outlying districts. On account of the conditions not being parallel to those in the districts herein considered we have not shown the points on the diagram.



MAP OF
ASHLAND, KY.
SHOWING
PRESENT AND PROPOSED SEWERS

TO ACCOMPANY THE REPORT OF
ALVORD, BURDICK & HOWSON
Engineers 1903 Chicago

SCALE
SEWER DISTRICTS

have been prepared are shown by a heavy dash line in red, while proposed sewers not estimated are shown by a dotted line. Such sanitary sewer laterals need be only eight inches in diameter laid on grades to conform to the ground surface but not less than a minimum grade of 4/10%. The full lines indicate existing sewers. Storm sewers for which estimates have been made are shown in yellow on Exhibit No. 7.

For proposed sewers we have contemplated using vitrified pipe up to and including 24" in diameter. For sewers 30" and over the estimates are based upon the use of plain concrete of circular cross-section. Other materials such as brick and segment block will be of about equal cost at the present time. The material used for the larger sewers should depend largely upon the relative costs at the time bids are taken.

In designing both storm and sanitary main sewers we have assumed that all branches or laterals will discharge into the mains at approximately the same points that the natural water-courses do now.

Where sewers cross under railway tracks, special precautions will need to be taken so as not to interfere materially with train service. Reinforced concrete sewers or cast iron pipe should be used under the actual crossing. Our estimate is intended to cover such items.

THIRTEENTH STREET DISTRICT SANITARY SEWERS:

The Thirteenth Street District comprises most of

the drainage area of Long Run, and has an area above Thirteenth Street at the point of the second crossing by Long Run of approximately eight hundred and forty acres.

This district is characterized by steep slopes and rough topography and it is only toward the mouth of Long Run at the Ohio River that the grade of the run flattens out. Because of the nature of this territory the only practicable location for a main sewer, either sanitary or storm, is the bottom land along the creek.

We have thus located the sewers, and insofar as possible have attempted to keep the cuts reasonably shallow. At places, due to excessive winding of the creek, it is necessary to cut through the nose of some hill, with resulting deeper cuts. We have put the sanitary sewers at such a depth that all branches can reach the main sewer from either side of the creek without affecting the carrying capacity of the creek channel. That is, it has been our intention to keep the sanitary sewers below the creek bed.

In designing the main sanitary sewer we have assumed that the flow from the various branches will reach the main sewer at about the same point as the branch creeks intercept Long Run. Probably the principal branch sewers will follow more or less closely the general path of the existing creeks.

We have estimated the cost of the main sanitary sewer and the branches which are more than eight inches in size to be \$43,920. Table 5 shows the detailed estimate.

TABLE C.
ESTIMATED COST OF MAIN SANITARY SEWER.

Exhibit No. 6 shows the general layout of the main sewer, and those branches which will occupy existing streets. As we have no data which shows what the proposed street layout may be in those areas which have no streets, we have not indicated other branches. This will have to be worked out when the street layout is known. However, eight inch sewers on a minimum grade of .4% will be adequate for all branches not shown, and as there is ample fall everywhere, no serious difficulty will be involved in building such laterals as they are required. We have laid out and computed the grades for all the sewers where an eight inch on a .4% grade will not be adequate.

We have shown the main sewer to follow approximately the course of Long Run all the way to the Ohio River. That portion of the sewer below Thirteenth Street might be taken directly to the River in Thirteenth Street, but difficult excavation would be encountered due to the development of the main part of the city, and also there would be exceedingly deep cuts. The maximum would be about thirty feet and the cuts would average about twenty feet for a distance of approximately 4700 feet.

At the outlet of the main sewer which will be a twenty-four inch pipe, a concrete bulk-head is contemplated which will have sufficient mass and weight to withstand ice action as well as conditions of flood.

We have estimated the cost of the main sanitary sewer and the branches which are more than eight inches in size to be \$43,920. Table C shows the detailed estimate.

TABLE C.
ESTIMATED COST OF MAIN SANITARY SEWERS,

13TH ST. DISTRICT.

Location	Size	Length	Cut	Cost per Foot	Total
Long Creek Main	8"	480	6.0	.70	\$336
	8"	170	10.0	.90	153
	8"	170	9.0	.85	145
	8"	500	5.0	.65	325
	8"	420	7.0	.75	315
	8"	150	5.0	.65	98
	8"	520	6.0	.70	364
	8"	880	7.0	.75	660
	8"	140	6.0	.70	98
	8"	460	7.0	.75	345
	8"	250	5.0	.65	162
	12"	845	6.0	1.05	887
	15"	300	6.0	1.30	390
	15"	190	7.0	1.35	257
	15"	190	8.0	1.40	266
	15"	365	7.0	1.35	493
	15"	410	6.0	1.30	533
	18"	265	8.0	1.85	490
	18"	285	12.0	2.15	613
	18"	260	8.0	1.85	481
	18"	575	7.0	1.80	1,036
	18"	385	6.0	1.70	654
	18"	325	5.0	1.65	536
	24"	7,600	6.0	2.85	21,650
					\$31,287
Branch A	12"	405	6.0	1.05	425
	12"	225	12.0	1.50	338
	10"	525	7.0	.90	472
	10"	160	10.0	1.10	176
	10"	145	9.0	1.00	145
	10"	270	7.0	.90	243
	10"	145	6.0	.85	123
	10"	120	5.0	.80	96
					\$ 2,018
Branch B	10"	160	10.0	1.10	175
	10"	370	9.0	1.00	370
					\$ 545
Manholes					2,750
Outlet at River					1,000
Engineering & Contingencies	20%				7,320
					\$43,920

CLYFFESIDE SANITARY SEWER:

On Exhibit No. 6 we have shown the proposed main sanitary sewer for Clyffeside. This sewer will occupy the low ground along the creek and insofar as practicable will follow the course of the creek. At Winchester Avenue the sewer from Normal and Keys Creek will join the Clyffeside sewer, and the combined flow will continue in a twenty-four inch pipe and then a 30" pipe along Clyffeside Creek until it reaches the north property line of the Kentucky Solvay Coke Company's property. Thence the 30" sewer will go directly to the Ohio River.

The Clyffeside District is very similar to the Thirteenth Street District in topography and general conditions. The total area tributary above Winchester Avenue is approximately 750 acres.

As in the Thirteenth Street District steep slopes and rugged topography characterize the district, leaving the water courses as the only available location for sewer construction. At the lower end of Clyffeside Creek the grade is comparatively flat, and marshes exist along the bottomlands. Here some latitude is available in locating a sewer. We have located it as shown on the above mentioned map but when plans are prepared some shifting may be warranted because of local conditions.

We have kept the main sewers below Clyffeside Creek at all points so that all laterals can enter the main at any point from either side of the creek.

We have estimated the total cost of the main sewer exclusive of the Winchester Avenue branch to be \$42,350.

TABLE D.

Table D shows this estimate in detail.

ESTIMATED COST OF MAIN SANITARY SEWERS,

NORMAL SANITARY SEWERS

CLYFFESIDE DISTRICT.

The Normal District comprises approximately 140

Location	Size	Length	Cut	Cost per foot	Total
Clyffeside Creek	8"	260	8.0	\$.80	\$ 208
	8"	420	7.0	.75	315
	8"	320	10.0	.90	288
	8"	200	12.0	1.10	220
	8"	200	11.0	.95	190
	8"	360	7.0	.75	270
	12"	1,040	6.0	1.05	1,090
	12"	400	7.0	1.15	460
	12"	1,200	6.0	1.05	1,260
	12"	400	6.0	1.05	420
	15"	540	7.0	1.35	729
	15"	600	5.0	1.25	750
	15"	200	6.0	1.30	260
	18"	900	7.0	1.80	1,620
	18"	800	7.5	1.85	1,480
	18"	300	14.0	2.20	660
	18"	600	8.0	1.85	1,110
	24"	500	9.7	3.25	1,625
	30"	1,350	7.7	4.30	5,760
Across Lots	30"	950	16.2	6.40	6,075

\$24,790

Crossing Tracks 5,000

Manholes 2,500

Outlet at River 1,000

Pumping & Sheet piling 2,000

Engineering & Contingencies (20%) 7,060

\$42,350

On Exhibit No. 5 we have shown by dotted lines the

layout of these sewers which we have not estimated. The main

sewer which we have estimated is shown by dash line. The

branches will be eight inch sewers on a four to the percent

grade, except the Fort-seventh Street branch which will be

We have estimated the total cost of the main sewer exclusive of the Winchester Avenue branch to be \$42,350.

