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RECOMMENDATIONS OF JOINT COMMITTEE ON RURAL SANITATION—RURAL SEWAGE DISPOSAL

December 1942

Federal and State agencies represented on the Joint Committee

United States Department of Agriculture:
- Bureau of Agricultural Chemistry and Engineering.
- Extension Service.
- Farm Security Administration.
- Forest Service.
- Rural Electrification Administration.
- Soil Conservation Service.

Conference of State Sanitary Engineers.
Federal Housing Administration.
Federal Security Agency:
- Office of Education.
- United States Public Health Service.

Tennessee Valley Authority.

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FOREWORD

In June 1941, at the suggestion of various Government agencies interested in proper disposal of sewage and development of safe water supplies in rural areas, the Public Health Service held a meeting to consider appointment of a joint committee to study the problems involved and develop a set of uniform recommendations to be followed by the agencies concerned. At this meeting, held on June 17, 1941, the Joint Committee on Rural Sanitation was formed consisting of the following representatives: [1]

U. S. Department of Agriculture:
- Bureau of Agricultural Chemistry and Engineering:
  - S. H. McCrory, Assistant Chief.
- Extension Service:
  - S. P. Lyle, in Charge of Agricultural and Home Economics Section.
- Farm Security Administration:
  - D. W. Evans,[2] Senior Sanitary Engineer.
  - J. P. Slater,[3] Sanitary Engineer.
  - I. F. Shull,[4] Senior Sanitary Engineer.
- Forest Service:
  - Clifford A. Betts, Engineer.
- Rural Electrification Administration:
  - Harry Slattery, Administrator.
  - F. J. Sette,[5] Deputy Administrator.
  - J. R. Cobb,[6] Installations Loan Section.
  - C. G. Kilbourne,[7] Senior Engineer, Washington, D. C., Liaison Office.
- Soil Conservation Service:
  - Hugh R. McCall, Construction Engineer.

Conference of State Sanitary Engineers:
- H. N. Old, Senior Sanitary Engineer, Secretary of Conference.

Federal Housing Administration:
- John B. Thomas, Sanitary Engineer.

Federal Security Agency:
- Office of Education:
  - Miss Alice Barrows, Specialist in School Buildings.
  - W. Gaumitz,[8] Senior Specialist in Rural Education Problems.
- Public Health Service:
  - J. K. Hoskins, Senior Sanitary Engineer.
  - F. E. DeMartini, Passed Assistant Sanitary Engineer.

Tennessee Valley Authority:
- W. G. Stromquist, Principal Sanitary Engineer.

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[1] Titles as of date of appointment to Committee.
[2] Committee member until April 1942.
[3] Committee member until September 1941.
[4] Replaced D. W. Evans in April 1942.
[5] Committee member until February 20, 1942.
[6] Replaced F. J. Sette on February 20, 1942.
[7] Replaced J. R. Cobb in May 1942.
[8] Replaced Miss Alice Barrows on September 9, 1942.

The following subcommittees and officers were appointed at the meeting of June 17, 1941:

Policy and Program—F. J. Sette, chairman.
Research—S. H. McCrory, chairman.
Rural Sewage Disposal Involving Water Carriage—J. B. Thomas, chairman.
Rural Sewage Disposal Without Water Carriage—D. W. Evans, chairman.
Chairman of Joint Committee—J. K. Hoskins.
Secretary of Joint Committee—F. E. DeMartini.

A number of meetings of the Joint Committee and subcommittees were held in 1941 and 1942 in the development of the recommendations here proposed, in the first report of the Joint Committee, for rural sewage disposal.

The recommendations of the Committee are presented primarily to serve as a guide of satisfactory practice in this field for the governmental agencies represented in their development. In addition it is hoped that State and local health authorities, school boards, recreational agencies, and others interested in disposal of sewage in rural areas will make use of these principles and recommendations in the preparation of their detailed bulletins or codes on this subject.

The Committee believes it desirable to issue these recommendations with the proposal that revision of the material be made from time to time over a period of years on the basis of comments that may be received from interested agencies and of further developments in this field. It is hoped that by following this procedure a generally accepted manual may be developed which will be helpful in attaining uniformity and improvement in the field of rural sewage disposal.

INTRODUCTION

Of all factors influencing the health of individuals in rural and urban areas where public sewers are not available, no single item is of greater importance than the proper disposal of human excreta. Many diseases such as typhoid fever, dysentery, and various types of diarrhea are transmitted from one person to another through the fecal contamination of food and water, largely due to the improper disposal of human wastes. For this reason, every effort should be made to prevent such hazards and to dispose of all human excreta so that no opportunity will exist for fecal contamination of water or food.

Safe disposal of all human and domestic wastes is necessary to protect the health of the individual family and the community and to prevent the occurrence of nuisances. To accomplish satisfactory results, such wastes must be disposed of so that:

1. They will not contaminate any drinking water supply.
2. They will not give rise to a public health hazard by being accessible to insects, rodents, or other possible carriers which may come in contact with food or drinking water.
3. They will not give rise to a nuisance due to odor or unsightly appearance.
4. They will not pollute or contaminate the waters of any bathing beach, shellfish breeding ground, or stream used for public or domestic water supply purposes, or for recreational purposes.
5. They will not violate laws or regulations governing water pollution or sewage disposal.

The Committee has studied the various devices used for disposal of sewage in rural areas and presents its recommendations under the headings of water carriage and nonwater carriage methods. Under the first heading are included: The septic tank, subsurface disposal field, seepage pit, dry well, and cesspool. Under the second heading are: The earth pit privy, masonry vault privy, chemical toilet, pail or can type privy, and cremating latrine or incinerator privy.

Adequate inspection of all features of rural sewage disposal works discussed in these recommendations is presupposed. Plumbing, tile lines, septic tanks, etc., which are to be covered or buried underground, should of course be inspected before being covered so that corrections can be made if necessary.

War emergency.—These recommendations have been prepared to indicate the Committee's views on satisfactory practice. Reference has necessarily been made in various places to materials that should be used or those that are preferable. It is realized, however, that during the war emergency some of the materials specified may not be obtainable. Use of substitutes will therefore be necessary in such instances in accord with the program of conservation of critical materials for the direct war effort.

PART I

Water Carriage Sewage Disposal Methods

A water carriage system is a system of piping through which all sewage and domestic liquid wastes are conveyed by the flow of water from the point of origin in a place of human habitation to the point of disposal.

The most satisfactory and convenient method of disposing of sanitary wastes where running water is available is by a water carriage system. While this type of system allows an easy carriage of the wastes from the dwelling, the problem of final disposal is complicated by the large increase in bulk caused by the addition of water.

Experience has shown that the most efficient installation for the disposal of sewage from individual dwellings and public buildings located in rural areas where a public sewerage system cannot be made available is an adequate sized septic tank with properly designed field system for the disposal of the effluent. However, no individual design is applicable for universal adoption due to varying local conditions and types of soil encountered. Where only very restricted yard or lot areas are available, other complications often develop and in many instances seepage pits or a combination of subsurface disposal fields and seepage pits, or even cesspools with seepage pits, for effluent disposal must be designed to meet the conditions encountered. Tight clay soils also offer many perplexing problems regarding the safe and satisfactory disposal of the effluent from the various types of systems considered. These problems often become serious where a number of dwellings are contemplated on adjoining lots and where individual disposals are proposed for subdivision developments.

Where individual systems are proposed in subdivision areas which may eventually become congested areas, special care must be taken to assure the construction of the most satisfactory installation, bearing in mind the conditions which will exist when such areas are completely developed. Soil conditions must be carefully checked by percolation tests to determine the porosity of the soil. In all cases the systems must be designed in accordance with definite recommendations in order to prevent the development of saturated soil conditions which may eventually result in public health hazards.

The design of any individual sewage disposal system must take into consideration location with respect to wells or other sources of water supply, topography, soil conditions, area available, and maximum living capacity of the building served. Where soils are impervious and suitable unobstructed yard area is limited, consideration must be given to the construction of a public or community sewerage system rather than proceeding with the installation of individual systems which may prove unsatisfactory and become insanitary within a short period of time.

Individual septic tank systems should be considered a temporary means of sewage disposal when installed in subdivisions or large developments which are destined to become congested communities. In planning such developments consideration should be given to extension of and connection to a municipal sanitary sewerage system or to the installation of an approved type of community system and treatment plant.

PLUMBING SYSTEM

The plumbing system is a system of pipes including the water service line and building drainage lines from their several connections within the building to their connections with the public mains or individual water supply and sewage disposal systems, together with fixtures, traps, vents, and other devices connected thereto. Storm water drainage pipes may be considered a part of the plumbing system when connected to a public sewer system.

Building drain.—The building (house) drain is that part of the lowest horizontal piping of a building drainage system which receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building (house) sewer, which begins at a point approximately 5 feet outside the inner face of the building wall.

Good plumbing is essential to the proper functioning of the drainage system of any building or individual dwelling. Unless all fixtures are properly installed and connected, the sewage will not be carried from the building in a safe and sanitary manner. All fixtures must be properly trapped and vented to prevent odors from being discharged into the rooms of the building. Ground water, any foundation drainage, or rain water from roofs and areaways should not be discharged into the plumbing system, especially where the building is to be served by an individual sewage disposal system.

There should be no interconnections between the water distribution system and the drainage system regardless of how constructed or controlled and all plumbing installations should be made in such a manner as to prevent back flow. The Plumbing Manual, Report B. M. S. 66 of the National Bureau of Standards, United States Department of Commerce, is the recommended standard for plumbing installations. In the interest of conservation of metals, it is recommended that during the emergency period the following standards be used as the plumbing guide: "Emergency Plumbing Standards for Defense Housing" (issued by the Division of Defense Housing Coordination, Office for Emergency Management), which is fundamentally in accord with Report B. M. S. 66.

GREASE INTERCEPTOR

A grease interceptor is a device in which the grease present in sewage is intercepted, congealed by cooling, and from which it may be skimmed from the surface of the liquid waste for disposal.

Function.—Grease interceptors are considered unnecessary on individual sewage disposal systems unless excessive amounts of grease are used within the building served. Some State departments of health require the installation of grease interceptors on individual systems serving dwellings, but this is not believed to be necessary as the ordinary kitchen wastes do not in most cases contain sufficient grease to justify such installations. Where large kitchens exist in public buildings such as lodge buildings, recreational centers, or restaurants, grease interceptors may be installed to prevent excessive accumulation of grease in the septic tank which may affect efficient operation.

Unless grease interceptors are properly located and inspected at intervals not exceeding 30 days, their purpose cannot be fully realized and they often become a nuisance. It is the consensus among sanitary engineers today that grease interceptors on sewage disposal systems serving individual dwellings need not be provided if a properly designed septic tank is installed having adequate capacity for sludge storage and accumulation of scum.

Location.—Grease interceptors, when used, should be placed at an accessible location for cleaning. Where efficient and regular cleaning is questionable it is desirable to install large interceptors and locate them outside the building adjacent to the building drain. Wherever such grease interceptors are constructed, care must be exercised to have the inlet and outlet properly trapped.

Design.—The design and capacity of grease interceptors will depend upon the type of building and the number of persons served. For a single family dwelling the interceptor capacity should be about 30 gallons. In instances where a variable load is encountered or only a daytime load is to be served allowances should be made accordingly.

The interceptors may be constructed of metal, brick, vitrified or concrete pipe, or concrete, and should be of sufficient depth to permit proper trapping of outlet to assure the retention of all grease. The

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inlet and outlet should be placed as far apart as possible and the depth below the outlet flow line should be not less than 2 feet.

BUILDING SEWER

The building sewer is that part of the horizontal piping of a building drainage system extending from a point 5 feet outside the inner face of the foundation wall to the public sewer connection or individual sewage disposal unit (septic tank, cesspool, or other type of disposal).

The building sewer should be constructed of bell and spigot cast-iron pipe, vitrified clay, concrete, or other approved sewer pipe. Portland cement mortar or an approved bituminous compound should be used for all joints on pipe lines other than cast iron; lead or other approved joint material should be used on all cast-iron pipe lines. It is desirable in cases where the septic tank or primary unit of the disposal system is located within 25 feet of the building or dwelling to construct the building sewer of extra heavy cast-iron pipe throughout its entire length because cast-iron lines are less susceptible to clogging and easier to clean. Vitrified clay or concrete pipe should not be used in sizes less than 6 inches. When cast-iron pipe is used in the building sewer it may be the same diameter as that of the building drain, provided that it is not less than 4 inches in diameter. Whenever the building sewer is a different size than the building drain the connection therewith should be made with the proper type increasing fittings, assuring a watertight joint and satisfactory construction.

All joints on the building sewer should be made by using a ring of oakum (jute) and approved joint material to provide water tightness. Whenever the building sewer line is laid within 15 feet of large trees or dense shrubbery and constructed of material other than cast-iron pipe with lead-caulked joints the joints should be made with a bituminous compound or other root-proofing material. Special copper rings may be used with cement mortar or the cement mortar treated with copper sulfate or coarse salt to prevent roots penetrating the joints and entering the pipe line, eventually clogging the sewer.

The most essential features to be observed in construction of the building sewer line are listed as follows:

1. Minimum size of pipe:

   6 inches if sewer is of vitrified clay or concrete, 4 inches if sewer is of cast iron.

2. Minimum grade—1 percent (1 foot fall per 100 feet or ⅛ inch per foot). However a fall of ¼ inch per foot is preferable and should be provided wherever feasible.

3. Grade of building sewer for 10 feet immediately preceding the tank should not exceed 2 percent.

4. Cast-iron pipe with lead or other approved joint material used when within:

50 feet of a well or suction line from a well.
10 feet of any drinking water supply line under pressure.
5 feet of basement foundations, and when laid beneath driveways with less than 3 feet of earth cover.

5. Cleanout at every change in line in excess of 45° and at every change in grade in excess of 22½°. (Cleanouts are desirable within 5 feet of the septic tank where tanks are located more than 20 feet from the building. An economical cleanout may be provided by inserting a tee in the line with the vertical leg extending to ground level and plugged with a brass cap. If the line is deeper than 4 feet, manhole construction would be required for cleanout purposes.)

