

817. These vessels on the rivers frequently passed towns and landing places where supplies could be obtained and did not require the same equipment and stores as are needed for sea-going vessels. In addition to wards each of these vessels had rooms for officers and attendants, store-rooms of various kinds, kitchen and special diet kitchens, pantries, dumbwaiters, linen rooms, dispensary, operating room, bath, water-closets, etc. Water was supplied from a refrigerating apparatus by faucet in convenient places. Medical officers, hospital stewards, ward masters, and nurses were detailed in sufficient numbers. The medical officer or surgeon-in-chief was in absolute control and responsible for the administration. Figs. 1196-1199, in Vol. III. of the former edition of this HANDBOOK, show the arrangement of these boats, the *January* being taken as a type.

In May, 1862, the Medical Director of the Army of the Potomac asked for hospital steamers sufficient to carry 5,000 patients; from this time water transportation was recognized as a method of moving the disabled and a medical officer was placed in charge, known as "medical director of transportation." During the war it is said that as many as thirty well-fitted hospital steamers were used at different times in the East and West.

The best ocean transport of those times was the *J. K. Barnes*. She was a side-wheel steamer, 1,400 tons, 288 feet in length, 35 feet 2 inches in width, 22 feet 9 inches depth of hold. Her total capacity was 477 patients; she was used but ten months, during which time she carried 3,655 patients. Her plans may be seen in Figs. 1200-1202, of Vol. III. of the former edition of this HANDBOOK.

During the recent South African war a hospital ship known as the *Maine* was fitted up by American women. This vessel is a duplicate of the *Missouri* and her equipment was similar. Her operating room was complete, and said to be the best in South Africa. She had accommodations for 218 patients, an x-ray machine, electric lights, fans, and diet kitchens, a completely equipped laundry, a steam disinfecting apparatus, refrigerating plant, etc. Her hospital force consisted of six medical officers, five women nurses, eleven male nurses, ten orderlies, and two apothecaries.

The *Trojan*, *Spartan*, and *Prince of Wales* were other ships fitted as hospital transports; the capacity of all four being about one thousand patients. These ships participated in the China campaign of the allied troops in 1900. During this campaign the Japanese, Germans, and French also had hospital transports, but the details of their equipment cannot be ascertained. It is said, however, that our own hospital ships, especially the *Relief*, were far superior to all others in equipment and facilities for caring for the disabled at sea.

Alfred E. Bradley.

HOT BORATE SPRING.—Lake County, California. This remarkable spring is situated near the town of Lakeport and on the edge of Clear Lake. The spring flows 18,000 gallons per hour, and has a temperature of 124° F. (July, 1888). On analysis it is found to contain the following mineral ingredients:

ONE UNITED STATES GALLON CONTAINS:	
Solids.	Grains.
Sodium chloride	86.82
Sodium bicarbonate	75.40
Sodium biphosphate	201.75
Potassium iodide	.12
Potassium chloride	Trace.
Potassium bromide	Trace.
Potassium bicarbonate	4.26
Ammonium bicarbonate	96.20
Magnesium bicarbonate	.73
Calcium sulphate	Trace.
Alumina	2.04
Silica	7.93
Organic matter	9.07
Total	484.35

Free carbonic acid gas, 30.75 grains.

An analysis by Dr. Moore shows a much smaller percentage of borax—103 grains per gallon. The spring is remarkable on account of the excessive amount of borax and ammonium salts which it contains. Professor Whitney states that the water is changeable both in its rate of flow and in its proportion of mineral ingredients. It is used in Lakeport and vicinity for kidney and bladder troubles. It is claimed that the water has dissolved a stone in the bladder.

James K. Crook.

HOT SPRINGS, BATH COUNTY, VIRGINIA.

Post-Office.—Hot Springs. Hotels and cottages. ACCESS.—Via Hot Springs Branch of the Chesapeake and Ohio Railroad. Connection is made at Covington, Virginia. Through sleepers to Hot Springs are run in the summer. The Virginia Hot Springs Company run a line of first-class stages to the Warm Springs, five miles north, and to the Healing Springs, three miles south of the terminus at Hot Springs. The valley containing the Hot, Warm, Sulphur, and Healing springs of Virginia is located in the heart of the Appalachian Mountains, in the first of several lofty ranges that lie east of and parallel with the main Allegheny divide. Some two miles in width, the valley extends for more than a dozen miles between towering mountains, from the crests of which, 4,000 feet above the sea, villages and farm-houses with intervening stretches of country, over 1,500 feet below, are spread out to the view of the observer as a beautiful panorama. The visitor can drive for miles over new boulevards and carefully constructed roads. The streams formed by the various springs in the valley have pierced the western range and divided it into a series of five tall distinct mountains, narrowly separated from each other by chasms and gorges. Meandering roads and romantic bridle-paths and footways, bordered with ferns and mosses, penetrate these rugged and secluded passes. The altitude of the valley (2,300 feet) and its protection by the surrounding mountains from wind-storms and sudden changes combine to produce a temperature safe in winter and delightful all the rest of the year. The air is clear and dry, mists and fogs being rarely seen. The highest summer temperature observed during a series of recent observations was 87° F., the monthly mean for June, July, and August being 68.5° F.