Table D shows this estimate in detail.

NORMAL SANITARY SEWERS:

The Normal District comprises approximately 140 acres beyond Keys Creek. This area for the most part is relatively flat, and consequently the main sewer reaches a fairly good depth at its lower end. We have used minimum grades, however, and have kept the sewer at as high an elevation as is practicable.

As shown by Exhibit No. 6 we have laid the main sewer in Winchester Avenue, crossing Keys Creek on the existing bridge or culvert, and thence on down Winchester Avenue to the Clyffeside main sewer.

If the Normal Sewers could be permitted to discharge into Keys Creek some saving in cost would be effected, but this is not to be permitted because of the location of the water works intake a short distance below the mouth of Keys Creek. Therefore, either the main sewer will have to be sufficiently deep or the sewage will have to be pumped. It would be much cheaper to make a deep cut than to pump, and therefore we have used the cut method.

On Exhibit No. 6 we have shown by dotted lines the layout of those sewers which we have not estimated. The main sewer which we have estimated is shown by dash line. The branches will be eight inch sewers on a four tenths percent grade, except the Forth-seventh Street branch which will be

an eight inch sewer on a .26% grade, with a flush tank at its upper end.

From Keys Creek to the outlet at the Ohio River the sewer is designed to provide capacity to care for that part of the Keys Creek drainage area lying South of the Clyffeside District. This is now unoccupied territory but will ultimately require sewers and in view of the relatively small increased cost of the added capacity in the Normal outlet sewer we have designed that sewer so as to be adequate for both the upper Keys Creek and Normal District. We have estimated the cost of the main sanitary sewer for Normal including the 24" sewer in Winchester Ave. between Keys Creek and Clyffeside main sewer, to be \$22,340, the details of which estimate are given in Table E.

WATER WORKS HILL SANITARY SEWERS:

The Water Works Hill district is a small district located mainly upstream from the water works reservoir, and is similar in topography to both the Thirteenth Street district and the Clyffeside district. The district has an area of about ninety-five acres, some of which lies along Winchester Avenue.

The main tributary area lies south of Winchester Avenue but an eight inch sewer is ample. This sewer is shown on Exhibit No. 6 to be located along the creek so as to reach all parts of the watershed.

At Winchester Avenue the sewer from the north will be intercepted and the combined flow carried in a twenty inch pipe to Glyffside Creek and discharged. This 20" pipe

TABLE E.

ESTIMATED COST OF MAIN SANITARY SEWERS.NORMAL.

<u>Location</u>	<u>Size</u>	<u>Length</u>	<u>Cut</u>	<u>Cost per foot</u>	<u>Total</u>
Winchester Ave.	8"	1,550	10.5	\$.95	\$1,472
	10"	310	13.0	1.40	434
	10"	350	13.0	1.40	490
					\$2,396
Winchester Ave.	24"	800	14.5	3.70	2,960
	24"	1,200	16.3	3.90	4,680
	24"	500	13.7	3.60	1,800
					\$9,440
Manholes					1,000
Cutting & Repairing Paving	2200 ft. @			1.15	2,530
	2500 ft. @			1.30	3,250
					5,780
Engineering & Contingencies (20%)					3,724

\$22,340

This district for the purpose of this report was considered as comprised of that area tributary to the upper end of the existing fifty-four inch sewer at Twenty-ninth Street. This area is approximately 200 acres.

This district is very similar to both the Thirteenth Street district and the Glyffside district in that it is characterized by steep slopes and rugged topography. Consequently in this case also it is advisable to locate the main sewer along the creek bottoms.

At Winchester Avenue the sewer from the north will be intercepted and the combined flow carried in a twenty inch pipe to Clyffeside Creek and discharged. This 20" pipe will operate as a combined sewer which will carry sanitary flow and some storm flow from a 20" sewer which it intercepts.

We have shown the 20" sewer as discharging into Clyffeside Creek which we believe will not be objectionable so long as Clyffeside Creek drains the Clyffeside District. However if this should cause nuisance and in any event when the Clyffeside storm sewer is built and Clyffeside Creek abandoned this sewer will have to be extended to the Ohio River in order to avoid a nuisance at Clyffeside Creek. Our estimate does not include this extension.

We estimate the cost of the main sanitary sewer for the water works hill district to be \$6,655, the details of which estimate are shown in Table F.

TWENTY-SIXTH STREET DISTRICT SANITARY SEWERS:

This district for the purpose of this report may be considered as comprised of that area tributary to the upper end of the existing fifty-four inch sewer at Twenty-ninth Street. This area is approximately 206 acres.

This district is very similar to both the Thirteenth Street district and the Clyffeside district in that it is characterized by steep slopes and rugged topography. Consequently in this case also it is advisable to locate the main sewers along the creek bottoms.

There are two main parts to this district, namely: That portion drained by Simpson Creek, and that portion traversed by Twenty-ninth Street Road.

The Twenty-ninth Street Sewer has properly been designated TABLE F. ESTIMATED COST OF MAIN SANITARY SEWERS. far as the Junction of WATER WORKS HILL DISTRICT. Creek. above that

Location	Size	Length	Cut	Cost per Foot	Total
Along Creek	8"	540	6.0	\$.70	\$ 378
	8"	360	6.0	.70	252
	8"	40	5.0	.65	26
	8"	440	6.0	.70	308
	20"	100	4.0	2.10	210
	20"	100	7.0	2.30	230
	20"	100	4.0	2.10	210
	20"	100	6.0	2.20	220
	20"	100	7.0	2.30	230
	20"	140	6.0	2.20	308
	20"	130	4.0	2.10	273
					<u>\$2,645</u>
Cutting & Repairing Paving					100
Crossing Tracks					2,000
Manholes					600
Outlet into Clyffeside Creek					200
Engineering and Contingencies (20%)					<u>1,110</u>
Total					<u>\$6,655</u>

There are two main parts to this district, namely: That portion drained by Simpson Creek, and that portion traversed by Twenty-ninth Street Road.

The Twenty-sixth Street Sewer has properly been designed as a combined sewer and should be as far as the junction of the two branches of Simpson Creek. Above that point for the present at least it would appear to us as practicable to carry the storm flow in street gutters and the natural water courses providing adequate inlet capacity is provided at the junction to intercept the heaviest flows. All sanitary sewers in this area will lead to the existing sewer.

A new sanitary sewer of ample proportions has recently been constructed along Twenty-ninth Street road connecting with the new fifty-four inch combined sewer. Thus this portion of the district, which is more built up than the other is well provided with sanitary main sewers. Several laterals exist in that part of this branch known as South Ashland which is now fairly well sewered.

As shown on Exhibit No. 6 we have laid out an eight inch main along Simpson Creek which will adequately serve that portion of the district for sanitary flow. We have placed the sewer lower than the bed of the Creek so that branches can enter from either side without obstructing the Creek's waterway.

TABLE G.

ESTIMATED COST OF MAIN SANITARY SEWER.

26TH ST. DISTRICT.

Location	Size	Length	Cut	Cost per Foot.	Total
Simpson Creek	8"	240	5.0	\$.65	\$ 156
	8"	220	6.0	.70	154
	8"	1140	5.0	.65	740
	8"	360	6.0	.70	252
	8"	360	7.0	.75	270
	8"	440	5.0	.65	286
					<u>\$1,858</u>
Manholes					1,000
Engineering and Contingencies					<u>572</u>
					<u>\$3,430</u>

TABLE E.
ESTIMATED COST OF MAIN STORM SEWERS.
13-TH ST. DISTRICT.

Eight inch laterals on a .4% grade will be adequate for all sewers not shown, at any point in the district.

We have estimated the cost of the Simpson Creek main sewer branch to be \$3,430, the details of which are shown in Table G.

THIRTEENTH STREET DISTRICT STORM SEWERS.

The area of this district above Thirteenth Street at the second crossing of Long Run is approximately 840 acres. The district is described in the section under sanitary sewers.