6. All joints made watertight and protected from damage by roots wherever necessary.

SEPTIC TANK

A septic tank is a sewage settling tank intended to retain the solids in immediate contact with the sewage flowing through the tank, for a sufficient period to secure satisfactory decomposition of settled solids by bacterial action.

Function.—The septic tank in conjunction with a subsurface disposal field is considered by the majority of engineers today to be the most satisfactory method of disposing of sewage from small installations, especially individual dwellings and isolated rural buildings where public sewers are not available. Contrary to general belief septic tanks should not be depended upon to remove disease-producing bacteria from sewage. The septic tank serves the purpose of separating the solids from the liquid, permitting the liquid to be more easily disposed of by filtration into the soil and the solid matter to be handled in the form of sludge. The fact that solids are retained in the tank requires that a tank of adequate size be provided in all cases, considering the maintenance the system may receive. Periodic maintenance must be provided to assure inspection and the removal of accumulated sludge at regular intervals if a reasonable length of service is to be expected.

Location.—The septic tank should be located where surface drainage from the site is away from all sources of water supply. The elevation of the tank should be such as to permit sufficient fall in the house sewer lines (minimum ⅛ inch per foot) and proper grading of all lateral lines in the disposal field, allowing all field lines to be constructed without excessive cover. The location should permit easy access for inspection and cleaning. Low swampy areas or areas which may be subject to flooding should be avoided.

Septic tanks constructed of material not subject to excessive corrosion or decay need not be restricted to any minimum distance from the building foundation. The tank site should be chosen so as to make the largest possible area available for the disposal field. A safe distance (such "safe distance" to be dependent upon the numerous local factors involved—preferably separation of at least 50 feet) should be maintained between this site and any sources of water supply. Caution should be taken to provide that surface drainage from the area around the tank site will not reach the vicinity of the water supply. The tank should be at a lower elevation than the source of water supply.

Where buildings have no basement fixtures or are constructed without basements the building drain should be held to an elevation which will permit the tank to be installed without excessive cover. Proposed finish grades about the building should also be checked in order that the tank will not be buried more than 12 to 18 inches. In cold climates the tank may be placed at a greater depth to prevent freezing if topography permits. Where additional earth cover is unavoidable the manholes on the tank should be extended to the ground surface.

Design features.—The size of the septic tank should be based on the average daily flow of sewage into it with a retention period of approximately 24 hours with due consideration to sludge storage. The minimum liquid capacity for any tank serving a dwelling should be 500 gallons and this capacity should be increased for dwellings having more than two bedrooms. Where tanks are used having more than one compartment the inlet compartment should always have a liquid capacity of at least 500 gallons. It should be realized that the capacity of a septic tank is reduced approximately 20 gallons per person per year by the accumulation of sludge. All tanks should be designed to allow the sewage to enter at one end, permit a slow uniform horizontal flow through the tank and discharge of settled sewage at the other end with the least possible disturbance of the tank contents. Tanks should be designed with a length not less than twice the width and with a minimum liquid depth of 4 feet. The liquid capacities of septic tanks should conform with tables 1 or 2. The tank capacities given in tables 1 and 2 are based on a sewage contribution of:

50 gallons per capita daily in dwellings.
25 gallons per capita daily in camps.
17 gallons per capita daily in day schools.

The liquid capacities in table 1 provide enough space for 2 years' accumulation of sludge and an additional volume equal to the sewage flow for 24 hours. However, the minimum size tank permitted is 500 gallons.

TABLE 1.—*Required capacities for septic tanks serving individual dwellings*

Number of bedrooms	Maximum number of persons served	Nominal liquid capacity of tank in gallons	Recommended dimensions				
			Width	Length	Liquid depth	Total depth	Total capacity in cubic feet
			Ft. In.	*Ft. In.*	*Ft. In.*	*Ft. In.*	
2 or less	4	500	3 0	6 0	4 0	5 0	90
3	6	600	3 0	7 0	4 0	5 0	105
4	8	750	3 6	7 6	4 0	5 0	130
5	10	900	3 6	8 6	4 0	5 0	150
6	12	1,100	4 0	8 6	4 6	5 6	190
7	14	1,200	4 0	9 0	4 6	5 6	200
8	16	1,500	4 6	10 0	4 6	5 6	250

NOTE.—Liquid capacity based on number of bedrooms in dwelling. Total volume in cubic feet includes air space above liquid level. Where two-compartment tanks are used the inlet compartment should have a liquid capacity of not less than 500 gallons.

The liquid capacities in table 2 are equal to a 24-hour sewage flow without allowance for sludge storage. The omission of allowance for sludge storage is due to the necessity that the best of care and maintenance be given septic tanks serving schools and camps, including cleaning at least annually, and to the lower per capita solids load in such tanks in comparison with those serving individual dwellings.

TABLE 2.—*Required capacities for septic tanks serving camps and day schools*

Maximum number of persons served		Nominal liquid capacity of tank in gallons	Recommended dimensions				
Camps	Day schools		Width	Length	Liquid depth	Total depth	Total capacity in cubic feet
			Ft. In.	*Ft. In.*	*Ft. In.*	*Ft. In.*	
40	60	1,000	4 0	8 6	4 0	5 0	170
80	120	2,000	5 0	11 0	5 0	6 3	345
120	180	3,000	6 0	13 6	5 0	6 3	505
160	240	4,000	6 0	18 0	5 0	6 3	675
200	300	5,000	7 6	18 0	5 0	6 6	880
240	360	6,000	8 0	20 0	5 0	6 6	1,040
280	420	7,000	8 6	20 0	5 6	7 0	1,190
320	480	8,000	8 6	23 0	5 6	7 0	1,370

NOTE.—Total volume in cubic feet includes air space above liquid level. Tanks with capacities in excess of 8,000 gallons should be designed for the specific requirements involved; however, in such cases the necessity of a more complete type of treatment should receive consideration.

Experience seems to indicate little need for a multiplicity of partitions, baffle walls, or connecting pipes from various chambers. Such construction adds to cost and often reduces the efficiency of the tank by decreasing sludge storage capacity in the inlet compartment and increasing the velocity of flow through the tank which interferes with sedimentation. Small tanks used for individual residence installations have been found to operate most efficiently with single submerged inlet and outlet connections or single baffle walls at the inlet and outlet ends. Inlet baffles should extend 12 inches and outlet baffles 15 to 18 inches below the liquid level and they should project not less than 6 inches above the flow line. The submerged connections should be constructed with cast-iron pipe, using a sanitary tee and a short section of pipe to provide an inlet to proper depth. The cross-sectional area of the submerged inlet pipe should always be the same as that of the inlet sewer line. The outlet should be of similar construction. Where baffles are used in lieu of the submerged inlet and outlet they may be of concrete or wood construction, but should be placed approximately 12 inches from the inlet and outlet ends of the tank. The invert of the inlet should be at an elevation 3 inches above the invert of the outlet.

The septic tank cover or slab should be designed for a dead load of not less than 150 pounds per square foot. When constructed of concrete the slab should be reinforced and at least 4 inches thick. The tank slab should provide a watertight cover for the tank and where constructed in one piece or monolithically with the tank should have at least one manhole. Sectional slab covers may also be used but this type of cover may prove unsatisfactory as difficulty is encountered in obtaining a watertight seal if the cover is once removed for maintenance permitting surface drainage or ground water to seep into the system. All large tanks should have two manholes when provided with a solid slab cover. When only one manhole is provided it should be located above the inlet; where two manholes are provided they should be placed over the inlet and outlet of the tank and each manhole should be at least 20 inches square. Circular manhole openings, when provided, should be at least 24 inches in diameter. Properly designed covers which can be sealed watertight should be provided for all manhole openings.

A sludge drain may be provided in the septic tank whenever the installation is in a rural area and located where it may be possible to drain the tank on adjacent land rather than cleaning by pumping. Either a plug or valve may be used on the sludge drain.

Dosing chamber with automatic siphon.—Dosing chambers with automatic siphons are not generally recommended on septic tank installations serving individual dwellings. Periodical dosing of the disposal field is desirable in most instances but the additional cost of automatic siphons is not considered justifiable on the small dwelling installations. Siphons should be provided on large septic tank installations (1,000 gallons and above), especially those using sand filter trenches or open sand filter beds for the disposal of effluent and for installations serving schools and camps. Whenever a siphon is installed the liquid capacity of the dosing chamber should be sufficient to fill all field lines from ½ to ¾ full at each discharge, but discharges should not occur more frequently than at 2- to 3-hour intervals.

Operation and maintenance.—Maintenance of any septic tank will depend largely on the daily flow of sewage and the number of persons served. With ordinary use and care, cleaning of the average septic tank should be necessary only every two to three years provided the tank has been properly designed with adequate sludge storage space. However, the tank should be inspected every 12 to 18 months, and the depth of accumulated sludge checked. When the scum accumulations and the sludge deposits reach a combined depth of 18 to 20 inches the tank should be cleaned. Sludge should be removed in the spring rather than in the fall to avoid loading the tank with undigested solids during the cold weather months. The sludge may contain disease-bearing bacteria, hence the disposal of sludge should be accomplished by burial or other methods satisfactory to the State health department. Excessive amounts of foreign substances should not be permitted to enter the tank. By proper construction of the tank and all connecting lines, rain water, surface drainage, and foundation drainage should be prevented from entering the tank.

It is recommended in all individual dwelling installations that a chart be provided and placed at a suitable location in the dwelling showing the location of the tank and the field system. This chart should also contain brief instructions as to the inspection and maintenance required. Such a chart should assist in acquainting home owners of the necessary maintenance septic tanks require and forestall many of the failures by assuring satisfactory operation.

FIELD DISTRIBUTING BOX

A distributing box is a box or chamber into which the septic tank effluent discharges and from which the sewage enters the subsurface absorption lines, permitting regulation of flow into these lines and inspection of the quality of the septic tank effluent.

Function.—For the efficient operation of a disposal field, drain tile should be fed through a distributing box which permits regulation and equalization of flow in all lines. A distribution box also serves the purpose of an inspection manhole for checking the quality of effluent.

Location.—The distributing box should be connected to the septic tank by a short tight sewer line and located at the upper end of the distribution field (subsurface disposal field).

Design.—The inlet pipe should enter at one end of the box about 2 inches above the bottom. Sides of the box should extend to within

6 inches of the surface and the box should be provided with a removable cover. Drain lines should be constructed with inverts at bottom level of the box and all set at the same elevation. They should take off straight in the desired direction. Horizontal bends should be avoided where possible, but when necessary they should be made with tight joints. When set at the same elevation and operating under the same head, all pipes of the same size are more likely to receive an equal quantity of flow.

The size of the box need not be more than 18 inches in width, nor longer than is necessary to accommodate drains for effective outlet capacity. Diversion baffle boards should not be installed in distribution boxes on systems serving individual dwellings. However, such construction may prove advisable on systems serving public buildings where constant supervision and maintenance is provided and where the purpose of such baffle boards may be realized. Drains may be shut off at will for repairs or to rest the field when it becomes waterlogged, provided a distribution box is installed. Flow diversion devices may be installed in the distribution box to facilitate rotation of use of the distribution lines where adequate and proper maintenance is assured.

SUBSURFACE DISPOSAL FIELD

A subsurface disposal system is an open-jointed system of pipes or drains through which sewage effluent is distributed beneath the surface of the ground for absorption into the soil.

Function.—Every disposal system should be designed to dispose adequately of all liquid waste discharged into it. This will be controlled chiefly by the actual soil absorption and evaporation. Where the surface stratum is definitely impervious, a modified design of the system should be considered, using seepage pits or sand filter trenches in order to secure adequate effective absorption area and provide for the discharge of effluent without causing a health hazard or nuisance. Sand filter trenches should be used only in cases of unusual soil conditions and then the installation should be approved by the State department of health.

Location.—Disposal fields should be at least 100 feet from any water supply well, 25 feet from any stream, and 10 feet from dwellings or property lines. A minimum distance of 50 feet from drilled wells is permissible when the casing extends watertight to a depth of 50 feet or more.

Details pertaining to water wells such as depth, type of construction, vertical zone of pollution, etc., together with the geological formations and porosity of subsoil strata must be considered in determining the safe allowable distance between wells and disposal fields.

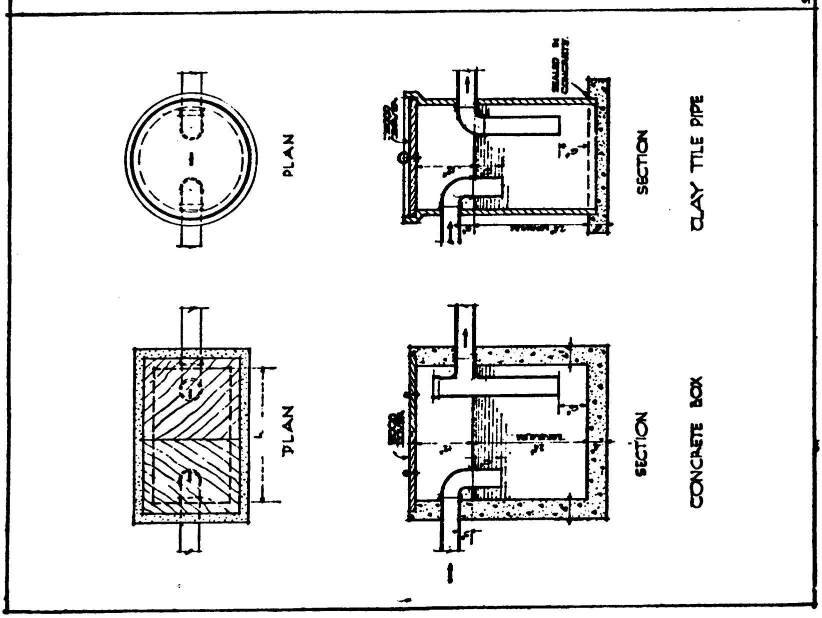

FIGURE 1.—Grease interceptors.