On Exhibit No. 7 are shown in yellow the locations, sizes, elevations and grades of the main storm sewer with its principle branches. These sewers insofar as practicable may occupy the Creek Beds and thus save excavation as the creeks can be abandoned and filled up after the construction of the sewers.

Inlets should be provided at such points along the sewer and in sufficient number to properly intercept and conduct to the sewers such run-off as accumulates. We believe we have allowed sufficient money in the estimate to cover this item.

The outlet bulkhead at the Ohio River for the nine foot sewer will have to be of ample proportions and so designed to properly fit the contour of the river bank. Rip-rap along the river bank below the outlet will probably be necessary in order to avoid excessive washing during times of heavy run-off and we have made allowance for it in our estimate.

TABLE H.
ESTIMATED COST OF MAIN STORM SEWERS.
13 TH ST. DISTRICT.

<u>Location</u>	<u>Sizes</u>	<u>Length</u>	<u>Cut</u>	<u>Cost per Foot</u>	<u>Total</u>
Long Creek Main	12"	200'	5.0	\$ 1.00	\$200
	15"	220	5.0	1.25	275
	15"	220	7.0	1.35	297
	20"	200	5.2	2.15	430
Branch F	30"	420	5.5	3.80	1,596
	30"	345	8.5	4.40	1,520
	30"	295	6.5	4.05	1,195
	33"	450	5.8	4.35	1,960
	33"	150	6.3	4.45	667
	36"	700	6.5	5.00	3,500
	48"	865	7.5	8.50	7,350
	60"	505	8.0	10.65	5,385
	66"	570	9.5	12.55	7,150
	66"	1180	9.0	12.40	14,620
	72"	680	9.5	13.95	9,500
	84"	1290	10.5	16.50	21,300
	84"	280	8.5	15.85	4,440
Branch G	108"	7600	13.0	26.50	201,500
Branch A	24"	900	6.0	2.85	2,565
	18"	100	7.0	1.80	180
	18"	300	8.0	1.85	555
	15"	200	8.0	1.40	280
Branch H	12"	200	6.0	1.05	210
Branch B	30"	200	6.8	4.20	840
	30"	400	6.2	3.95	1,580
	27"	700	7.0	3.60	2,520
	27"	200	9.0	3.75	750
	20"	180	6.2	2.20	396
	18"	100	5.5	1.70	170
	12"	200	6.0	1.05	210
Branch C	24"	630	6.3	2.90	1,830
	24"	240	5.8	2.85	684
	24"	430	7.1	3.00	1,290
	20"	530	6.8	2.25	1,192
	18"	770	5.7	1.70	1,310
Branch D	42"	330	8.0	6.90	2,280
	36"	650	7.5	4.15	2,700
	30"	890	7.0	4.25	2,785
	24"	420	5.8	2.85	1,197
	24"	160	6.8	2.95	472
	20"	470	8.5	2.40	1,130
	18"	340	6.2	1.75	595
	12"	140	6.0	1.05	147
Outlet at River					
Engineering & Consulting					

11,306
\$ 310,753

Forward

TABLE H. (Cont'd)

Location	Size	Length	Cut	Cost per Foot	Total	
	Brought Forward					\$ 310,753
Branch E	18"	260	9.0	1.95	176	
	18"	180	8.0	1.85	333	509
Branch F	54"	400	8.0	9.90	3,960	
	54"	100	10.0	10.20	1,020	
	54"	880	8.0	9.90	8,710	
	42"	700	7.5	6.75	4,725	
	36"	360	7.5	5.10	1,840	
	33"	120	7.0	4.65	458	
	33"	440	7.5	4.75	2,090	
	20"	380	5.0	2.15	817	
	20"	120	6.5	2.25	270	
	20"	400	5.0	2.15	860	
	15"	160	5.5	1.25	200	24,950
Branch G	20"	260	5.5	2.15	560	
	18"	240	5.0	1.65	396	
	18"	200	5.5	1.70	340	
	12"	310	5.5	1.05	326	1,622
Branch H	30"	265	6.0	3.90	1,034	
	30"	160	9.5	4.60	736	
	30"	675	6.0	3.90	2,630	
	27"	160	9.0	3.75	600	
	24"	440	5.0	2.80	1,232	
	20"	200	6.5	2.25	450	
	20"	500	4.5	2.10	1,050	
	18"	300	5.0	1.65	495	
	18"	90	5.5	1.70	153	
	18"	160	4.4	1.60	256	
	12"	140	4.5	1.00	140	8,776
Branch I	27"	410	5.5	3.40	1,395	
	27"	450	4.5	3.35	1,510	
	24"	710	6.0	2.85	2,025	
	20"	350	6.0	2.20	726	
	18"	300	5.0	1.65	495	6,151
Branch J	18"	500	6.0	1.70	850	
	18"	300	5.5	1.70	510	1,360
Manholes						8,500
Inlets						4,200
Outlet at River						2,500
Engineering & Contingencies (20%)						73,864
						\$443,185

Table H
ESTIMATED COST OF MAIN STORM SEWERS
CLYFFESIDE DISTRICT

We estimate the cost of constructing the main storm sewer and principal branches to be \$443,185, the details of which estimate are shown in Table H.

CLYFFESIDE STORM SEWERS:

The drainage area of the Clyffeside district above Winchester Avenue is 750 acres. This district is described in a general way in the section devoted to sanitary sewers.

Exhibit No. 7 shows the location of the main sewer and branches, with grades, elevations and sizes. As in the Thirteenth Street district we have located the sewers in the creek beds insofar as possible to save excavation. When the storm sewers are built therefore the creeks can be abandoned and filled up. The excess excavation will do much of this filling if desired.

Below Winchester Avenue we have shown the main sewer as following Clyffeside Creek for a distance before turning to the Ohio River. We did not show this sewer as running directly to the river on Winchester Avenue because of the obstructions involved at such a point on the Kentucky Solvay Coke Company's property and also because of the difficulty in getting a right-of-way across the government dam property.

The estimate covers the cost of a well designed concrete bulkhead for the 9'-6" sewer, and also the rip-rapping of the river bank below the outlet.

We estimate the cost of the main sewer and principal branches to be \$393,170, the details of which estimate are shown in Table I.

\$249,757

Table I
ESTIMATED COST OF MAIN STORM SEWERS
CLYFFESIDE DISTRICT

Location	Size	Length	Cut	Cost per ft.	Total
Clyffeside Creek	2'-6"	400	8.0	\$4.40	\$1760
	3'-6"	400	9.0	7.10	2840
Brought Forward	3'-6"	400	14.5	9.00	3600
	4'-0"	400	11.5	9.35	3740
Branch E	4'-0"	160	8.5	8.70	1390
	5'-6"	1040	8.5	12.20	12690
	5'-6"	400	10.0	12.65	5060
	5'-6"	650	9.0	12.30	8000
	6'-0"	550	9.5	14.00	7700
	6'-0"	400	9.5	14.00	5600
	6'-0"	960	10.5	14.25	13700
	6'-0"	200	12.5	15.05	3010
	6'-0"	200	10.5	14.25	2850
Branch F	7'-0"	600	10.5	16.50	9900
	9'-0"	800	15.0	27.50	22000
	9'-0"	300	15.5	27.80	8340
	9'-0"	250	20.0	30.00	7500
	9'-0"	650	15.5	27.80	18050
	9'-0"	500	13.0	26.35	13170
	9'-0"	1340	12.0	25.80	34600
	9'-6"	160	16.0	30.50	4880
	9'-6"	700	24.0	34.75	24325
Branch G	9'-6"	100	17.0	30.95	3095
					\$217,800
Branch A	12"	100	10.0	1.30	130
	12"	200	5.0	1.00	200
	12"	250	6.0	1.05	262
	12"	180	7.5	1.15	207
	15"	100	7.5	1.40	140
	18"	260	5.0	1.65	429
	18"	200	6.0	1.70	340
Branch H	24"	300	6.0	2.85	855
					2,563
Branch B	12"	100	4.0	1.00	100
	12"	100	6.0	1.05	105
	15"	90	7.0	1.35	122
	15"	260	6.0	1.30	338
	15"	270	5.5	1.25	337
	18"	170	5.0	1.65	281
					1,283
Branch C	15"	200	8.0	1.40	280
	24"	400	6.0	2.85	1140
	24"	300	5.0	2.80	840
	27"	500	5.5	3.40	1700
	27"	670	7.7	3.65	2445
					6,405
Branch D	12"	350	5.0	1.00	350
	15"	300	7.0	1.35	405
	18"	560	6.0	1.70	951
					1,706
Forwarded,					\$229,757