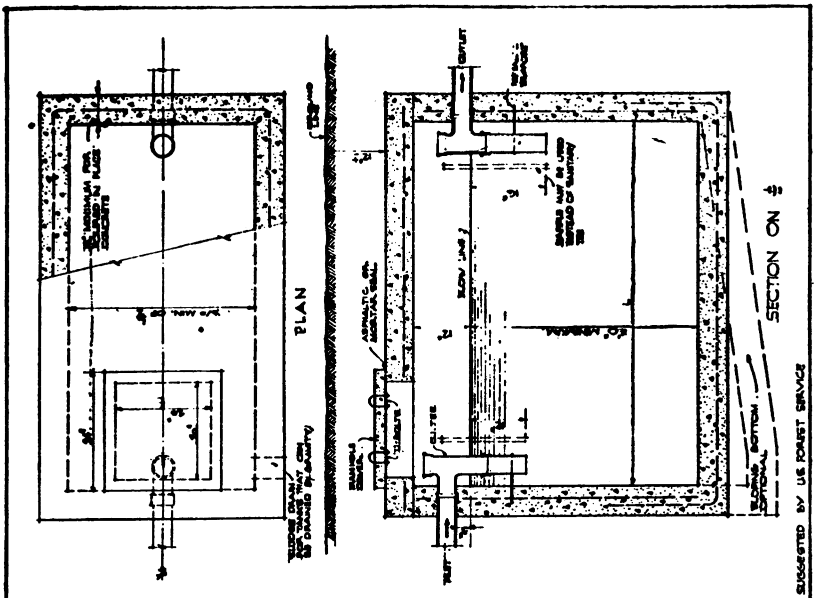

FIGURE 2.—Single chamber septic tank.

Design features of disposal field.—A distribution box is considered essential in every field system and at least two lateral lines should be constructed from every distribution box and when necessary sufficient additional laterals should be installed to provide the required trench area. The installation of the distribution box will provide means whereby the design of the system can be varied to meet most topographical conditions encountered. Such design will permit proper grade and alignment for all laterals.

The disposal field should be designed to provide proper distribution of the effluent throughout the field. By proper design of the field system trouble from overloading of single lines, with resultant bleeding of effluent to the ground surface, may be avoided.

Accepted practice in the design of disposal field systems has been to base all calculations on footage of tile per person served, using a general classification of the soils encountered. It is doubtful whether this method achieves the desired results. Since the actual absorptive quality of the soil and the flat area made available in the bottom of the trenches are the controlling factors, it appears more practical to base the design on these factors and on the maximum living capacity of the dwelling or building served.

The porosity of the soil should be determined by percolation tests; however, where such tests are impractical the experience data available from the health authority having jurisdiction may be sufficient. With dwelling installations all calculations should be based on a daily flow of 100 gallons of sewage per bedroom. In cases involving public buildings or recreational buildings having a daytime usage only, the daily load should be based on the estimated average usage. Actual experience will govern a safe estimate of usages in this case as it may vary from 30 to 60 gallons per person per day. This information, with data in table 3, should provide sufficient data for determining the absorption area (flat area in the bottom of the trench) necessary in the disposal system laterals.

Tile, 4 inches in diameter, is recommended as most desirable for the field laterals. Bell and spigot vitrified clay pipe has been found practical for use in the field laterals when constructed in unprotected rural areas subject to traffic and is preferable where the additional expense can be met. Although this pipe is more expensive than agricultural drain tile, its use may often prove advantageous as this pipe is not easily crushed and the bells provide better means for maintaining a true line and grade. Bell and spigot pipe should be used only in 2-foot lengths and should be laid with ½-inch open joints constructed with sufficient cement mortar at the bottom of the joint to assure an even flow line.

Open joints of ¼ inch to ½ inch should be provided between agricultural tile sections, and the upper half of the joint should be covered with a strip of asphalt-treated paper. The paper strips should be large enough to be readily held in place while the tile is being covered. Covering of the joints on the bell and spigot pipe is not necessary, as the bell surface provides sufficient cover for the open joint.

All lines in the field should be separated by at least three times the width of the trenches with a minimum spacing of 6 feet. A greater spacing is desirable where available area permits. It is desirable that all laterals be of equal length to provide even distribution of the effluent. Under no condition should a field with less than 150 square feet of effective absorption area (100 linear feet of 18-inch trench) be provided for any individual dwelling unit. Maximum length of the lines should not exceed 100 feet and at least two lines of tile should be provided.

The grade of the field lateral lines may vary from 2 inches to 4 inches per 100 feet, but should never exceed 6 inches per 100 feet (.5 percent grade). It is desirable to have the tile lines within 18 inches of the finished grade but in many instances, due to topography, the depth of cover must be varied in order to maintain an even grade. The total depth of the lateral trenches should average not more than 36 inches. Where it may be necessary to construct a large percentage of the field lines with cover in excess of 30 inches other designs using seepage pits should be considered.

Method of making percolation test.—1. Excavate a hole 1 foot square and to the depth of the proposed disposal trenches. This depth in most instances will be approximately 24 inches and should not exceed 36 inches.

2. Fill the hole with water to a depth of at least 6 inches, and allow this water to seep away. Judgment is required in determining how soil conditions at time of test vary from year-round average conditions. Where soil appears exceptionally dry, or where soil conditions are questionable, greater depths of water may be used or the test may be repeated. In no case shall tests be made in filled or frozen ground. Where fissured soil formations are encountered, tests should be made only as directed by and under the supervision of a representative of the State health department.

3. Observe the time in minutes required for the water to seep away completely. This time divided by the total number of inches of water placed in the hole gives the average time required for the water to drop 1 inch. With this information, the effective absorption area required for each individual system may be determined from table 3.

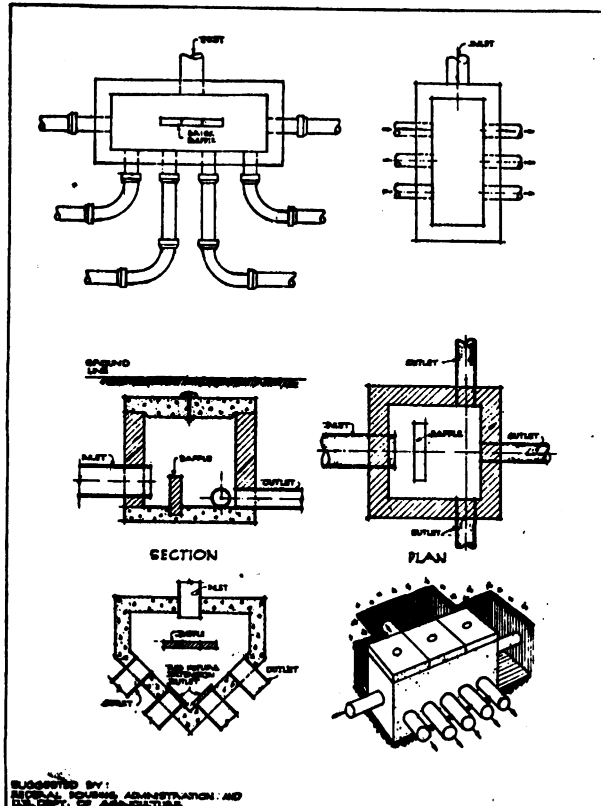

FIGURE 3.—Distribution boxes.

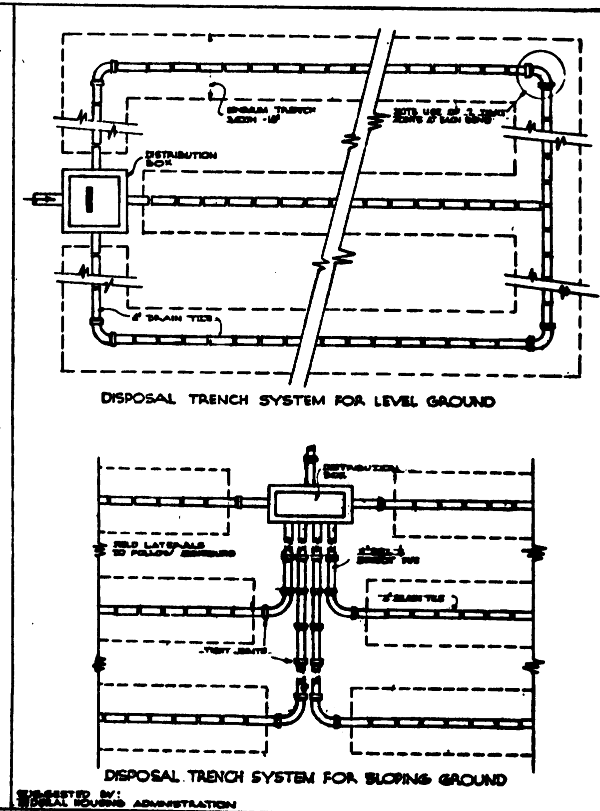

FIGURE 4.—Subsurface disposal fields.

TABLE 3.—*Data for determining field requirements from percolation tests*

Time required for water to fall 1 inch (in minutes)	Effective absorption area required in bottom of disposal trenches in square feet		
	Residences (per bedroom)	Camps (per person)	Schools (per person)
2 or less	52	13	9
3	60	15	10
4	72	18	12
5	80	20	13
10	105	24	18
15	126	32	21
30	180	45	30
60	240	60	40
Over 60	Special design using seepage pits or sand filter trenches.		

NOTE.—A minimum of 150 square feet should be provided for each individual family dwelling unit.

DISPOSAL TRENCH CONSTRUCTION

Improper trench design and construction is in many instances the cause of the failure of the disposal system. Disposal trenches should be designed on the basis of the required effective percolation area. More direct attention should be given to the trench excavation and the specified width obtained at the bottom of the trench which is the area available for absorption.

The depth of the filter material beneath the tile may be varied, depending on the width and depth of the trenches; the filter material should be placed over the full width of the trench and should be not less than 6 inches deep beneath the bottom of the tile. Table 4 gives data on trench design and spacing for various conditions, together with requirements for general design. Agricultural drain tile should be laid on a grade board to assure proper grading. Grade boards are not necessary where bell and spigot pipe is used. Sufficient filter material should be placed around and over it to hold it in place and completely cover the tile to a depth of 2 inches.

TABLE 4.—*Size and minimum spacing requirements for disposal trenches*

Width of trench at bottom in inches	Depth of trench in inches	Effective absorption area in square feet per linear foot	Spacing of tile lines in feet [1]
18	18 to 30	1.5	6.0
24	18 to 30	2.0	6.0
30	18 to 36	2.5	7.5
36	24 to 36	3.0	9.0

[1] A greater spacing is desirable where available area permits.

The filter material may be washed gravel, crushed shell or stone, slag, rock spalls, or clean run of bank gravel. Such material may range in size from ¾ inch to 2½ inches. Cinder may be used if sufficient coarse material is available. Where fine material must be used sufficient coarse material should be provided to protect the joints and prevent the fine material from being carried into the tile lines. Coarse material of uniform size larger than 2½ inches may be used at the bottom of the trenches.

A piece of untreated building paper or a 2-inch layer of straw should be placed over the filter material of all disposal trenches as the laying of the tile is completed, and before any earth backfill is placed. This will protect the filter material until the backfill settles. Where sloping areas are used for the disposal field it is desirable to construct an earth berm around the upper section of the field to divert surface drainage.

Sand filter trenches.—In tight, impervious soils sand filter trenches offer a means of disposal for septic tank effluent, provided a satisfactory and approved disposal point is available to receive the filter effluent. The sand filter trench is constructed by laying two lines of tile, one below the other, in a trench or series of trenches with an artificial filtering medium between the upper and lower lines of tile. A good filtering medium is coarse sand or coarse sand with not more than 10 to 15 percent of pea gravel. The septic tank effluent is distributed by the upper line of tile and filters through the sand. It is collected in the lower line of tile from which it may be discharged into a seepage pit or to an approved disposal point. When effluent is to be discharged into open ditches or water courses, approval of the State health department should be obtained. Figure 5 illustrates the details of construction for sand filter trenches.

SEEPAGE PIT

A seepage pit is a covered pit with open-jointed lining through which septic tank effluent or laundry wastes may seep or leach into the surrounding porous soil.

Function.—The function of seepage pits is primarily to facilitate the disposal of liquid wastes making them supplemental (or in some cases alternative) to tile drains, which are laid in specially constructed trenches, for the handling of effluent from a septic tank or laundry wastes.

Location.—Seepage pits, when used as supplemental to a subsurface tile field, should be located at minimum distances of 100 feet from any source of water supply, 20 feet from buildings, and 10 feet from lot lines. They should also be located at least 20 feet from disposal fields unless they are a part of the field as at ends of tile lines, and at least three times their diameter from each other. Seepage pits should never be used where there is a likelihood of contaminating underground waters, nor where adequate subsurface tile disposal fields can be provided. When seepage pits are to be used in place of a subsurface tile field the same limitations with respect to location should apply as for cesspools, in addition to the above requirements.

Pit excavations should not extend into the ground water table. Where ground water is encountered, at least 2 feet of clean coarse sand and gravel (run-of-bank) should be placed in the bottom of the pit, raising the elevation of the bottom at least 2 feet above the maximum water table and providing a firm foundation for the lining.

Construction.—In the construction of a seepage pit provision of a hole 3 feet or more in diameter through at least 6 feet of porous soil is recommended. It should be lined with stone, brick, or concrete blocks laid up dry with open joints that are backed up with at least 3 inches of clean, coarse, bank run gravel to the elevation of the inlet. Above the inlet level the joints should be sealed with cement mortar.

It is customary to draw in the upper section of the lining, thereby reducing the size of the cover required over the top. A reinforced concrete slab should be provided on all pits and should be located 1 to 2 feet below the surface or finished grade. Where slab covers in excess of 30 inches square must be constructed there should be a manhole approximately 20 inches square provided therein. All removable slabs or manhole covers should be sealed in place so as to be watertight. Coarse gravel at least 1 foot deep should be placed in the bottom of the pit before the lining is installed. Gravel may also be used under the lining to stabilize the foundation if necessary. Tight jointed sewer pipe should be used for making connections to the pit. When conditions require that seepage pits be located in close proximity to trees they may be constructed without lining. In such cases the entire pit should be filled with loose rock. This type of construction will provide means whereby roots may enter the pit without damaging it. Tree roots often assist and prove advantageous in the disposal of effluent.