TABLE I (CONT'D)

Location	Size	Length	Cut	Cost per ft.	Total
Brought Forward,					\$229,757
Branch E	18"	200	5.7	1.70	340
	24"	260	6.2	2.90	754
	24"	490	6.8	2.95	1447
	30"	650	6.2	3.95	2568
	36"	360	6.7	5.00	1800
	36"	100	9.7	5.65	565
	36"	80	6.7	5.00	400
					7,874
Branch F	18"	150	5.5	1.70	255
	18"	470	6.5	1.75	823
	18"	500	5.0	1.65	825
	18"	110	7.0	1.80	252
	18"	380	5.0	1.65	627
	20"	80	8.0	2.35	188
	20"	60	5.0	2.15	129
					3,099
Branch G	18"	400	5.5	1.70	680
	20"	300	7.0	2.30	690
	27"	100	6.0	3.45	345
	27"	180	13.5	4.20	756
	27"	220	8.3	3.70	814
	36"	500	7.2	5.05	2525
	36"	600	4.7	4.60	2760
	36"	100	5.2	4.70	470
					9,040
Branch H	15"	280	5.0	1.25	350
	15"	180	10.0	1.55	279
	18"	240	4.0	1.85	444
	27"	330	4.5	3.35	1107
	27"	170	5.0	3.40	578
	30"	250	6.0	3.90	975
	30"	150	10.0	4.65	697
	30"	80	5.0	3.70	296
					4,726
Branch I	12"	400	7.0	1.15	460
	18"	220	5.5	1.70	374
	18"	180	5.0	1.65	297
	18"	270	6.0	1.70	459
	20"	230	4.5	2.10	483
	20"	80	6.0	2.20	176
	24"	100	6.0	2.85	285
					2,534
Forwarded,					\$257,030

TABLE I (CONT'D)

Location	Size	Length	Cut	Cost per ft.	Total
Brought Forward,					\$257,030
Branch J	15"	360	7.0	1.35	486
	18"	190	6.5	1.75	332
	18"	580	8.0	1.85	1072
					1,890
Branch K	12"	340	4.5	1.00	340
	15"	320	5.0	1.25	400
	18"	290	5.0	1.65	478
	18"	40	5.5	1.70	68
	24"	200	5.5	2.80	560
	24"	300	6.0	2.85	855
	24"	100	7.5	3.00	300
	33"	280	6.0	4.40	1232
					4,234
Branch L	12"	130	6.0	1.05	137
	12"	120	7.0	1.15	138
	12"	120	6.0	1.05	126
	18"	300	7.0	1.80	540
	20"	300	6.0	2.20	660
	20"	230	6.0	2.20	506
	30"	210	6.5	4.05	850
	33"	560	7.0	4.70	2635
	36"	400	8.5	5.40	2160
	42"	800	11.0	7.55	6040
	42"	530	10.0	7.35	3900
					17,692
Branch M	20"	600	6.0	2.20	1320
	24"	500	8.5	3.10	1550
	18"	400	5.0	1.65	660
	18"	400	7.5	1.85	740
	24"	100	12.0	3.45	345
	24"	160	4.5	2.75	440
					5,055
Cutting & Repairing Pavement					
1730' @				2.75	4760
1900' @				2.00	3800
80' @				8.50	680
					9,240
Crossing tracks,					7,500
Pumping & sheeting 2500' @				2.00	5,000
Manholes					9,000
Inlets and catch basins,					8,500
Outlet at river,					2,500
Engineering and contingencies 20%,					\$ 65,529
Total					\$393,170

NORMAL STORM SEWERS:

The Normal district is described under sanitary sewers. Because of its relative flatness the runoff curve shown on Exhibit No. 4 and which was used on the other districts was not used for Normal. The times of concentration were figured at various points on the main sewer and the runoff computed from the rainfall curve, Exhibit No. 3, as explained elsewhere in this report. Thus any error due to the flatter slopes was avoided in the design of the Normal storm sewers.

Exhibit No. 7 shows the storm sewer layout for Normal. We have discharged the storm flow into Keys Creek as indicated, thus obviating the necessity of a long outfall sewer. This is entirely proper from a sanitary standpoint as such storm flow is extremely weak sewage and is no worse than any other drainage which reaches the river.

A small outlet bulkhead and rip-rap will be necessary at the outlet into Keys Creek.

The cost of the Normal main storm sewer is estimated to be \$33,600. The details of this estimate are shown in Table J.

WATER WORKS HILL STORM SEWERS:

In addition to the area comprising this district as described under sanitary sewers, we have included for storm sewerage that small drainage area lying immediately north of the

NORMAL STORM SEWERS:

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A small outlet bulkhead and rip-rap will be necessary at the outlet into Keys Creek.

The cost of the Normal main storm sewer is estimated to be \$33,600. The details of this estimate are shown in Table J.

WATER WORKS HILL STORM SEWERS:

In addition to the area comprising this district as described under sanitary sewers, we have included for storm sewerage that small drainage area lying immediately north of the

water works reservoir and above Central Avenue. This gives the district tributary at the intersection of Winchester Avenue with the creek and the reservoir an area of approximately 206 acres.

TABLE J.

ESTIMATED COST OF MAIN STORM SEWERS.NORMAL DISTRICT.

Location	Size	Length	Cut	Cost per Foot	Total
Williams Ave.	18"	500	7.0	1.80	\$ 900
Haney St.	18"	480	7.7	1.85	888
Winchester	33"	820	7.5	4.75	3,900
"	36"	600	8.5	5.40	3,240
"	36"	260	8.0	5.30	1,377
46st St.	36"	680	7.5	5.25	3,570
"	36"	100	5.5	4.75	475
					\$14,350
Cutting & Repairing Paving on Winchester					
1700 lin. ft. @			4.50		7,650
Manholes					800
Catch Basins & Inlets					1,000
Crossing under tracks					4,000
Outlet to Keys Creek					200
Engineering & Contingencies (20%)					5,600
Total					\$33,600

We have estimated the main storm sewers for Water Works Hill District to cost \$33,600, the details of which estimate are shown in Table K.

TWENTY-SIXTH STREET DISTRICT STORM SEWERS:

This district with an area of 206 acres is described

water works reservoir and above Central Avenue. This gives the district tributary at the intersection of Winchester Avenue with the creek south of the reservoir an area of approximately 125 acres.

We have taken this additional area into the Water Works Hill District because of the difficulty involved in extending the branch sewers leading to the sixty inch main sewer at Twenty-sixth Street. The sixty inch main sewer has ample capacity, but due to the comparative flatness of the ground in a southerly direction and the required sizes and grades, it is practically impossible to extend existing branches to include this area.

As in other districts we have located the main sewer in the creek bottom as indicated on Exhibit No. 7. Below Winchester Avenue the sewer is shown extending to the river, rather than stopping at Clyffeside Creek. However, if the Clyffside storm sewer is not constructed with a resulting abandonment of Clyffeside Creek, this main sewer should terminate at the creek.

We have estimated the main storm sewers for Water Works Hill District to cost \$49,915, the details of which estimate are shown in Table K.

TWENTY-SIXTH STREET DISTRICT STORM SEWERS:

This district with an area of 206 acres is described

TABLE K.

ESTIMATED COST OF MAIN STORM SEWERS.WATER WORKS HILL DISTRICT.

Location	Size	Length	Cut	Cost per Foot	Total
Winchester Rd.	30"	400	9.0	4.50	\$1,800
	33"	400	13.0	6.00	2,400
	33"	100	14.0	6.25	625
	33"	300	7.5	4.75	1,425
	36"	460	7.5	5.15	2,370
	36"	100	7.0	5.00	500
					<u>\$9,120</u>
Along Creek	18"	340	7.0	1.80	612
	18"	200	7.0	1.80	360
	33"	380	7.0	4.60	1,750
	33"	50	7.5	4.75	223
	36"	450	7.0	5.00	2,250
	48"	100	5.0	6.65	665
	48"	100	9.5	8.90	890
	48"	100	6.5	8.20	820
	48"	200	8.5	8.65	1,730
	48"	100	7.5	8.45	845
	48"	150	7.0	8.30	1,245
	48"	320	19.0	12.10	3,870
	48"	180	21.00	12.80	2,300
					<u>17,575</u>
Cutting & Repairing Paving 1800'	@	4.00			7,200
Crossing tracks					5,000
Manholes					1,000
Inlets & Catchbasins					1,200
Outlet at River					500
Engineering & Contingencies	(20%)				<u>8,320</u>
Total					<u>\$49,915</u>

under sanitary sewers. As is shown on Exhibit No. 7 we have extended the existing fifty-four inch sewer a short distance to the point where the Simpson Creek branch and the Twenty-ninth Street branch come together.

The Simpson Creek branch is shown to follow the creek, and the Twenty-ninth Street branch to follow the line of the existing sewer near Twenty-ninth Street. It is our understanding that this existing sewer is a sanitary sewer and was not intended to be adequate for a storm sewer.

As has been said previously, the existing fifty-four inch sewer is adequate for the runoff for which we are providing from the tributary area above it.

We estimate the cost of these main sewers to be \$27,240, the details of which estimate are given in Table L.

OUTLYING AREAS NOT CONSIDERED IN DETAIL:

Those portions of the city lying beyond the districts considered in detail in this report and yet within the city limits will probably require sewerage facilities some time in the far distant future.

The Upper Keys Creek area which is at present undeveloped will ultimately be sewered. We have accordingly allowed sufficient capacity in the Normal outlet sewer to intercept this flow at Keys Creek and conduct it to the Ohio River below Dam #29. We have not shown the Keys Creek main

TABLE L
ESTIMATED COST OF MAIN STORM SEWERS
26TH STREET DISTRICT

Location	Size	Length	Cut	Cost per ft.	Total
29th St. Branch	20"	100	5.0	2.15	\$215
	24"	260	5.0	2.80	728
	24"	380	6.0	2.85	1083
	33"	520	6.0	4.40	2290
	33"	540	7.0	4.70	2540
	42"	300	6.5	6.60	1980
	48"	250	5.5	7.50	1875
	54"	130	6.0	9.15	<u>1190</u>
					\$11,901
Simpson Creek	15"	240	5.0	1.25	300
	18"	220	6.0	1.70	374
	20"	440	5.0	2.15	946
	24"	700	5.0	2.80	1960
	27"	360	6.0	3.45	1242
	30"	360	7.0	4.20	1512
	42"	440	5.0	5.60	<u>2465</u>
					8,799
Manholes, plant near the R.R. at Good Street					1,000
Inlets, discharge of the sewage into the water					1,000
Engineering and Contingencies 20%,					<u>4,540</u>
Total,					\$27,240

ACKNOWLEDGMENTS

In preparing our report we are indebted to the assistance and co-operation of Mr. Thomas Higgins

sanitary sewer on the map as the topography of this district is lacking. However, at its juncture with the 24" Normal outlet sewer in Winchester Ave., the Keys Creek sewer should be an 18" sewer @ .2% grade, or its equivalent in carrying capacity.

The Hood Creek District which lies to the west of Pollard and the 13th St. District can best be handled as a separate consideration when that district is developed. The topography of this district is not available. However, the district can be easily sewered the maximum size at the crossing of the creek by the C. & O. R.R. being a 15" sewer @ .25% grade or its equivalent in carrying capacity. On account of the length of outfall sewer required it will be advisable to install either a pumping station at the R. R. which will lift the sewage into the 13th St. District outfall or build a small disposal plant near the R.R. at Hood Creek at such time as the discharge of the sewage into the water-course becomes objectionable. Which method is preferable can best be determined at the time the necessity arises. The sanitary sewage will come to the same point in either case.

ACKNOWLEDGEMENTS:

In concluding our report we wish to acknowledge the assistance and co-operation of Mr. Thomas Bogges,

City Engineer.

CONCLUSION:

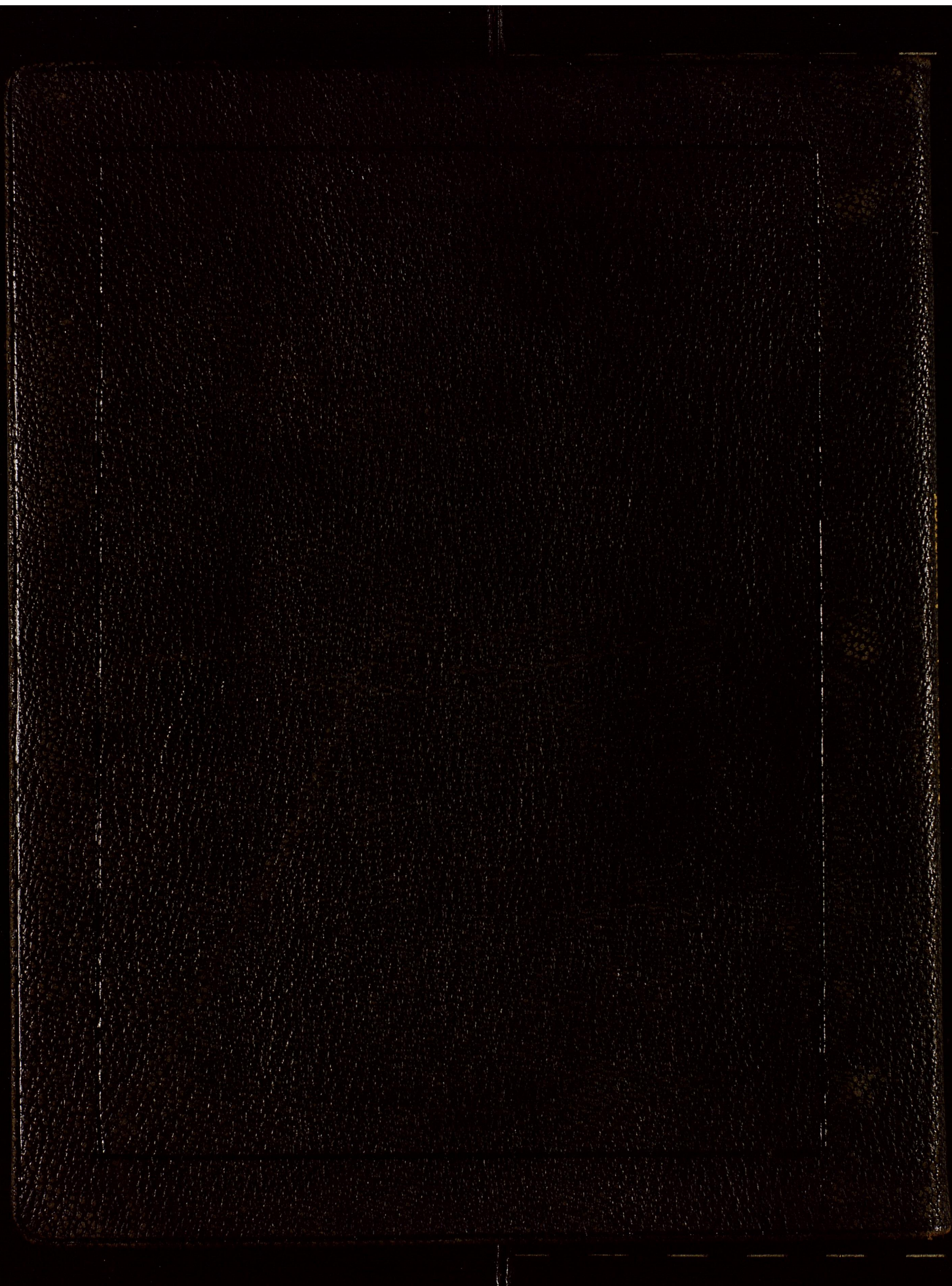
The City of Ashland is fortunate in that the topography of those districts now without sewers is such that the storm water can be adequately disposed of for many years without great investment in storm sewers. Postponing these great expenditures will make it possible for the proceeds of the recent bond issue to provide sanitary sewers for practically all of the area now requiring sewerage facilities.

We trust that our report may be of assistance in formulating the future sewerage policy of Ashland.

Respectfully submitted,
ALVORD, BURDICK & HOWSON,

By L. R. Howson

Chicago, March 1, 1923.