Capacity.—It is desirable that the liquid capacity of a seepage pit should be at least that of the septic tank. Where comparatively impervious soils are encountered the pit capacity should be twice that of the septic tank. Sufficient wall area should be provided to permit the liquid wastes to leach into the soil without overflowing. The wall area may be expressed in the design of the pit as effective absorptive area. The depth and coarseness of the porous formation and the depth of ground water are among the factors influencing the design of a seepage pit. Because these factors cannot always be accurately ascertained only an approximate determination can be made of the effective leaching area. This is generally done by making percolation tests in the porous strata as they are encountered in excavating the pit. Water poured into the hole until it is full should drain out in 24 hours.

Table 5 should be used for guidance in the general design of seepage pits. This table is based on number of bedrooms in the dwelling assuming two persons per bedroom, regardless of size, and on the number of persons served in the case of camps and schools. In applying this table it should be remembered that pit capacity should be not less than that of the septic tank, as mentioned above.

TABLE 5.—*Requirements for seepage pit design*

Character of soil	Effective absorption area required (square feet)		
	Residences (per bedroom)	Camps (per person)	Schools (per person)
Coarse sand or gravel	20	5	3
Fine sand	30	8	5
Sandy loam or sandy clay	50	13	8
Clay with considerable sand or gravel	80	20	13
Clay with small amount of gravel or sand	160	40	27
Heavy tight clay, hardpan, rock, or other impervious formations	(1)	(1)	(1)

[1] Unsuitable.

NOTE.—In calculating absorptive wall area of pit, gross diameter of pit excavation should be used.

DRY WELL

A dry well is a covered pit with open-jointed lining through which drainage from roofs, basement floors, or areaways may seep or leach into the surrounding porous soil.

Although drainage from roofs, areaways, and basement floors is not a sewage waste, a discussion of the method of its disposal by using dry wells is believed advisable to discourage its disposal with the sanitary sewage.

Function.—Dry wells are intended to provide means for soil absorption of drainage from basement floors and areaways and occasionally roof drainage, thereby eliminating these nonsewage wastes from the septic tank and subsurface drainage system. They should never be used for the disposal of sanitary sewage, septic tank effluent, or laundry wastes.

Location.—Dry wells should be located at least 50 feet from any source of water supply and 20 feet from any disposal field, cesspool, or seepage pit, and at least 10 feet from the building foundation.

Construction.—Dry wells may be considered in two classes—small pits serving individual drains and large pits receiving roof drainage from an entire building. Where a single pit is provided to serve a basement drain or areaway drain it may be constructed by using a 3-foot length of 15- or 18-inch diameter vitrified clay or cement pipe, provided a reasonably coarse foundation is encountered at the 3-foot depth. This tile is filled with coarse gravel or crushed stone thus providing sufficient voids to receive a quantity of water before overflowing, and permitting the water to leach out of the bottom into the soil.

The large dry wells are similar in size and construction to seepage pits; however, in many instances the pits are not curbed but entirely filled with very coarse gravel or crushed stone. Where it is not practicable to use one pit for all downspouts, individual pits may be provided for each downspout. The pits should be of ample size for the amount of water they may receive at any single period. The dry wells should have a solid concrete slab cover and be constructed so as to prevent the entrance of surface drainage from the surrounding soil. Dry wells should not be provided for roof drainage where surface discharge is feasible.

CESSPOOL

A cesspool is a covered pit with open-jointed lining into which raw sewage is discharged, the liquid portion of which is disposed of by seepage or leaching into the surrounding porous soil, the solids or sludge being retained in the pit.

Function.—A cesspool is not recommended as a substitute for a septic tank, as the raw sewage discharged into the cesspool tends to seal the openings in the lining and porous formation thereby reducing the leaching area and often causing the cesspool to overflow.

Cesspools are considered dangerous and often present a definite health hazard when excavated to excessive depth and into water-bearing formations. Their use should be permitted only where septic tanks are impractical and the possibility of contaminating any ground water supply is extremely remote. Many States have regulations prohibiting the installation of cesspools.

Location.—"Cesspools should be located at least 150 feet from wells, 15 feet from seepage pits and property lines, and 20 feet from dwelling foundations. They should never be used in the vicinity of shallow wells, and in any case only where approved by the State health department."

Construction.—In the construction of a cesspool a hole 3 feet or more in diameter and of sufficient depth to encounter a porous formation should be provided. Open-joint curbing should be used in a similar manner to the curbing of seepage pits and a slab cover with a manhole opening should be provided to permit access. All cesspools should be constructed with an overflow to a properly designed and constructed seepage pit. The overflow pipe to the seepage pit should have a submerged connection and the elevation of this overflow should be at least 6 inches lower than the elevation of the inlet.

Abandoned wells, drill holes, or abandoned mines should never be used either as cesspools or seepage pits for sewage disposal.

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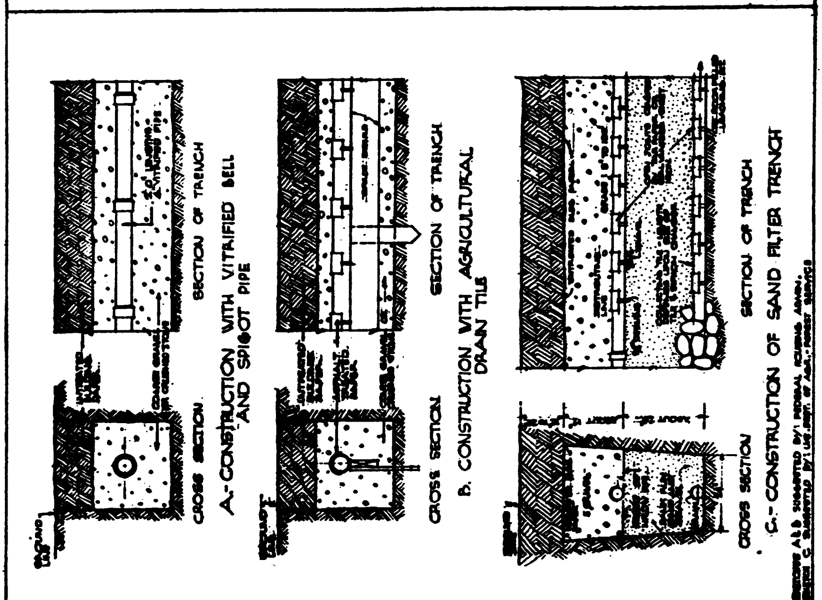

FIGURE 5.—Subsurface disposal trenches and sand filter trench.

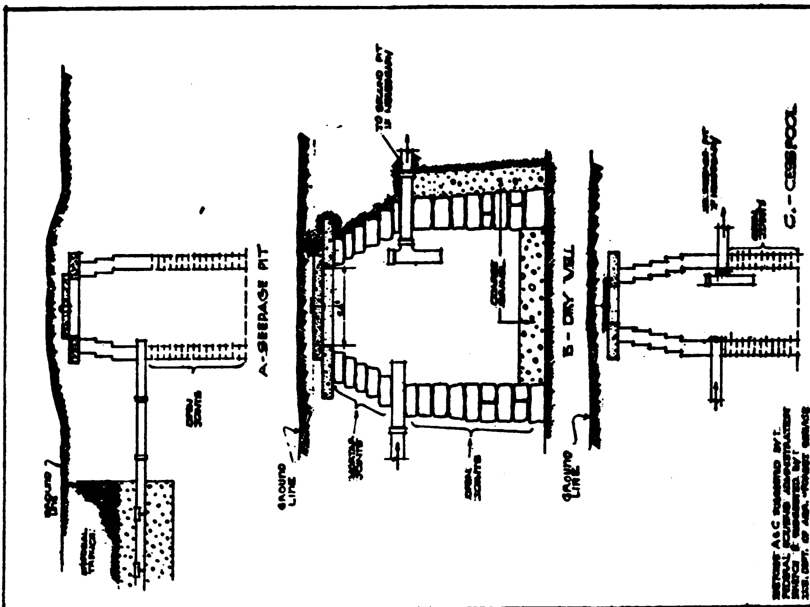

FIGURE 6.—(A) Seepage pit, (B) dry well, (C) cesspool.

PART II

Nonwater Carriage Sewage Disposal Methods

EARTH PIT PRIVY

An earth pit privy is a device for the disposal of human excreta in a pit in the earth. The pit is covered by a structure affording privacy and shelter and containing a seat with an opening into the pit.

Function.—The earth pit privy offers the most suitable type of excreta disposal unit for the individual rural home and in recreational areas where water carriage systems of disposal cannot be provided. In 1940, 114,000 of the 200,000 rural school buildings in the United States were of the one-room type and served by nonwater carriage sewage disposal units. While there are many different designs in use, the basic elements are the same in all cases.

The earth pit should be of such capacity that it may be used for several years without requiring the privy to be moved. Excreta and toilet paper are deposited directly into the pit. Aerobic bacteria break down the complex organic matter into more or less inert material. Insects, animals, and surface water are excluded from access to the pit to prevent the spread of intestinal diseases. It is essential that the privy be designed and constructed so that the pit can be maintained flytight.

Location.—The location of the privy should be such as to minimize danger of contamination of water supplies. Under ordinary conditions the privy should be located at least 50 feet from any well, spring, or other source of water supply. On sloping ground it should be located at a lower elevation than the water supply. On level ground the area around both privy and water supply should be mounded with earth. If any doubt exists as to the safety of the water supply if an earth pit privy is used, other types of disposal should be considered.

The site should be accessible to the user, ordinarily not less than 50 feet nor more than 150 feet from the buildings served. Consideration should be given to the direction of prevailing winds to reduce fly and odor nuisances. The privy pit should not encroach within 6 feet of any building line or fence to allow proper construction and maintenance.

Pit, sill, and mound.—A minimum capacity of 50 cubic feet for the average family is recommended. This pit should be tightly sheathed for several feet below the earth surface, but openings in the sheathing are desirable below this depth. The sheathing should extend from 1 to 2 inches above the natural ground surface to provide space between the sill and the upper portion of the sheathing in order that the floor and building will not rest on the sheathings. A reinforced concrete sill should be provided for support of the floor and superstructure. This sill should be placed on firm undisturbed earth.

An earth mound at least equal in thickness to the concrete sill should be constructed, with a level area of 18 inches away from the sill in all directions.

Floor and riser.—Impervious materials such as concrete are believed to be most suitable for floor and riser. Because privy units are commonly used as urinals, the use of impervious materials for risers is desirable in the interest of cleanliness. In cold climates, wood treated with a preservative such as creosote has been found to be durable and to reduce the problem of condensation. Therefore, in some sections of the country wood may be used if approved by the State department of health.

Seat and lid.—Both seat and lid should be hinged to permit raising. Material used in construction should be light in weight but durable. Seats should be comfortable. Lids need not necessarily be self-closing. Separate seats with smaller openings for small children are preferable to a separate smaller riser unit. Such extra seats need not be attached to the unit but may be placed on top of the standard seat. Two objections to self-closing seat lids are the discomfort to the user in having the lid rest on the upper portion of the back and the contact of the oftentimes soiled or frost-covered bottom surface of the lid with the user's clothing. A seat lid has been devised to overcome these objections. (See fig. 9.) This lid is raised to a vertical position by lifting it from the rear end so that the top surface of the lid faces the user rather than the bottom surface which is normally exposed to the pit.

With hinged seat and lid and impervious riser construction there should be little need for urinal troughs. Such troughs in most instances are not constructed so that they can be maintained water-tight, thus permitting very undesirable and insanitary conditions to develop within the building. Where proper trough construction is provided the connection to the pit often permits all gases to be vented through the building. It is therefore recommended that the riser and seat construction be so installed as to make the use of urinal troughs unnecessary.

Vent.—Venting practices differ in many parts of the United States because of differences in climatic conditions. In some States, particularly those in the South, vents have been omitted entirely and results from this practice appear to be satisfactory. Vents may pass vertically from either the pit or the riser through the roof or directly through the wall near the floor; the vertical vent from pit or riser may lead to a horizontal vent passing through both side walls or diagonally across a corner of the building. In all cases vents are screened. Galvanized steel wire screen dipped in paint, copper screens, and bronze screens are used. Nearly all designs employ a screen with 16 meshes to the inch. Hardware cloth is used to cover the outside entrance to vents to prevent entrance of large objects which would clog the vent.

It is stated by some authorities that venting serves no useful purpose and that vents should be eliminated from earth pit privies. The Committee believes that satisfactory recommendations with respect to vents can be made only after certain technical problems have been solved. The most important of these is the moisture condensation problem due to the temperature difference between the pit and the superstructure. The use of a cold wall to condense moisture within the pit has been suggested. In view of the uncertain value of venting no recommendations are offered in this report. Further research and study are indicated.

Superstructure.—Privy structures are standardized to some extent. The majority are 4 by 4 feet in plan, with a height in front of 6 feet 6 inches and at the rear of 5 feet 6 inches. Roofs with a 1 to 4 slope are commonly used. Variations provide a floor plan 4 feet wide and 5 feet deep, and 5 feet wide and 4 feet deep. The building should be constructed of substantial material, painted for resistance to weather, and fastened solidly to the floor slab. Proper roof overhang should be provided to dispatch rain water from the roof away from the mound. The roof should be constructed of watertight materials. Wood, composition shingles, or metal are suitable. Ventilation of the building by omitting siding beneath the roof is common except in cold climates. Here the siding is usually perforated with holes. Windows are sometimes used in the northern latitudes. Provision of coat hooks is also desirable.

MASONRY VAULT PRIVY

A masonry vault privy is essentially a pit privy in which the pit is lined with impervious material and in which provision is made for the removal of excreta.

Function.—Masonry vaults find their use chiefly where the ground water table is close to the ground surface or where it is necessary to prevent contamination of nearby water courses, wells, and springs. They are also used to some extent in limestone formations to prevent contamination of the water streams which occur in the solution channels of the limestone.