ALVORD, BURDICK & HOWSON

JOHN W. ALVORD

CHAS. B. BURDICK

LOUIS R. HOWSON

INVESTIGATIONS, REPORTS
DESIGNS, ESTIMATES, PLANS AND
SPECIFICATIONS FOR THE
CONSTRUCTION AND IMPROVEMENT
OF ENGINEERING WORKS

DONALD H. MAXWELL
PRINCIPAL ASSISTANT ENGINEER

MEMBERS
AMERICAN SOCIETY OF CIVIL ENGINEERS
WESTERN SOCIETY OF ENGINEERS
AMERICAN WATER WORKS ASSOCIATION
CHICAGO ASSOCIATION OF COMMERCE
AMERICAN PUBLIC HEALTH ASSOCIATION

ENGINEERS

SUITE 1417-18 HARTFORD BUILDING
CHICAGO

WATER WORKS
WATER PURIFICATION
FLOOD RELIEF
SEWERAGE
SEWAGE DISPOSAL
APPRAISALS AND RATE REPORTS
POWER GENERATION
TELEPHONE CENTRAL 0372

Copy

Chicago, April 3, 1923.

Mr. Thomas Boggess,
City Engineer,
Ashland, Ky.

Dear Sir:

We are in receipt of your wire relative to our services in connection with the design, advertising, letting of contracts, and the supervision of construction of the sanitary sewers for the City of Ashland, and have replied thereto by wire as follows:

"Replying your wire would advise we propose furnishing our services as outlined on pages three four and five of our letter of January twenty fifth nineteen twenty two addressed to Mr. Means copy of which is being sent today special delivery."

Under date of January 25, 1922 we submitted to Mr. E. C. Means, Chairman of the Sewerage Committee of Ashland a proposal covering:

- 1st. The making of the general study and the preparation of a report, outlining the methods of sewerage, and
- 2nd. The preparation of detailed plans and specifications and the supervision of construction of sewers.

The City of Ashland accepted the first part of our proposal covering the report. The report has recently been completed and delivered to you, and we have received payment for our services in connection with it.

On pages 3, 4, and 5 of our letter of January 25 we outlined the services which we propose to perform and the compensation therefor in connection with the plans and specifications and supervision of construction. We

herewith re-submit as formal proposal for this work the following which is a copy of a part of our letter of January 25, 1922:

SURVEYS AND PLANS:

We would propose to send a representative to Ashland who would accurately profile the lines of sewers to be laid at this time. We would investigate sub-surface conditions through borings or test holes, the labor for which we would expect to be furnished by the city, the holes, however, to be dug under our direction.

These plans and profiles would show the location of all manholes, catchbasins and connections. Details would be prepared showing crossings with creeks, if any, the construction of outlet sewer bulkheads with arrangements for taking care of dry weather flow, etc.

The plans will show typical cross-sections of all sewers, manholes, catchbasins, overflow basins, if any, etc. The plans will contain a complete tabulation of quantities, cuts, lengths of each size sewer, number of manholes, etc., and will give the contractor such information as is necessary for him to decide as to all quantities involved in the construction.

The detailed plans will be accompanied by a complete set of specifications for the sewers to be constructed in which the character of materials and workmanship entering into the construction will be fully defined, and which specifications taken in conjunction with the plans will completely specify the work both as to quality and quantity of materials entering thereinto.

We would prepare bidder's form, instructions to bidders, contract, form, and advertisement and interest reliable contractors specializing in this class of work so that active competition from reliable contractors will be secured.

SUPERVISION OF CONSTRUCTION:

We will supervise the construction of the main sewers as follows:

As soon as construction work is ready to start we will send a resident engineer to Ashland to represent us and the City of Ashland in seeing that the contract, plans and specifications are adhered to in the execution of the work. This resident engineer will reside in Ashland and devote his entire time to the work.

Our resident engineer will set all stakes both for line and grade, and will be in responsible charge of the work. If due to the speed with which the work is progressing, or if work is carried on in more than one location, making it impossible for our engineer to give detailed inspection in addition to setting all stakes we would expect the city to furnish an inspector who will work under the direction of our resident engineer reporting directly to him, and will be responsible to our resident engineer for the detailed inspection of materials and labor.

We will keep in personal touch with the work through daily reports from our resident engineer. We will also visit the work personally from time to time as it progresses, in order that we may be able to fully interpret the correspondence relative to the work, and advise intelligently concerning it. We will meet with the City Officials at such times as matters of importance require.

We will prepare monthly estimates and certificates showing the amount of work done during each month by the contractor, and the payments to which he is entitled under the contract. We will accompany these monthly certifications by progress reports which will set forth such items of importance as conditions may warrant.

At the completion of the work we will make detailed final inspection and issue final certificate of payment due to the contractor.

COMPENSATION:

For all of the work in connection with the making of detailed plans and specifications, and the supervision of construction of the sewer work, we would expect to receive an additional sum equivalent to five percent (5%) of the total cost of the work.

Of this amount two and one-half percent ($2\frac{1}{2}\%$) (based upon the estimated cost) shall be due and payable upon the completion of the plans and their submission to the city.

The remaining two and one-half percent ($2\frac{1}{2}\%$) shall be payable at the rate of Five Hundred Dollars (\$500.00) per month after construction starts until such time as the work is completed when the balance shall become due.

This total amount of five percent (5%) is contingent upon the entire construction work not requiring over ten months from the date of letting contracts. If the construction period should exceed ten months, we would expect to receive additional compensation at the rate of Three Hundred Dollars (\$300.00) per month plus the traveling expenses

-4-

of our representative in visiting the work.

Included in the above fee there will be furnished five complete sets of plans and specifications. Such additional copies as may be desired will be furnished at the actual cost of printing and typewriting to us.

We thank you for your continued confidence in the work of this office, and trust that we may be authorized to undertake this work for you.

Very truly yours,

ALVORD, BURDICK & HOWSON,

By L.R. HOWSON.

LRH/R

1,000 Lbs.

ICE

Nº

9072 A

COUPON BOOK

NOT TRANSFERABLE.

THE COUPONS IN THIS BOOK ARE NOT GOOD IF DETACHED
ISSUED BY "©©©" AND ARE PAYABLE ONLY IN ICE. "©©©"

ASHLAND ARTIFICIAL ICE CO.

INCORPORATED

Telephone 137

ASHLAND, KY.

When driver delivers amount of ice required, pay him in coupons. The Name and Address of the purchaser and the Number of this book is recorded in our office, and ice will be delivered at no other place on these coupons. Unused coupons will be redeemed at our office at any time. The original purchaser of this book agrees not to sell or transfer the same to any other party without the written consent of this company.

To make our coupon system effective, we find it necessary that our customers give a coupon at the time of each delivery of ice. We have therefore issued orders to our drivers to leave NO ICE unless they receive coupons for same at the time ice is supplied.

In case of absence of customer, we suggest that coupons be left for amount of ice needed.

\$ 55⁰⁰

March 26 1923

Received of _____

for this coupon book

Paul Dollars

By Albert M. E.

THIS BOOK IS ISSUED TO

Street,

191

And the coupons will be received for
their face value in ice if not torn out of the
cover.

Countersigned by

ALLISON COUPON COMPANY, INDIANAPOLIS, IND., U. S. A.

MOORE FEED & SEED COMPANY

DAIRY
FEED
OUR
SPECIALTY

FERTILIZER
FOR
ALL
USES

GRAIN, HAY, STRAW AND FEED

THE BEST OF EVERYTHING IN THE SEED LINE, FOR THE GARDEN, LAWN AND FARM

12th STREET and GREENUP AVENUE

TERMS: NET CASH

Ashland, Ky.,

4-19 1923

To

E. C. Means

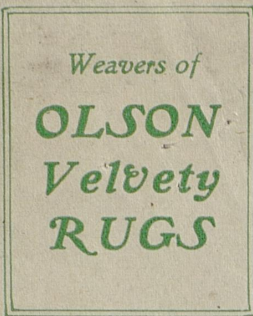
Address

306 E Tex

1686

CUSTOMER'S INVOICE

DO NOT DESTROY. WE DO NOT ITEMIZE AGAIN



Responsibility \$200,000.00

5032 APR 24 REC
OLSON RUG CO. Order No. 12093

28 to 40 Laflin Street

Chicago, 4/21/23. 19

To Mrs. E. C. Means,

Street No. 306 Lexington Ave., R. F. D.