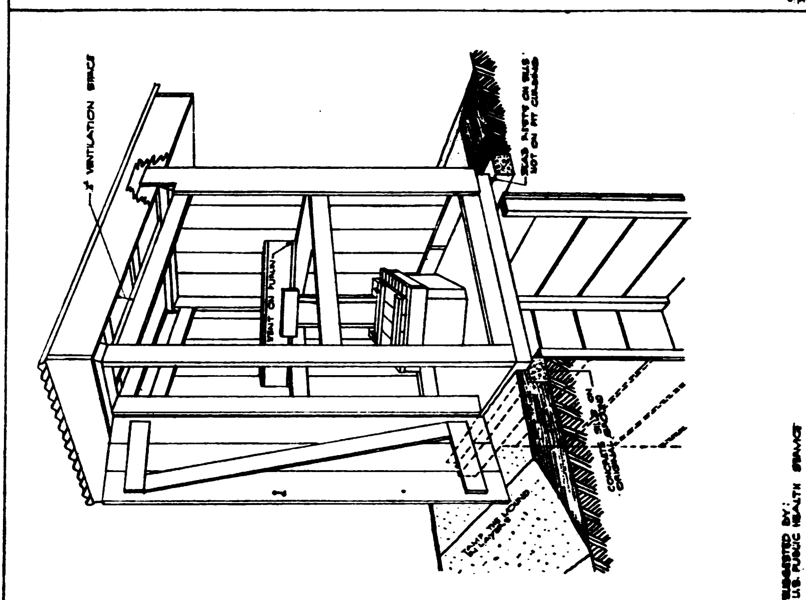

FIGURE 7.—Sanitary pit privy.

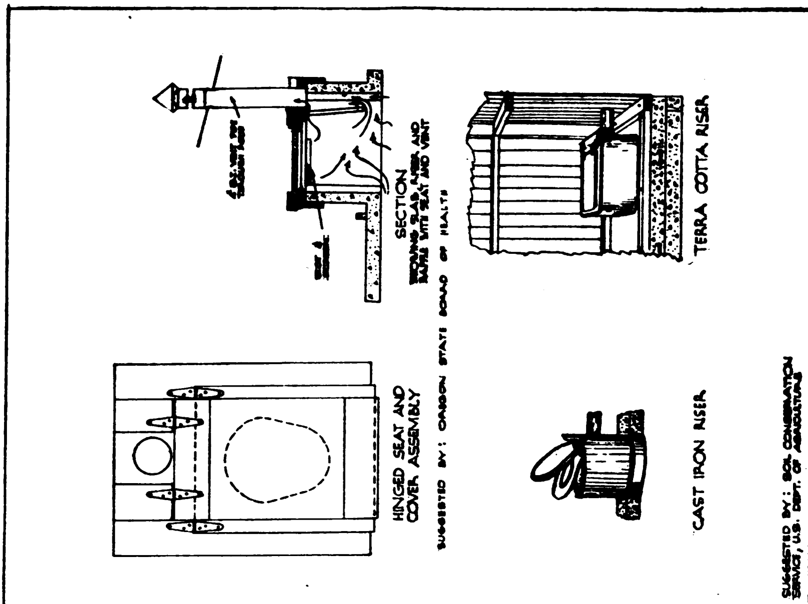

FIGURE 8.—Types of risers, vents, and seat assemblies.

The safety factors expected through the use of this type of privy are seldom achieved in actual practice. The leakage which generally occurs affects the safety features. Vaults are seldom built large enough and consequently frequent cleaning of vaults is necessary.

Construction.—Masonry vaults may be constructed of brick, stone, or concrete, although the latter is preferred. Vaults must be water-tight to keep out ground water and prevent leakage of the vault contents. A readily accessible clean-out door is necessary. This door must be constructed to prevent access of flies, animals, and surface water to the vault contents. The floor of the superstructure, which forms a partial covering for the vault, must be impervious and concrete is recommended.

Cleaning.—Cleaning of vaults is usually done by scavengers who pump or dip the wastes from the vault. Even with careful manipulation, spillage occurs, especially about the clean-out door. Vault contents must be either buried or disposed of in a public sewer system. Again maintenance and supervision are large factors in the successful use of this type of disposal. The same type of superstructure, seat, riser, floor, and vent are used for masonry vault privy as for earth pit privy.

This type of disposal unit is satisfactory where it is essential that pollution of nearby water sources be prevented and where adequate maintenance and servicing are assured.

CHEMICAL TOILET

There are generally two types of chemical toilets: (*a*) commode type in which a pail containing a chemical solution is placed immediately beneath the seat; (*b*) the tank type in which a metal tank which holds the chemical solution is placed in the ground directly beneath the seat. A pipe or conduit connects the riser with the tank. Tanks are usually cleaned by draining to a subsurface seepage pit. Chemical toilets differ from privies in that they are commonly placed inside the dwelling, whereas privies are generally located apart from the dwelling.

Function.—Toilets of this type are usually predominant in cold climates where it is found desirable to have toilet facilities in or near the home and where running water is not available for flush toilets. The commode type is particularly common in recreational areas, at individual homes, and where there is sickness or an invalid in the family. The tank type is more often used in recreational areas or schools.

Chemicals.—Sodium hydroxide is commonly used to prepare the caustic solution used in commode or tank types of chemical toilets. The chemical is dissolved in water and placed in the receptacle. The purpose of the chemical solution is to emulsify the fecal matter and paper and to liquify the contents. In order to accomplish this action, the chemical solution must be maintained at a proper strength and the mixture agitated each time the toilet is used. Odors are produced chiefly by the liberation of ammonia if the caustic solution is weak or if mixing by agitation is not carried out.

Difficulties are encountered when the caustic solution becomes diluted and fails to emulsify the fecal matter. The chemical solution breaks down due to absorption of carbon dioxide from the air and the solution ceases to be caustic. Decomposition of fecal matter takes place with foul odors emanating from the unit.

Sludge disposal.—Disposal of the resultant mixture is a disagreeable task. In the case of small commode types the usual method of disposal is by burial in the earth. Tank units are usually so constructed that the tank is emptied into a seepage pit. When emulsification is not complete, particles of paper clog the seepage pit, thus requiring corrective measures. Because of fundamental differences in design, chemical toilets resemble other types of privies only in the seat construction and manner of venting. Usually risers or stools manufactured commercially are used.

Chemical toilets should be used only where there is assurance of constant maintenance and where safe disposal of the final product is assured. Neither sludge nor liquid effluent from chemical toilet tanks should be discharged to a sewerage system where treatment processes are involved. Otherwise, the chemical constitutents of the sludge or liquid effluent may seriously interfere with the biological action upon which such treatment processes depend.

PAIL OR CAN TYPE PRIVY

A pail or can type of privy is one that employs the use of a watertight container directly beneath the seat for receiving deposits of human excreta.

Function.—This type of privy provides one means of disposal of body wastes under certain conditions. Temporary camps, such as Boy Scout camps, military camps, refugee camps, all of short duration, may well utilize such means of disposal provided the necessary scavenging system is available for regular maintenance.

Disposal of pail contents.—It is essential that there be responsible supervision if this type of disposal is to be expected to function properly. Provision must be made for daily removal of receptacles for cleansing. If scavenging service is to be satisfactory, soiled cans should be replaced by clean ones. The soiled cans should be hauled to a central point where facilities are provided for emptying and cleaning them. If a water supply line is used for can cleaning pur-

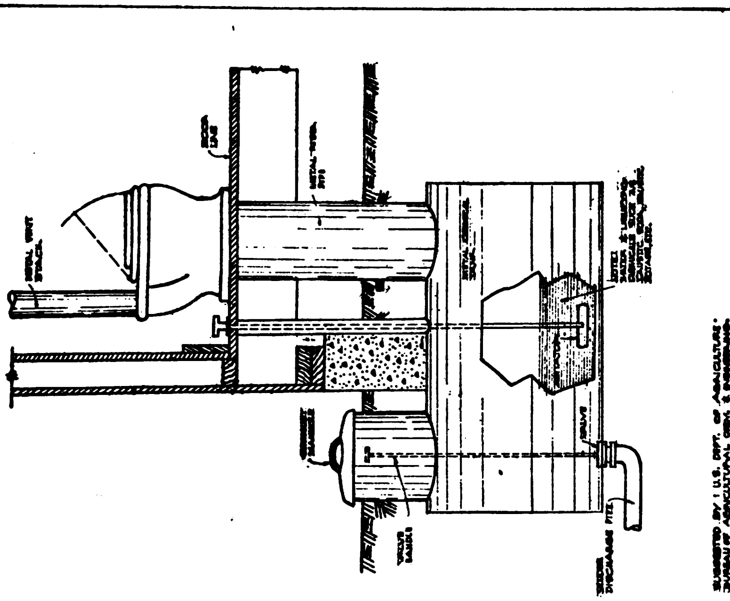

FIGURE 10.—Chemical toilet.

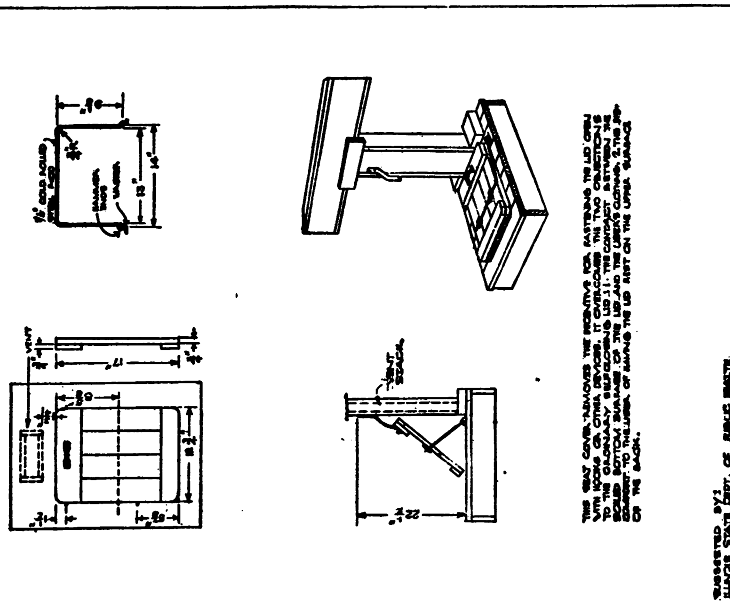

FIGURE 9.—Improved self-closing seat cover.

poses, it should be equipped with an approved back flow prevention device. Facilities must be provided for final disposal of the excreta. The methods recommended in order of preference are: (*a*) Disposal into a public sewer system or sewage treatment plant; (*b*) disposal by burial in the ground with immediate covering of earth.

A new type of toilet, originally designed for trailers and airplanes, is in use in portable housing developments such as house trailer camps where sewer systems have not been installed. This toilet provides a special roll of paper coated with asphaltum and by means of a ratchet lever the wastes are folded and sealed in a paper tube or envelope. While this method removes some of the objectional features of the pail and can type privy, the problem of final disposal of the waste remains. Daily removal of excreta is necessary and maintenance of the mechanism is a problem.

There are no pits in this type of privy. Floor, riser, seat, vent, and superstructure requirements are the same for this type of privy as for the earth pit privy.

Since pail or can types of privies are limited in usefulness due to excessive maintenance factors they should be used only in camps of a temporary nature.

CREMATING LATRINE OR INCINERATOR PRIVY

A cremating latrine or incinerator privy is essentially a pit privy designed to permit destruction of the excreta by incineration. Auxiliary fuel is provided to aid destruction of the body wastes.

Function.—This type of privy has been used at some rural schools in the South and the Forest Service has made use of the method in some recreational areas in National Forests. The cremating privy has been found applicable in circumstances where running water is not available, where rock formations are encountered which prohibit digging pits or trenches, where fuel is plentiful and cheap, and where maintenance is available. Units of this type are costly to build because of the fire box, clean-outs, grates, and stack required.

Design and construction.—The pit is fundamentally different for an incinerator privy from that used for the earth pit privy in that provision is made for adding fuel and removing ashes. Vents for this type of privy also differ from those required in other privies because of the need for increased draft. The same type of floor and superstructure may be used as for the earth pit privy; however, the floor must be made of fireproof material. Experience has indicated that it is necessary to utilize metal stools (risers) and lids to prevent flames from destroying them when the solids are incinerated.

This type of unit is not suitable for individual dwellings and should be used only for camps or recreational areas where maintenance is assured and the necessary fuel supply is readily available.

A GIEMSA STAIN OF QUITE CONSTANT COMPOSITION AND PERFORMANCE, MADE IN THE LABORATORY FROM EOSIN AND METHYLENE BLUE[1]

By R. D. LILLIE, *Senior Surgeon, United States Public Health Service*

When the eosinate formula (*1*) for compounding Giemsa stain from dyes of American manufacture was worked out, it was hoped that this would solve the problem of duplicating stains satisfactorily. However, continued experience with successive commercial lots from several American manufacturers indicated that commercial azure A, azure B, and azure I were quite variable substances and that considerable study and adjustment of proportions was necessary each time a new lot of Giemsa stain was offered.

On spectroscopic examination of various lots of the azures and methylene blue and their eosinates, the reason for this variability became apparent, as may be seen from table 1.

Considering the relative constancy of the spectroscopic data for methylene blue chloride, it seems that the variation in the azures is probably inherent in their mode of manufacture from methylene blue. If the traditional method of chloroform extraction of the base from weakly alkaline aqueous solution of polychrome methylene blue is employed, the composition of the product will depend to some extent on that of the polychrome methylene blue from which it is prepared. Not only azure I or B and methylene violet appear in the chloroform extract, but also, though in less amounts, azure A and azure C, and the three azures are all reextracted from chloroform solution by weak acetic acid. Consequently, if methylene blue polychromed by an alkali process is employed as a source of azures, a mixed product will be obtained, since alkali polychroming engenders simultaneously a wide variety of the decomposition products of methylene blue. The method of formaldehyde remethylation of crude azure A made by the acid oxidation process does not stop at trimethylthionin as was supposed, but may go on to methylene blue. Experimental extraction of some commercial azure B solutions with chloroform until no more red color was produced in the chloroform has left a deep blue solution with the spectral characteristics of methylene blue and as much as 20 to 25 percent of the color density of the original solution.