Town or City Ashland, County

Shipping Point State Kentucky.

(If Different from Post Office Address)

Should we ship by
freight ☐ or express ☐

EXP

NO GOODS C. O. D.

Our Order Number	Quantity	SIZE	DESIGN	Furnished Material	Weaving	TOTAL
------------------	----------	------	--------	--------------------	---------	-------

12093	1	9 x 11	961	2.85	32.67 2.85	35.52
-------	---	--------	-----	------	---------------	-------

74
bz

5710
MEMORANDUM BILL

APR 24 1923

OLSON RUG COMPANY

PER

This is a Memorandum Bill, the amount representing the cost of the rug(s) as per your order. Runners and odd sizes require extra time in setting machines to make same.

Please Remit At Once And Return This Bill So We Can Ship Without Delay

Send Postal or Express Money Order. You must include 10c for collection at Chicago, if you send your personal check or check on your local bank.

FORM COMPT. NO. 1
REVISED 10-1-90M

OFFICIAL RECEIPT No. **C 363081**

James L. Barton, Nat'l Chairman
Charles V. Vickrey, Gen'l Sec'y
Cleveland H. Dodge, Nat'l Treas.

Near East Relief

National Headquarters
151 Fifth Avenue
New York City

Date:

4.26.24

Amount:

Mrs. E.C. Means (Ruby R)
308 E. Lexington Ave.
Ashland, Kentucky

10.00

We gratefully acknowledge receipt of your kind remittance, as indicated above.

STATE OFFICE

Near East Relief

Per Beth Higgins G

INVOICE NO. _____

INCORPORATED

Date 4-26- 1973

Mr. E. L. Means

Address _____

PIANO ☐ NO. ROOMS FUR. ☐ 1st FLOOR ☐ 2nd. FLOOR ☐ SHORT CARRY ☐

LONG CARRY ☐ SPECIAL ATTENTION: _____ Time Promised 2:00 PM

[illegible]

Received

TERMS CASH—PLEASE PAY DRIVER

No. 246 Ashland, Ky. May 2 1923

THE ASHLAND YOUNG MEN'S CHRISTIAN ASSOCIATION

M \$ Ruby R. Mearns acknowledge with thanks the receipt from
OF _____ DOLLARS
ON ACCOUNT OF _____

MEMBERSHIP _____ \$
SUBSCRIPTION _____ 12.50
LOCKER, NO _____
DORMITORY _____
RENT _____

TOTAL _____ \$ 12.50
W. J. Nichols
For the Treasurer

No. D 69114

**Presbyterian Board of
Ministerial Relief and Sustentation**

510 WITHERSPOON BUILDING, PHILADELPHIA, PENNA.

Dear Friend:

We respectfully call your attention to the fact that, in accordance with the terms of your subscription of \$ 10.00 per year for 5 years, the 3rd payment of \$ 10.00 will be due June 1, 1923.

Kindly forward this notice with your remittance, and it will be receipted and returned to you.

Mrs. E. C. Means,

306 E. Lexington Ave. W. W. HEBERTON, Treas.
Ashland, Ky. Per: K

RECEIVED PAYMENT

JUN - 5 1923

Church 1st

Presbytery Ebenezer

Relief Department, \$ 10.00

Sustentation Department, \$ 10.00

Very truly yours,

W. W. Heberton

(W. W. HEBERTON)

Treasurer.

No. **D** 69113

**Presbyterian Board of
Ministerial Relief and Sustentation**

510 WITHERSPOON BUILDING, PHILADELPHIA, PENNA.

Dear Friend:

May 20, 1923. 19

We respectfully call your attention to the fact that, in accordance with the terms of your subscription of \$ 20.00 per year for 5 years, the 3rd payment of \$ 20.00 will be due June 1, 1923.

Kindly forward this notice with your remittance, and it will be receipted and returned to you.

E. C. Means,
306 E. Lexington Ave.
Ashland, Ky.

RECEIVED PAYMENT
JUN - 5 1923
W. W. HEBERTON, Treas.
Per. K.

Church Ashland

Presbytery Ebenezer

Relief Department, \$

Sustentation Department, \$ 20.00

Very truly yours,

W. W. Heberton

(W. W. HEBERTON)

Treasurer.

SHEET NO.

May 1923

All accounts due the first of the month after date of purchase

Store Phone 227
Office Phone 500

DATE	DESCRIPTION	CHARGES	CREDITS	BALANCE
5/21	1 pc 36X42 Blk Screen	33		
	11 ft 24" " "	66		
	14 ft 26" " "	91		
	1 Box 4oz Sacks	10		2.00

Received Payment

JUN 4 1923

Ogden Hardware Co.

BY L.E.D.

Thank you

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

CLASS OF '88

To the Members of the Class of '88:

CLASS RECORDS

This year marks another five year period since graduation. The Secretary is anxious to bring the Class Records up to date, and asks your co-operation to this end.

You will find enclosed a copy of your record as it stands. Please look it over without delay.

State your present occupation.

State your present business address.

Make any corrections or additions relating to family data.

Make any corrections or additions relating to what is stated as to occupations, dates, etc., relating to you personally.

A moment's consideration will convince you of the difficulty a Class Secretary has in collecting information from widely scattered classmates; a prompt compliance with the above requests will be much appreciated.

35TH REUNION AND OUTING.

We had such a good time at our 30th Reunion, held at Duxbury, Mass., in 1918, that the Class at its last meeting voted to go there again this year.

We have arranged to go to Powder Point Hall, arriving on Friday, June 29th, and remaining until Sunday, July 1st.

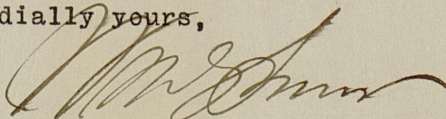
Please note these days on your calendar, and plan to be present.

Special announcements regarding this Reunion will be sent you from time to time later.

Those who cannot be with us for the entire Outing will be most welcome for any portion of the time that they can spend with us.

In conclusion, please return the enclosed sheet promptly, with notations in pencil or otherwise.

Cordially yours,



Sec'y. Class of '88.

112 Water Street,

Boston.

Jun 17/23

1923

Mrs E B McGinnis 6-20 3
E. L. L.

✓	Self	
✓	592 Uni Vac	
	Batth	500
✓	Cork	10
✓	Garin	xx
		5110

Paid 6/20/23
Ogden Hardware Co.
L.E.O.

INVOICE

Ashland, Ky., Aug. 15, 1923. 192

Mr. Cooke Means,

Ashland, Ky.

Kentucky-West Virginia Engineering & Electric Company

INCORPORATED

203 W. Greenup Ave.

Phone 925

ENGINEERING—CONSTRUCTION

ARMATURE and FIELD COILS REWOUND

Electric Supplies

Motors Repaired

Wiring, Fixtures, Appliances

Welding and Machine Work

Agents for Western Electric, A.C. and D.C. Motors

Terms Req. No. Order No. Our Order No.

1 Hrs. Labor on Washing Machine

\$1.10

Recd 8/17/23

F B Akers

9653
Telephone Chelsea 577F

New York, Sept 24 1923

Mrs E. C. Means

306 East Lexington Ave

To **ELLA MODE**, Dr. Ashland
HIGH CLASS PURCHASING 124

TERMS:
CASH WITH ORDER.

OF EVERYTHING PERTAINING TO THE HOUSEHOLD OR WARDROBE

Collection fees on out-of-town checks will be charged for,
you are therefore requested to remit on N. Y. Exchange.

171 ~~137~~ WEST 12th STREET

To Balance

To Office Charge

1 Combs Hair Wax

1 Tone to match

Inv P. P. Special

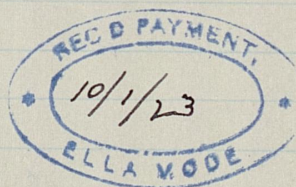
25

22.50

4.25

66

272.1



SHEET NO.

Sept 192 3

All accounts due the first of the month after date of purchase

Store Phone 227
Office Phone 500

Received Payment

OCT 4 1923

Order Hardware Co.

L E O.