Having shown that the acid oxidation process (*2*) produced polychrome methylene blues of quite constant spectroscopic characteristics when the same ratio of $K_2Cr_2O_7$ to methylene blue was used, and that after a certain time interval varying with temperature, further heating was without effect, and that the same product was produced at varying temperatures, it was believed that this process might prof-

[1] From the Division of Pathology, National Institute of Health.

itably be employed in preparing the constituents of Giemsa stain. Trials soon showed that fresh variations appeared when attempts were made to salt out and recrystallize from alcohol. This process of isolation of the dye chloride from solution produced shifts of the absorption maximum of the dye of as much as 5 to 10 mμ.

TABLE 1.—*Variations in absorption spectra of commercial lots of the azures and of methylene blue*

Lot No.	λ	W	M
Azure C			
NIH	617	24	615
AMM No. 2	614	25	613
AMM No. 8	623	35	623
AMM 22925	611	28	612
NAc-2a	612	34	612
NAc-2b	609	32	613
Azure A			
NIH	627	20	625
NAz-2	624	32	625
NAz-3	617	32	617
NAz-4	613	32	612
NAz-5	620	28	618
NAz-6	619	29	619
NAz-8	624	43	627
NAz-9	625	33	625
NAC No. 8847	617	30	617
NAC No. 9907	621	34	620
NAC No. 10161	627	37	625
Azure I			
CB No. AMS1	602	22	601
CB No. AMS2	602	24	600
Hr 1918	608	31	607
NAC No. 3513	620	46	624
CBS No. 3900	635	37	634
LAz-3	632	42	631
Azure I			
CAz-2 [1]	609	24	608
CAz-2A	633	36	631
CAz-3	631	38	630
CB No. 420523	639	41	636
CB No. 421104	637	36	635
PCC a	600	22	600
PCC b	596	26	599
Gr 9-24	653	33	648
Azure B			
NIH	645	22	642
NAC No. 3769 [3]	654	16	651
NAC No. 7724	652	27	648
NAC No. 9348a	652	29	649
NAC No. 9348b	650	27	649
NAC No. 9610	654	25	653
NAC No. 9907	655	28	654
NAC No. 10161	657	28	656
M. B. eosin			
Gr	662	24	660
LJr-1	664	21	661
CJr-3	662	22	660
NJr-4	663	22	662
NAC No. 10161	659	24	657
NIH No. 16E [2]	655	26	654
NIH No. 16D	662	19	661
Methylene blue			
PDC (Th)	661	21	659
CAI (Th)	663	20	661
HSL (TB)	664	19	662
HSL (TB) 78	664	19	661
LA-7a	664	18	663
LA-7b	662	19	660
EA No. 1	662	19	661
EA No. 2	664	18	662
HL (84)	664	19	663
M No. 41930	661	17	660
Gr 12.13	664	19	663
NA-8	665	18	663
NA-13	662	18	661
NA-15a	662	17	662
NA-15b	662	21	660
NA-16	663	19	662
NA-19a	663	19	661
NA-19b	661	19	661
CA-21	662	18	662
CB No. 420843	663	20	661
NAC No. 9907	664	20	662
NAC No. 9781 [3]	663	20	660
NIH No. 23A	664	17	662
NIH No. FMB	664	16	663

λ=absorption maximum. W indicates width of absorption band, which is determined by measuring the zone throughout which density (D) is at or over 90 percent of its maximum. M indicates the median point of this band.

[1] CAz-2 in crude state was apparently largely methylene violet. After extraction into $CHCl_3$ from alkaline solution, and thence back into 1 percent acetic acid, thus separating the azure, the values CAz-2A were obtained.

[2] NIH No. 16E and 16D were made both from methylene blue NA-13 and eosin Y LE-12. 16E was dried 24 hours at 56° C. from water; 16D, 24 hours at about 35° C. from alcohol.

[3] Zinc chloride double salt, a and b denote retests of same lots at approximately 1-year interval.

Lot designations are those of the Commission on Standardization of Biological Stains for certified lots, otherwise manufacturers' initials and lot numbers, dates or other distinguishing symbol. NIH designates samples made or repurified in the National Institute of Health. The azures were separated by serial extraction from weak $NaHCO_3$ into $CHCl_3$ and thence into 0.5 percent aqueous acetic acid, segregating portions with λ over 640, 630–640, 620–630, and under 620, and repeating this fractionation five times. Weak $NaHCO_3$ solution of methylene blue was extracted with $CHCl_3$ to remove azures and then acidulated with acetic acid.

It was then decided to prepare eosinates directly from the methylene blue solutions after $K_2Cr_2O_7$ oxidation, $BaCO_3$ neutralization, and filtration. But the boiling with $BaCO_3$ also appeared to produce further polychroming of the solution.

Finally it was found that prompt cooling of the acid solution after completion of oxidation, followed by neutralization with the exact precalculated amount of $NaHCO_3$ at 10°–15° C., immediate precipitation with eosin, and prompt filtration of the precipitate gave a product which on repeated trial varied only 2–3 mμ in its absorption maximum and median of the absorption band.

The amount of $K_2Cr_2O_7$ needed to produce a crude azure solution with absorption maximum about 645–647 mμ agrees closely with that theoretically required to oxidize one methyl group from methylene blue, thus:

$$(CH_3)_2NC_6H_3NSC_6H_3N(CH_3)_2Cl+$$
$$O \rightarrow (CH_3)_2NC_6H_3NSC_6H_3NHCH_3Cl+HCHO.$$

The oxygen is supplied by the $K_2Cr_2O_7$ only in acid solution, thus: $H_2Cr_2O_7 \rightarrow 3O+H_2O+Cr_2O_3$; or 1 mole=319 gm. methylene blue+1/3 mole $K_2Cr_2O_7$=294/3=98 gm., yields one mole azure B, and 1 mole of formaldehyde. Allowing an 80–85 percent dye content of methylene blue this is approximately 250 mg. $K_2Cr_2O_7$ per gm. methylene blue. Production of azure A requires approximately twice the amount of $K_2Cr_2O_7$.

The following procedure has given satisfactory eosinates and good stains of Giemsa type as tested on human blood containing malaria parasites and rat blood containing trypanosomes.

Dissolve 10 gm. methylene blue of 85–88 percent dye content in 600 cc. distilled water. Add 6.8 cc. concentrated sulfuric acid (sp. gr. 1.835 to 1.84). Bring to a boil and add 2.5 gm. potassium bichromate dissolved in 25 cc. distilled water. Boil 20 minutes. Cool to 10° C. or lower (place in refrigerator over night). When cold add 17.5 gm. sodium bicarbonate slowly with frequent shaking. Then add a 5-percent solution of eosin Y of about 90 percent dye content and shake constantly until margin of fluid appears pale blue or bluish pink. About 205 cc. will be required and three-fourths of this can be added at once. Filter at once, preferably on vacuum funnel with hard paper. When fluid has been drawn through and surface begins to crack, add 100 cc. distilled water, let drain, and wash again with a second 100 cc. distilled water. Lay the (opened out) filter on a larger piece of filter paper or paper towel and dry overnight on warm plate or in incubator, at 37° C. The drying may be accelerated by using two 100 cc. portions of acetone or, preferably, 95 percent alcohol as washes after the second wash with water. Drying at 55° to 60° C. has been tried, and produces quite a little alteration of the thiazin dye; less if acetone or alcohol washes are used and the heating limited to 2 or 3 hours. This is the crude azure B eosinate.

To make the crude azure A eosinate, proceed exactly as above but take 5 gm. potassium bichromate in place of 2.5 gm. and dissolve it in 50 cc. distilled water.

To make the methylene blue eosinate, dissolve 10 gm. methylene blue in 600 cc. cold distilled water and precipitate as before with 5 percent eosin, filtering and drying as above.

To make the finished stain, grind the three eosinates separately into fine powder in separate clean mortars. (The same mortar may be used if washed out with water, dried with a paper towel, washed with concentrated sulfuric acid until no more green color is liberated, then again with water and alcohol.) Then weigh out 500 mg. crude azure B eosinate, 100 mg. crude azure A eosinate, 400 mg. methlyene blue eosinate, and 200 mg. finely ground methylene blue. Decant the mixed powder onto the surface of 200 cc. of solvent allowing it to settle in gradually. Then shake frequently for 2 or 3 days, keeping the bottle between 50° and 60° C. between shakings.

The traditional solvent is equal parts of glycerin and methyl alcohol. If the bottle is tightly stoppered and the fluid level marked on the outside with a grease pencil or a piece of adhesive, there will be little or no loss from evaporation, and in any case the fluid level can be restored by addition of methyl alcohol. The glycerin should be neutral, anhydrous, and of the purest grade obtainable. If the special methyl alcohol for blood work is unobtainable, ordinary C. P. methanol may be repurified by distillation in glass after adding 4–5 gm. each of silver nitrate and sodium hydroxide. This destroys aldehydes and anchors volatile acids as sodium salts.

The proportions in the foregoing stain mixture will give a very satisfactory picture. Should a deeper blue background or a greener blue tint to parasite cytoplasm be desired in thick film staining, additional aqueous methylene blue solution may be added to the diluted staining mixture. Or for routine use additional methylene blue may be added to the stock solution. The amount may readily be determined by adding to a 50 cc. quantity of a 1 to 50 dilution of the stock stain as much 1:10000 aqueous methylene blue as will produce the desired effect. The addition of 0.1 cc. of 1:10000 aqueous solution is equivalent to the addition of 1 mg. dry stain to 100 cc. stock solution.

SUMMARY

The variations in Giemsa stain due to variations in the composition of the constituent dyes are discussed and some of the reasons are indicated. The relative constancy in character of the product of the oxidation of methylene blue with a definite proportion of potassium bichromate is recalled, and the substitution of eosinates of such crude azures for the usual constituents of Giemsa stain is proposed. The detailed method of preparation is described.

REFERENCES

(*1*) Roe, M. A., Wilcox, A., and Lillie, R. D.: Eosinates of the azures and methylene blue in preparation of a satisfactory Giemsa stain from dyes of American manufacture. Pub. Health Rep., **56**: 1906–1909 (1941).

(*2*) Lillie, R. D.: Studies on polychrome methylene blue. II. Acid oxidation methods of polychroming. Stain Technol., **17**: 97–110 (1942).

DEATHS DURING WEEK ENDED FEBRUARY 27, 1943

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Feb. 27, 1943	Corresponding week, 1942
Data for 89 large cities of the United States:		
Total deaths	10,2[illegible]0	9,085
Average for 3 prior years	9,236	
Total deaths, first 8 weeks of year	81,377	74,203
Deaths under 1 year of age	724	517
Average for 3 prior years	535	
Deaths under 1 year of age, first 8 weeks of year	5,731	4,472
Data from industrial insurance companies:		
Policies in force	65,395,887	64,927,623
Number of death claims	12,451	11,930
Death claims per 1,000 policies in force, annual rate	9.9	9.6
Death claims per 1,000 policies, first 8 weeks of year, annual rate	10.6	10.1

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MARCH 6, 1943

Summary

Continued favorable health conditions, except for the unusual prevalence of meningococcus meningitis, are indicated by reports for the current week. The figures for measles and poliomyelitis are slightly above the respective 5-year (1938–42) medians, while the numbers of cases of the other six communicable diseases included in the following table are below the respective medians.

A total of 531 cases of meningococcus meningitis was reported for the week, exclusive of delayed reports of 15 cases in Virginia and 10 in Arizona, as compared with a total of 484 for the preceding week. This is the largest number reported for any week on record, and brings the cumulative total for the first 9 weeks of the current year to 3,515, more than 25 percent above the largest number reported in any other 9-week period of the past 16 years. Current totals for geographic divisions are above those for the preceding week in all except the East South Central, West South Central, and Mountain groups of States. States reporting the largest numbers were New York (63), California (46), Washington (31), Pennsylvania (29), Missouri (29), New Jersey (25), Massachusetts (23), North Carolina (23), and Maryland (21).

Other reports for the week include the following: Anthrax, 4 cases; dysentery, 391; infectious encephalitis, 14; tularemia, 7; endemic typhus fever, 43.

Deaths in 87 large cities of the United States during the current week aggregated 9,567 as compared with 10,198 for the preceding week. The accumulated total for the first 9 weeks of the current year is 90,310, as compared with 82,930 for the same period of last year.

Telegraphic morbidity reports from State health officers for the week ended March 6, 1943, and comparison with corresponding week of 1942 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1938–42	Week ended—		Median 1938–42	Week ended—		Median 1938–42	Week ended—		Median 1938–42
	Mar. 6, 1943	Mar. 7, 1942		Mar. 6, 1943	Mar. 7, 1942		Mar. 6, 1943	Mar. 7, 1942		Mar. 6, 1943	Mar. 7, 1942	
NEW ENG.												
Maine	1	1	1	------	------	3	1	129	129	8	2	0
New Hampshire	0	0	0	------	20	------	31	6	23	0	0	0
Vermont	0	0	0	------	------	------	412	4	23	2	0	0
Massachusetts	2	8	5	------	------	------	910	593	593	23	11	3
Rhode Island	0	3	0	1	------	------	27	169	14	19	0	0
Connecticut	0	1	1	2	1	7	259	375	150	9	4	1
MID. ATL.												
New York	24	30	23	[1] 12	[1] 17	[1] 68	2,040	678	1,224	63	5	5
New Jersey	2	6	10	17	11	29	1,299	322	322	25	5	1
Pennsylvania	8	11	28	3	------	------	2,891	11	254	29	4	6
E. NO. CEN.												
Ohio	7	16	16	8	18	18	292	261	261	6	3	3
Indiana	9	9	12	30	35	52	400	50	50	10	0	1
Illinois	16	14	32	23	16	49	835	493	493	15	1	1
Michigan [2]	0	4	4	5	1	20	40	241	320	9	0	0
Wisconsin	0	1	1	50	52	173	958	647	668	4	0	0
W. NO. CEN.												
Minnesota	3	5	3	------	7	7	58	775	253	4	0	0
Iowa	3	2	3	10	1	65	298	325	192	2	0	0
Missouri	4	1	13	6	3	32	387	255	141	29	1	1
North Dakota	0	0	0	------	5	44	53	77	11	0	0	0
South Dakota	5	2	1	------	------	2	125	14	14	0	0	0
Nebraska	3	3	0	55	38	2	371	121	42	5	0	0
Kansas	6	2	5	14	8	41	428	319	382	3	1	1
SO. ATL.												
Delaware	0	0	1	------	------	------	52	7	7	1	0	0
Maryland [2]	36	5	5	18	29	55	46	584	115	21	2	2
Dist. of Col.	2	2	7	3	3	4	113	46	19	4	2	2
Virginia	6	13	13	595	652	1,509	338	128	252	[3] 31	3	0
West Virginia	4	5	7	38	52	113	32	229	229	3	0	0
North Carolina	6	12	14	75	52	52	33	1,356	1,356	23	3	3
South Carolina	3	4	5	705	1,028	1,028	59	192	192	13	3	1
Georgia	10	8	3	261	144	144	143	365	200	4	1	1
Florida	2	3	9	3	5	9	47	165	188	5	0	0
E. SO. CEN.												
Kentucky	5	8	8	7	4	107	854	71	71	13	1	3
Tennessee	5	2	4	42	187	187	259	79	80	7	1	1
Alabama	10	2	6	155	233	490	65	148	228	16	1	1
Mississippi	3	6	6	------	------	------	------	------	------	9	0	------
W. SO. CEN.												
Arkansas	5	4	4	108	236	711	90	243	146	5	0	0
Louisiana	1	5	5	8	4	30	178	85	59	16	3	1
Oklahoma	5	4	6	76	176	222	34	293	58	0	1	0
Texas	35	37	40	1,634	1,734	1,658	472	2,222	594	6	4	4
MOUNTAIN												
Montana	1	0	0	8	25	25	162	90	49	1	0	0
Idaho	0	0	1	------	------	1	149	26	26	2	0	0
Wyoming	0	2	0	14	227	1	122	77	77	1	1	1
Colorado	6	7	7	30	73	64	607	207	167	1	0	0
New Mexico	2	3	2	1	8	8	12	111	60	1	0	0
Arizona	1	1	3	115	218	181	29	214	31	[3] 10	0	0
Utah [2]	1	0	1	71	5	17	445	93	130	9	0	0
Nevada	0	0	------	10	------	------	2	16	------	0	0	------
PACIFIC												
Washington	7	0	4	------	3	4	841	150	150	31	1	1
Oregon	1	1	1	29	25	38	456	142	142	12	0	0
California	20	17	21	77	101	101	741	3,987	462	46	6	5
Total	270	270	321	4,319	5,457	10,117	18,496	17,191	17,191	[3] 556	70	47
9 weeks	2,750	2,909	3,716	40,673	44,521	51,947	114,932	114,719	114,719	3,515	573	481

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 6, 1943, and comparison with corresponding week of 1942 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1938–42	Week ended—		Median 1938–42	Week ended—		Median 1938–42	Week ended—		Median 1938–42
	Mar. 6, 1943	Mar. 7, 1942		Mar. 6, 1943	Mar. 7, 1942		Mar. 6, 1943	Mar. 7, 1942		Mar. 6, 1943	Mar. 7, 1942	
NEW ENG.												
Maine	1	0	0	4	6	7	0	0	0	0	0	0
New Hampshire	0	0	0	14	8	4	0	0	0	0	0	0
Vermont	0	0	0	8	7	7	0	0	0	0	1	0
Massachusetts	0	0	0	476	272	220	0	0	0	1	0	1
Rhode Island	0	0	0	27	17	15	0	0	0	0	0	0
Connecticut	0	1	0	61	42	82	0	0	0	1	0	0
MID. ATL.												
New York	3	0	1	569	475	638	0	0	0	6	7	5
New Jersey	0	1	0	136	199	179	0	0	0	1	2	2
Pennsylvania	0	1	1	0	563	404	0	0	0	5	2	3
E. NO. CEN.												
Ohio	0	2	1	278	399	399	0	1	1	0	4	3
Indiana	0	0	0	127	166	170	7	0	1	0	1	1
Illinois	0	0	1	213	333	516	1	4	6	0	2	2
Michigan [2]	0	0	0	113	261	414	0	0	4	1	1	1
Wisconsin	0	0	0	303	176	170	0	0	5	1	0	0
W. NO. CEN.												
Minnesota	0	2	0	79	131	118	0	1	9	0	3	1
Iowa	0	0	0	92	48	65	1	0	4	1	0	0
Missouri	0	0	0	118	75	101	0	2	4	0	1	1
North Dakota	0	0	0	10	20	17	0	0	0	0	0	0
South Dakota	0	0	0	21	40	23	1	0	3	0	0	0
Nebraska	1	0	0	67	57	41	3	0	0	0	0	0
Kansas	0	0	0	76	102	102	0	0	2	2	0	0
SO. ATL.												
Delaware	0	0	0	6	63	15	0	0	0	0	0	0
Maryland [2]	0	0	0	91	91	61	0	0	0	8	1	1
District of Columbia	0	0	0	26	13	20	0	0	0	0	1	0
Virginia	1	1	0	42	31	35	0	0	0	4	0	1
West Virginia	0	0	0	30	35	53	1	0	0	0	0	1
North Carolina	1	2	1	45	35	45	0	0	0	1	0	0
South Carolina	0	0	0	8	3	4	0	0	0	0	0	1
Georgia	0	0	0	11	38	15	0	0	0	3	14	4
Florida	1	0	0	12	7	8	0	0	0	0	9	5
E. SO. CEN.												
Kentucky	0	1	0	61	100	89	0	0	0	1	2	2
Tennessee	1	1	0	48	73	73	0	2	4	1	3	3
Alabama	1	1	1	26	18	18	0	0	0	0	1	1
Mississippi	1	0	1	10	10	8	1	1	0	2	0	1
W. SO. CEN.												
Arkansas	0	1	0	5	6	9	1	1	1	1	1	1
Louisiana	0	2	1	11	6	11	0	0	0	1	5	5
Oklahoma	0	1	0	27	11	31	0	2	2	0	1	1
Texas	4	1	1	63	79	79	0	6	6	4	6	6
MOUNTAIN												
Montana	0	2	0	11	35	31	0	0	0	0	1	0
Idaho	0	0	0	2	3	18	0	0	0	0	0	0
Wyoming	0	0	0	67	19	6	0	0	0	0	0	1
Colorado	0	0	0	53	36	36	0	0	0	2	2	2
New Mexico	0	0	0	5	10	17	0	0	0	0	0	1
Arizona	1	0	0	12	16	10	0	0	0	1	0	0
Utah [2]	0	0	0	73	23	24	0	0	0	0	0	0
Nevada	0	0	------	0	2	------	0	0	------	0	0	------
PACIFIC												
Washington	1	0	0	26	66	63	0	0	1	1	0	2
Oregon	0	1	0	14	9	32	0	0	1	5	1	0
California	2	2	2	144	122	175	0	0	0	2	4	2
Total	19	23	18	3,741	4,357	5,147	16	20	67	56	76	76
9 weeks	249	232	232	34,154	34,622	40,913	247	190	640	465	721	721

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended March 6, 1943, and comparison with corresonding week of 1942 and 5-year median—Continued

Division and State	Whooping cough			Week ended Mar. 6, 1943								
	Week ended—		Median 1938-42	Anthrax	Dysentery			Encephalitis, infectious	Leprosy	Rocky Mt. spotted fever	Tularemia	Typhus fever
	Mar. 6, 1943	Mar. 7, 1942			Amebic	Bacillary	Unspecified					
NEW ENG.												
Maine	29	26	46	0	0	0	0	0	0	0	0	0
New Hampshire	12	15	15	0	0	0	0	0	0	0	0	0
Vermont	35	63	42	0	0	0	0	0	0	0	0	0
Massachusetts	173	183	183	0	0	1	0	0	0	0	0	0
Rhode Island	33	52	29	0	0	0	0	0	0	0	0	0
Connecticut	40	122	63	0	0	0	0	1	0	0	0	0
MID. ATL.												
New York	397	536	491	0	14	7	0	3	0	0	0	1
New Jersey	209	286	177	1	0	0	0	0	0	0	0	0
Pennsylvania	346	227	285	1	0	0	0	1	0	0	0	0
E. NO. CEN.												
Ohio	177	170	159	0	0	0	0	0	0	0	0	0
Indiana	40	40	27	0	0	0	1	0	0	0	0	0
Illinois	177	170	121	1	0	3	0	1	0	0	0	0
Michigan [2]	191	130	177	0	0	0	0	0	0	0	0	0
Wisconsin	269	273	141	0	0	0	0	0	0	0	0	0
W. NO. CEN.												
Minnesota	91	43	35	0	1	0	0	0	0	0	0	0
Iowa	27	18	19	0	0	0	0	0	0	0	0	0
Missouri	9	12	39	0	0	0	1	1	0	0	0	0
North Dakota	22	30	14	0	0	0	0	0	0	0	0	0
South Dakota	0	1	6	0	0	0	0	0	0	0	0	0
Nebraska	4	6	6	0	0	0	0	0	0	0	0	0
Kansas	59	58	58	0	0	0	0	1	0	0	1	0
SO. ATL.												
Delaware	15	0	6	1	0	0	0	0	0	0	0	0
Maryland [2]	109	54	84	0	0	0	2	0	0	0	0	1
Dist. of Col.	22	31	11	0	0	0	0	0	0	0	0	0
Virginia	77	51	67	0	1	0	6	0	0	0	2	0
West Virginia	40	60	53	0	0	0	0	0	0	0	0	0
North Carolina	178	77	211	0	1	0	0	0	0	0	0	2
South Carolina	28	94	94	0	0	0	0	0	0	0	0	2
Georgia	37	38	12	0	0	0	1	0	0	0	1	7
Florida	19	23	21	0	0	0	0	0	0	0	0	2
E. SO. CEN.												
Kentucky	28	98	67	0	0	0	0	2	0	0	0	0
Tennessee	50	26	41	0	1	0	0	0	0	0	1	0
Alabama	8	4	24	0	0	0	0	1	0	0	0	0
Mississippi	------	------	------	0	0	0	0	0	0	0	1	0
W. SO. CEN.												
Arkansas	20	16	17	0	1	1	0	0	0	0	0	0
Louisiana	2	6	12	0	0	2	0	1	0	0	1	0
Oklahoma	25	9	9	0	0	0	0	0	0	0	0	1
Texas	485	167	167	0	1	264	0	1	0	0	0	27
MOUNTAIN												
Montana	18	6	10	0	0	0	0	1	0	0	0	0
Idaho	2	9	9	0	0	0	0	0	0	0	0	0
Wyoming	2	1	1	0	0	0	0	0	0	0	0	0
Colorado	28	61	35	0	0	0	0	0	0	0	0	0
New Mexico	21	19	36	0	1	1	0	0	0	0	0	0
Arizona	17	62	28	0	0	0	9	0	0	0	0	0
Utah [2]	54	23	51	0	0	0	0	0	0	0	0	0
Nevada	6	37	------	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington	18	130	107	0	0	0	0	0	0	0	0	0
Oregon	13	35	15	0	0	0	0	0	0	0	0	0
California	272	309	309	0	3	10	0	0	0	0	0	0
Total	3,934	3,907	3,999	4	24	289	20	14	0	0	7	43
9 weeks	34,878	36,162	36,162	------	------	------	------	------	------	------	------	------

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Delayed reports are included (Virginia, 15; Arizona, 10).

WEEKLY REPORTS FROM CITIES

City reports for week ended February 20, 1943

This table lists the reports from 85 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
Atlanta, Ga	0	0	27	1	16	0	4	0	6	0	0	0
Baltimore, Md	0	0	4	1	17	12	17	0	41	0	1	53
Billings, Mont	2	0		0	0	0	1	0	1	0	0	3
Birmingham, Ala	3	0	6	0	0	0	7	0	1	0	0	5
Boise, Idaho	0	0		0	0	0	0	0	0	0	0	0
Boston, Mass	0	0		0	157	2	18	0	138	0	0	35
Bridgeport, Conn	1	0		0	4	2	0	0	3	0	0	0
Brunswick, Ga	0	0		0	1	0	2	0	0	0	0	0
Buffalo, N. Y	1	0		0	119	1	14	0	15	0	0	11
Camden, N. J	0	0		0	45	1	2	0	4	0	0	1
Charleston, S. C	1	0	111	1	2	0	2	0	1	0	0	0
Charleston, W. Va	0	0		0	0	0	0	0	1	0	0	0
Chicago, Ill	7	0	2	1	309	11	25	0	75	0	1	52
Cleveland, Ohio	0	0	5	2	11	2	14	0	44	0	0	36
Columbus, Ohio	0	0	1	1	4	0	2	0	13	0	0	6
Concord, N. H	0	0		0	0	0	2	0	2	0	0	0
Cumberland, Md	0	0		0	1	0	3	0	0	0	0	2
Dallas, Tex	1	0	2	0	2	0	7	0	6	0	0	5
Detroit, Mich	4	0		0	101	3	16	0	45	0	0	100
Duluth, Minn	0	0		0	0	0	2	0	6	0	0	0
Fall River, Mass	0	0		0	6	0	1	0	1	0	0	22
Fargo, N. Dak	0	0		0	2	0	0	0	0	0	0	1
Flint, Mich	0	0		0	10	0	0	0	6	0	0	3
Fort Wayne, Ind	0	0		0	0	0	1	0	1	0	0	0
Frederick, Md	0	0		0	1	0	1	0	0	0	0	0
Galveston, Tex	0	0		0	0	0	3	0	0	0	0	4
Grand Rapids, Mich	0	0		0	2	0	3	0	0	0	0	7
Great Falls, Mont	0	0		0	17	0	0	0	2	0	0	13
Hartford, Conn	0	0		0	15	1	4	0	2	0	0	0
Helena, Mont	0	0		0	27	0	0	0	0	0	0	0
Houston, Tex	10	0		2	3	0	7	1	6	0	0	1
Indianapolis, Ind	1	0		2	86	2	16	1	18	0	0	11
Kansas City, Mo	1	1		0	73	3	13	0	55	0	0	0
Kenosha, Wis	0	0		0	0	0	0	0	2	0	0	0
Little Rock, Ark	0	0		0	0	0	4	0	0	0	0	1
Los Angeles, Calif	4	0	43	1	70	2	8	4	31	0	0	45
Lynchburg, Va	0	0		0	0	0	1	0	0	0	0	0
Memphis, Tenn	0	0		0	1	0	4	0	9	0	0	2
Milwaukee, Wis	0	0		0	411	0	3	0	131	0	0	41
Minneapolis, Minn	0	0		0	11	2	6	0	19	0	0	12
Missoula, Mont	0	0		0	0	0	0	0	0	0	0	0
Mobile, Ala	0	0	11	2	0	0	3	0	0	0	0	0
Nashville, Tenn	0	0		0	83	0	5	0	0	0	0	9
Newark, N. J	0	0	5	0	36	3	13	0	10	0	0	12
New Haven, Conn	0	0	1	0	2	1	6	0	1	0	0	1
New Orleans, La	1	1	4	3	95	2	15	0	9	0	2	1
New York, N. Y	14	1	5	4	200	37	83	0	318	0	2	48
Omaha, Nebr	0	0		0	5	0	5	0	7	0	0	4
Philadelphia, Pa	2	0	4	5	1,376	10	36	0	101	0	3	59
Pittsburgh, Pa	0	0		1	6	3	11	[3]0	11	0	0	24
Portland, Maine	0	0		0	0	7	3	0	4	0	0	3
Providence, R. I	0	0	10	0	11	7	6	0	8	0	0	24
Pueblo, Colo	0	0		0	2	0	2	0	3	0	0	8
Racine, Wis	0	0	1	1	12	0	0	0	59	0	0	1
Reading, Pa	0	0		2	138	0	2	0	1	0	0	10
Richmond, Va	0	0	1	1	9	2	4	0	1	0	1	4