No. D 76126

**Presbyterian Board of
Ministerial Relief and Sustentation**

510 WITHERSPOON BUILDING, PHILADELPHIA, PENNA.

Dear Friend:

October 20 19 23

We respectfully call your attention to the fact that, in accordance with the terms of your subscription of \$ 10.00 per year for five years, the first payment of \$ 10.00 will be due Nov. 1923

Kindly forward this notice with your remittance, and it will be receipted and returned to you.

Mrs. E. E. Means
306 E. Lexington
Ashland, Ky.

Church First

Presbytery Ebenezer

Relief Department, \$

Sustentation Department, \$ 10.00

Very truly yours,

W. W. Heberton

(W. W. HEBERTON) Treasurer.

RECEIVED PAYMENT
OCT 24 1923
W. W. HEBERTON, Treas.
Per *W.*



The Ashland Milling Co.,

FLOUR BRANDS:
KENTUCKY HOME,
JERSEY CREAM,
LIMESTONE.

INCORPORATED.
FLOUR, MEAL, FEED, GRAIN AND HAY.

MIXED CAR-LOADS A SPECIALTY.

ASHLAND, Ky. Dec. 22, 1923.

Mr. E. C. Means,
City.

Dear Mr. Means:

Your letter of the 21th offering to present to the Ashland Public Library the volumes of the American Institute of Mining Engineers is certainly appreciated. And the gift of these books and your check for \$100.00 to purchase the bookcases means more then you can imagine for it is certainly encouraging to know that this Association is in your heart and mind, especially at this time of the year.

This gift is greatly appreciated and if the check is made out to Miss Lou Poage and sent to Miss Sally Martin it will be officially received and acknowledged by the directors. We ask you to call at all times but especially when these books and bookcases are installed.

Let me again thank you.

Best wishes,

JOM:HC

PRES. ASHLAND PUBLIC LIBRARY

Jonathan

ASHLAND, BOYD COUNTY, KENTUCKY. 1854 - 1923

Population	1900	6000
Population	1910	8688
Population	1920	14729
Population—1916 Estimated	10000	
Population—1916 to 1923 by annexation	6400	
Population—1916 to 1923—1788 new homes	8000	
Population	1923	24400

Corporation Limits extended 1916-1917 and 1921.
Annexed Territory in 1916 added 400 population to city.
Annexed Territory in 1917 added 1,500 population to city.
Annexed Territory in 1921 added 4,500 population to city.

Annexed Territory in 6 yrs. added 6,400 population to city

Ashland built in 1919 216 homes. 1,269 of these new homes are supplied with gas
Ashland built in 1920 242 homes. by the Warfield Gas Co.
Ashland built in 1921 252 homes.
Ashland built in 1922 315 homes.
Ashland built in 1923 552 homes. 308 are not served by the Gas Company.

Ashland built in 5 years 1,577 homes 1,577

Number of lots in the City of Ashland prior to 1912, from Hilton Avenue north and 7th Street east to 35th Street, inclusive. Not including Vansant, Orchard Place and Means Subdivisions

Lots laid out prior to 1912 in Pollard, Oakview, Haney's Addition, etc., now in the city limits 1,723
680

NUMBER OF LOTS IN THE CITY LIMITS AND PLATS FILED FROM 1912 - 1923.

1. South Ashland	1912	518	33. McCown No. 3, Pollard	1923	6
2. Prospect	1913	160	34. Gartin No. 3, Ferguson	1923	255
3. Glendale Pollard	1913	129	35. Rosemount, Pollard	1923	44
4. Huggins & Sparks	1913	28	36. Means, W. Montgomery	1923	108
5. Henderson	1913	20	37. Woodland Ferry Farm	1923	65
6. Staab & Kelly	1913	28	38. Friel	1923	80
7. Osten Pollard	1914	63	39. Price Hill	1923	177
8. Rolling Green, Ferguson Farm	1915	121	40. Mount Adams, F. Shute	1923	64
9. Williams Addition, Normal	1915	33	41. Elam, South Ashland	1923	59
10. Henderson Add., Pollard	1915	8	42. Oak Grove	1923	125
11. Mount Adams	1916	351	43. Old Orchard	1923	268
12. Spring Hill	1916	36	44. Blackburn Dixon Farm	1923	151
13. East Oakview	1918	47	45. Pinehurst, Near "	1923	85
14. Pine Grove	1918	167	46. Gartrell No. 2	1923	250
15. Hyland Ferguson Farm	1918	75	47. Clyffeside Park	1923	250
16. Gartrell	1918	150	48. Justice Faulkner F.	1923	116
17. Batesville	1918	45	49. Mock Bros. & Fairchild	1923	40
18. H. R. Dysard	1919	12	50. Helfin, Keil Farm	1923	47
19. Midland Heights	1919	269	51. Nichols Place, Means	1923	56
20. McCown No. 2	1920	90	52. Murphy Springs	1923	45
21. Henderson No. 3	1920	12	53. Russell Roads	1923	57
22. Highland Mount Adams	1920	114	54. Ed. Roberts, Pollard	1923	40
23. Grayson Roads	1921	340	55. Murphy Hill, Pollard	1923	160
24. Prichard and Malin	1921	33	56. Payne's	1923	25
25. William Deal, E. Ashland	1921	167	57. W. R. Vansant, 29th St.	1923	68
26. Elkhorn Pollard	1922	35	58. Orchard Place	1923	51
27. Gartin Acre Add.	1922	20	59. Huddleson, Prospect	1923	58
28. Gartin No. 2	1922	105	60. A. J. Brown	1923	22
29. Moriarity, Pollard	1922	84	61. Tom Jones, Ferguson	1923	16
30. Lexington View	1922	177	62. Lynnwood, Pollard	1923	27
31. Forest Hills	1922	356	63. Circle View	1923	44
32. High Lawn, Keil Farm	1922	114			
			Total No. of Lots in City		9,170

NUMBER OF LOTS OUTSIDE THE CITY LIMITS 1912 - 1923.

1. O. F. L. Beckett, Fairview	1913	85	9. J. W. Montgomery	1923	61
2. Westwood, Fairview	1915	157	10. A. R. M. Co.	1923	50
3. West Fairview, Fairview	1918	114	11. Bellefonte Country Club	1923	154
4. McCown No. 1, Fairview	1920	36			
5. A. Heneman, Fairview	1923	37	Total number outside city		1,120
6. Fairview	1922	68	Total number in city		9,170
7. Westwood, Fairview	1922	123			
8. Millseat	1923	235	Grand total of all lots		10,290

Number of homes built in the above territory, approximately 4,916
Less homes built on lots on which there is already a home 500

Total number of lots used for homes purposes 4,416
Number of vacant lots in the above territory 5,874

TOTAL NUMBER OF NEW LOTS ON MARKET EACH YEAR FROM 1912 - 1923.

1912	518 Lots	1919	281 Lots
1913	365 Lots	1920	216 Lots
1914	64 Lots	1921	540 Lots
1915	162 Lots	1922	891 Lots
1916	387 Lots	1923	2,859 Lots
1918	484 Lots		

Lots used for schools, depot, manufacturing plants and lumber yards and business houses do not appear in the above figures.

The three building and loan associations of Ashland, in the last eight years, have loaned to its members in the city enough money to build 855 homes of an average cost of \$5,000 each.

The Home and Building Loan Association in the last eight years, loaned to its members \$3,879,290. and paid to its members dividends of \$739,700. The West Virginia Mortgage and Discount Co., The Southern Trust Co., and The Bankers Mortgage and Finance Co., in 1923, loaned in Ashland \$571,000. The above companies and Building and Loan Associations from the reports of their agents will loan in Ashland during the year 1924 approximately \$2,400,000.

There are within the Corporation limits of Ashland approximately 10 square miles of territory.

Ashland has completed 35 miles of paved streets and 5 miles of paved allies, with 2.7 miles of paving under contract.

Ashland has spent to date for paving its streets \$1,789,592.95
Ashland collected taxes on property valuation in 1918 of \$10,554,185.00
Ashland collected taxes on property valuation in 1920 of 13,172,732.00
Ashland collected taxes on property valuation in 1923 of 20,288,322.00

The above data was secured by R. A. Elam, Real Estate, for the Kiwanis Club, of Ashland, Kentucky.