See footnotes at end of table.

City reports for week ended February 20, 1943—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza Cases	Influenza Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
Roanoke, Va.	0	0	-----	0	0	0	1	0	0	0	0	1
Rochester, N. Y.	0	0	-----	0	11	0	5	0	14	0	0	24
Sacramento, Calif.	1	0	-----	0	6	5	1	0	1	0	0	1
Saint Joseph, Mo.	0	0	-----	0	0	0	2	0	0	0	0	1
Saint Louis, Mo.	3	0	3	2	21	11	24	0	33	0	0	7
Saint Paul, Minn.	0	0	-----	0	1	1	4	0	1	0	0	54
Salt Lake City, Utah	0	0	-----	0	77	2	3	0	28	0	0	6
San Antonio, Tex.	2	0	2	1	3	0	4	0	3	0	0	9
San Francisco, Calif.	2	0	4	0	46	4	14	1	21	0	0	16
Savannah, Ga.	1	0	23	4	0	0	2	0	0	0	0	4
Seattle, Wash.	1	0	-----	2	72	0	4	1	3	0	0	19
Shreveport, La.	1	0	-----	0	0	0	6	0	0	0	0	0
South Bend, Ind.	0	0	-----	0	6	0	0	0	1	0	0	0
Spokane, Wash.	0	0	-----	0	159	0	6	0	0	0	0	1
Springfield, Ill.	0	0	-----	0	0	0	1	0	0	0	0	0
Springfield, Mass.	0	0	-----	0	3	0	0	0	103	0	0	0
Superior, Wis.	0	0	-----	0	1	0	3	0	0	0	0	6
Syracuse, N. Y.	0	0	-----	0	14	2	4	0	17	0	0	7
Tacoma, Wash.	1	0	-----	0	32	1	0	0	0	0	0	0
Tampa, Fla.	0	0	-----	0	2	0	2	0	1	0	0	0
Terre Haute, Ind.	1	0	-----	0	1	0	1	0	1	0	0	0
Topeka, Kans.	0	0	-----	0	47	0	6	0	4	0	0	2
Trenton, N. J.	0	0	2	0	35	0	6	0	10	0	0	0
Washington, D. C.	1	0	4	1	80	2	13	0	24	0	0	10
Wheeling, W. Va.	0	0	-----	0	1	0	4	0	2	0	0	3
Wichita, Kans.	1	0	1	0	14	0	9	0	3	0	0	6
Wilmington, Del.	0	0	-----	0	10	2	9	0	1	0	0	5
Winston-Salem, N. C.	0	0	-----	0	0	0	3	0	1	0	0	14
Worcester, Mass.	0	0	-----	0	123	0	8	0	18	0	0	2
Total	68	3	282	41	4,254	146	553	8	1,508	0	10	878
Corresponding week 1942	70	4	293	38	2,963	23	477	6	1,392	0	11	1,058
Average, 1938-42	100	------	968	[1] 92	[2] 4,100	------	[1] 606	------	1,433	23	18	1,021

[1] 3-year average, 1940-42.
[2] 5-year median.
[3] The report of 10 cases of poliomyelitis in Pittsburgh for the week ended January 16, 1943, (Public Health Reports for Feb. 5, 1943, p. 242) was in error. There have been no cases reported in Pittsburgh this year.

Dysentery, amebic.—Cases: Dallas, 1; New York, 12.
Dysentery, bacillary.—Cases: Birmingham, 1; Buffalo, 2; Charleston, S. C., 2; Los Angeles, 6; New Haven, 1; New York, 92.
Dysentery, unspecified.—Cases: San Antonio, 1.
Tularemia.—Cases: Mobile, 1.
Typhus fever.—Cases: Los Angeles, 1; Nashville, 1.

PLAGUE INFECTION IN TACOMA, WASH.

Plague infection has been reported proved in tissue and fleas from rats (*R. norvegicus*) taken in industrial sections of Tacoma, Wash., as follows: February 8, in a specimen of tissue from 2 rats, and in a pool of 41 fleas from 72 rats; February 15, in 2 pools, respectively, of 33 fleas from 36 rats and 52 fleas from 51 rats.

FOREIGN REPORTS

BRAZIL

Para (Belém)—Amebic dysentery.—Information dated February 4, 1943, states that during the week an outbreak of amebic dysentery occurred in Para, Brazil, where at least 100 cases were reported at Val de Cans Airport and a considerable number of cases in the city proper. The source of infection has not been definitely established, but the outbreak is thought to be well under control.

CANADA

Provinces—Communicable diseases—Week ended February 6, 1943.—During the week ended February 6, 1943, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox	2	6		142	342	38	42	30	64	666
Diphtheria	2	20		38		5		4		69
Dysentery (bacillary)				122						122
German measles		1		9	12		12	1	5	40
Influenza		12			4	2			14	32
Measles		5	4	123	155	32	139	13	96	567
Meningitis, meningococcus			1	3	6				3	13
Mumps		117	2	48	1,149	124	147	90	145	1,822
Poliomyelitis				3						3
Scarlet fever		11	8	124	110	9	36	18	36	352
Tuberculosis (all forms)		3	4	88	49	16	23	13	10	206
Typhoid and paratyphoid fever		2		12	1	1				16
Undulant fever				2				2		4
Whooping cough		6	1	172	93	38	2	79	29	420

JAMAICA

Notifiable diseases—4 weeks ended February 13, 1943.—During the 4 weeks ended February 13, 1943, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	2	4	Puerperal fever		2
Diphtheria	3	2	Tuberculosis	36	73
Dysentery	1	1	Typhoid fever		18
Leprosy		6	Typhus fever	2	

SWEDEN

Notifiable diseases—December 1942.—During the month of December 1942, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	5	Poliomyelitis	47
Diphtheria	235	Scarlet fever	2, 528
Dysentery	60	Syphilis	52
Epidemic encephalitis	1	Typhoid fever	8
Gonorrhea	1, 242	Undulant fever	5
Paratyphoid fever	4	Weil's disease	2

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual prevalence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

(Few reports are available from the invaded countries of Europe and other nations in war zones.)

Plague

Palestine—Tel-Aviv.—During the week ended January 30, 1943, one case of plague was reported at Tel-Aviv, Palestine.

Typhus Fever

Afghanistan.—According to information dated January 8, 1943, for the year 1942 a total of 2,439 cases of typhus fever were hospitalized in Government hospitals in Afghanistan, of which 487 died. It was stated that these figures would probably be doubled if nonhospitalized cases were included. It is estimated that about 5 percent of the population of Kabul and Jalalabad had typhus fever in 1942. The mortality rate of about 15 percent is said to be unusually low. Prisons and barracks are the most infected places. A report dated February 16, 1943, states that since January 8 over 400 new cases of typhus fever had been admitted to the military hospital in Kabul. Additional information dated February 22, 1943, states that an epidemic of typhus fever has broken out in two small villages near the British Legation on the outskirts of Kabul. Over 120 cases are said to have occurred within a week.

Bulgaria.—For the period January 14 to February 3, 1943, 136 cases of typhus fever were reported in Bulgaria.

Germany.—A report dated February 24, 1943, states that for the first 9 months of 1942 a total of 2,043 civilian cases of typhus fever were reported in German territory as of 1919, as compared with 395 cases for the year 1941. The numbers of cases reported by quarters for 1942 are as follows: First quarter, 418; second quarter, 1,151;

third quarter, 474. The distribution of cases reported for 1942 shows a high prevalence in industrial areas instead of the prevalence in 1941 in provinces bordering Poland.

Rumania.—For the period February 2–15, 1943, 349 cases of typhus fever were reported in Rumania.

Yellow Fever

Colombia—Intendencia of Meta.—On February 2, 1943, one death from yellow fever was reported in Intendencia of Meta, Colombia.

COURT DECISION ON PUBLIC HEALTH

Filled milk law upheld.—(Kentucky Court of Appeals; *Carolene Products Co.* v. *Hanrahan, Commonwealth's Atty., et al.*, 164 S. W. (2d) 597; decided November 28, 1941, rehearing denied October 23, 1942.) A Kentucky statute made it unlawful to manufacture for sale or sell or exchange any filled milk. Filled milk was defined as "any milk, cream, or skimmed milk, whether or not condensed, evaporated, concentrated, powdered, dried, or desiccated, to which has been added, or which has been blended or compounded with, any fat or oil other than milk fat, so that the resulting product is an imitation or semblance of milk, cream, or skimmed milk, whether or not condensed, evaporated" etc. The plaintiff company brought an action seeking a declaration of rights and injunctive relief against threatened multiplicity of prosecutions under the act. It was alleged by the plaintiff that its products were manufactured by adding refined bland coconut oil and vitamin A and vitamin B concentrates to pure sweet skimmed milk and that thereafter this mixture was evaporated in the same manner as sweet whole or skimmed milk is evaporated in the manufacture of evaporated milks and the product canned by modern and approved processes. The defendants demurred to the petition, thus admitting as true all facts well pleaded but denying that such facts constituted a cause of action. The demurrer was sustained by the trial court and the plaintiff appealed. The contentions made by the plaintiff before the Kentucky Court of Appeals were (1) that the filled milk act did not apply to the plaintiff's products, and (2) that the act, if construed to so apply, was unconstitutional because violative of the fourteenth amendment to the Federal Constitution and of certain specified sections of the State constitution.

The appellate court considered first the matter of constitutionality and, with reference to the act offending the Federal Constitution, said that it thought that this question had been definitely set at rest by the case of *United States* v. *Carolene Products Co.*, 304 U. S. 144 (1938), in which the Supreme Court of the United States held constitutional a Federal act which was almost identical with the Kentucky act. Under that decision the fact that articles within the prohibited class were wholesome and nutritive did not render the Federal act unconstitutional for the reason that Congress was justified in determining that prohibition of the entire class was necessary. By taking judicial notice of the report of the Congressional committee to the effect that prohibition of all the products involved was necessary because of the impracticability of separating the good from the bad, the supreme court satisfied itself of the existence of a rational basis for the legislation. According to the court of appeals, the fact that, since the supreme court decision, the plaintiff had added vitamins to its product and that there had been no Congressional or legislative investigation or report on the subject in no way detracted from the decision's binding effect. The addition of the vitamins only had the effect of making the plaintiff's product more wholesome and nutritive, and the wholesome and nutritive character of the product was assumed by the supreme court when the decision was reached.

With respect to whether the Kentucky act violated the State constitution the court of appeals said that it was in thorough accord with the reasoning of the supreme court decision, even though such decision was not binding as concerned this question, and was of the opinion that the act was not violative of the State constitution, since the aggregate effect of the restraints imposed on State legislative action by the State constitutional provisions relied on was in substance the equivalent of the 14th amendment insofar as the instant controversy was concerned.

Nor was the act's constitutionality rendered any less certain by the plaintiff's allegations (1) that the legislation was unnecessary because the plaintiff alone was engaged in marketing the products involved, and (2) that the statute was passed in disregard of the findings of the State board of health. "There was a rational basis supporting the legislative action, as heretofore indicated * * *." It was the court's conclusion that the act was a reasonable exercise of the police power.

Coming to a consideration of the plaintiff's other contention that the act did not apply to plaintiff's products, the appellate court took the view that such products were filled milk within the meaning of the act. "When considered in their entirety, appellant's allegations are insufficient to show that its product is not in semblance of milk but, on the contrary, establish this to be a fact." Also decided adversely to the plaintiff were its arguments (1) that its products were so different from others of the prohibited class as to be without the reason for the prohibition, and (2) that the public had been fully informed as to the products and that there was no possibility of fraud in connection with their sale. The court stated that, as already indicated, the wholesome and nutritive qualities of the products did not remove them from the prohibited class and that, as far as fair labelling was concerned, it had to be assumed that the legislature had determined that prohibition of false labelling would fail to furnish adequate protection and that, therefore, complete prohibition, not regulation, was required to accomplish the legislative purpose.

The judgment of the trial court dismissing the petition was affirmed.

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