The Hot Springs have been resorted to for three generations of white men. Physicians of wide reputation and abundant experience have pronounced them equal to the most effective similar waters of the European spas. The drinking-waters are also of great variety, and besides the hot springs there are magnesia, sulphur, soda, and alum springs, each of which is widely recommended for medicinal purposes. The bath-house at Hot Springs is a substantial four-story structure of stone and brick, built in the Colonial style of architecture at a cost of over \$100,000. It is fitted up in a sumptuous manner with all the requisites of a modern institution of this kind. All varieties of baths will be found here. The old bath-house has been converted into two large swimming pools, one each for gentlemen and ladies. The hotels at Hot Springs are the "Homestead," a charming house of the true old Colonial style, which has been entirely remodelled and modernized, and the "Virginia," a new hotel built in the latest fashion, and supplied with every comfort and convenience. This hotel is kept open all the year. Ten new cottages cluster close by, each with a broad porch and veranda. This hotel is connected with the passenger station, but so arranged that no noise or annoyance is caused by railroad trains. The waters of the Hot Springs have been analyzed by several well-known chemists. The Spout, Boiler, and Sulphur Springs were examined by Professor Clarke, of the Smithsonian Institution in 1884, and the last two, together with the Soda and Magnesia springs, have recently been analyzed by Messrs. Dickoré and Morgan, of Cincinnati, Ohio. The several results in the examinations of the same waters have been practically identical. Following are specimen analyses:

BOILER (BATH) SPRING.
(Analysis by Dickoré and Morgan.)

ONE UNITED STATES GALLON CONTAINS:	
Solids.	Grains.
Magnesium sulphate	8.48
Magnesium carbonate	3.02
Calcium sulphate	1.89
Calcium carbonate	23.08
Sodium sulphate	3.68
Potassium sulphate	.69
Potassium chloride	.54
Silica	1.95
Total	43.33

Temperature, 108° F.

SODA (DRINKING) SPRING.
(Analysis by Dickoré and Morgan.)

ONE UNITED STATES GALLON CONTAINS:	
Solids.	Grains.
Magnesium sulphate	5.90
Magnesium carbonate	2.61
Calcium sulphate	3.22
Calcium carbonate	17.55
Sodium sulphate	2.02
Potassium sulphate	.88
Potassium chloride	.21
Silica	.49
Total	32.88

Temperature, 74° F.

SPOUT BATH SPRING.
(Analysis by Professor Clarke.)

ONE UNITED STATES GALLON CONTAINS:	
Solids.	Grains.
Silica	1.37
Alumina	.15
Potassium chloride	.54
Potassium sulphate	1.09
Sodium sulphate	1.54
Calcium sulphate	8.32
Magnesium carbonate	7.02
Calcium carbonate	13.96
Total	34.09

Temperature, 106° F.

These waters resemble considerably in chemical composition those of the Hot Springs of Arkansas. They also resemble those of Aix-les-Bains in France, the French spring having a somewhat higher temperature. Both for internal use and for bathing the waters of the Virginia Hot Springs have gained a wide celebrity in the treatment of many of the ills to which human flesh is heir. The baths here are especially to be commended. The excellent thermal waters with the elegant and elaborate methods of using them may be expected to render all the service in diseased states which can be accomplished by this means. It is especially desired that all those who visit the springs with the intention of using the baths consult a resident physician in regard to the use of the waters.

The *Healing Springs Hotel*, three miles from the railway station at Hot Springs, is reached by a comfortable line of stages. It is connected by telephone with the depot and with the hotels at Hot and Warm Springs. No place in the Virginia Mountains is more pleasant or picturesque. The air is pure, dry and bracing, the temperature being uniform and delightful, throughout the season. The rooms in the hotel and cottages are large and cheerful; they are kept scrupulously clean, and the management throughout is charmingly homelike and in harmony with the surroundings. The supply of water is abundant, being derived from four springs of essentially the same character, and is beautifully bright and crystalline. Its temperature is uniformly 85° to 88° F. The bathing accommodations have been greatly extended and otherwise improved by the erection of a new bath-house, and by the addition of several apartments to those already built. The waters of these springs, as will be seen by the analyses, are almost identical with those of Schlangenbad and Ems in Germany. These were made by Prof. William E. Aiken, of the University of Maryland:

ONE UNITED STATES GALLON CONTAINS:

Solids.	HEALING SPRINGS.	
	Old Spring. Grains.	New Spring. Grains.
Calcium carbonate	17.90	18.72
Magnesium carbonate	1.24	1.96
Iron carbonate	.07	.28
Calcium sulphate	1.32	1.26
Magnesium sulphate	7.25	7.39
Potassium sulphate	2.21	2.53
Iron sulphate	.18	.10
Ammonium sulphate	.23	.23
Potassium chloride	.25	.25
Potassium carbonate	.24	.29
Sodium chloride	.27	.29
Silicic acid	1.82	.88
Organic acid (cremic?)	.86	.88
Carbonic acid	2.20	2.29
Sulphureted hydrogen	Trace.	Trace.
Bromine	Trace.	Trace.
Sodium	Trace.	Trace.
Total	38.56	38.00

The bubbles of gas that rise from the springs contain in 100 parts: nitrogen gas, 97.25; carbonic acid gas, 2.75. These waters have proved valuable in a considerable range of diseases; they are diuretic, somewhat laxative, and tonic in their effects upon the system. The best results have been observed in chronic congestion of the liver, in irritability of the bladder from cystitis, in enlarged prostate, etc., in the early stages of Bright's disease, and in debilitated states generally.

The *Warm Springs* are located five miles north of the railroad terminus at Hot Springs. The court-house and county buildings are located here. The springs are picturesquely located in a grand old grove and lawn in the centre of a tract of about 1,800 acres, which in width includes the crests of the mountains on either side of the valley. The remarks concerning the scenery, atmospheric conditions, etc., in the description of the Hot Springs apply with equal force to the Warm Springs. An excellent hotel, built in the Colonial style, charmingly situated and well-kept, will be found. There are also a number of comfortable cottages. For three generations the springs have been visited by people from all over the United States, with not a few from foreign countries, and even when it involved a long and tiresome journey in primitive stage coaches they were a favorite resort of the wealth and fashion of Virginia and the South. The grand boulevard recently completed between the Hot and Warm Springs is a magnificent driveway, and passengers will be transported from the Hot Springs station in comfortable carriages in the brief space of forty minutes after a most enjoyable ride. The gentlemen's bath is an octagon forty feet in diameter and holds 43,000 gallons of water. The ladies' bath is circular in shape, with a capacity of 60,000 gallons. These pools are supplied from separate springs discharging upward of 60,000 gallons of water per hour, at a temperature of 96° F., which, charged with myriads of bubbles of sulphureted hydrogen gas, rises naturally from the bottom of the pools, affording a delightful and luxurious bath. There are also private baths of various kinds, and ample provision for the comfort and convenience of bathers. An old analysis of one of the springs, made by Prof. A. A. Hayes, shows the following solid constituents:

ONE UNITED STATES GALLON CONTAINS:	
Solids.	Grains.
Calcium carbonate	5.22
Calcium sulphate	14.53
Potassium sulphate	1.38
Ammonium sulphate	.36
Sodium silicate	1.72
Magnesium silicate	2.50
Iron crenate	6.92
Carbonic acid	32.63
Total	32.63

Gases: Sulphureted hydrogen, carbonic acid, and nitrogen.

The water is limpid, has a styptic taste, and the odor of sulphureted hydrogen. The action of the water is sedative, as a rule. Immersion in the bath gives rise to a sense of voluptuous repose and as the hand passes over the body the surface presents a velvet smoothness, as though anointed with some delicate ointment. This unctuous quality has also been observed in the baths of Moltz, in France, and in those of Wildbad near Stuttgart. It has been variously ascribed by European writers to the presence of silicates, to the monosulphuret of sodium, and to an organic matter, the last being the most probable cause. These waters, by reason of their soothing effects, are applicable in chronic and subacute rheumatism, gout, neuralgia, congestive amenorrhœa and dysmenorrhœa, and in nephritic and calculous disorders. The spring bath, arranged with an ascending douche, is especially useful in the type of dysmenorrhœa named. The baths are also beneficial in the squamous skin affections.

James K. Crook.

HOT SPRINGS, FALL RIVER COUNTY, SOUTH DAKOTA.

POST-OFFICE.—Hot Springs. Numerous hotels and cottages.

ACCESS.—Via Fremont, Elkhorn, and Missouri Valley Railroad (branch of the Chicago and Northwestern system), or via the Chicago, Burlington and Quincy Railroad (Burlington route) direct to Hot Springs, arriving at the same depot by either route. This magnificent new spa is located in the heart of the Black Hills at an elevation of 3,400 feet above the sea level. The advantages of Hot Springs as a health resort are numerous. First as to the topographical features. The scenery in and adjacent to the place is varied and delightful. The lofty pine-clad hills, grand canyons, rippling streams, and beautiful falls of the Minnekahta and Cheyenne, make up a group of attractions difficult to excel.

Second as to climate. By reason of certain peculiar circumstances of location this resort is favored by very mild, equable atmospheric conditions. Summer days are followed by evenings of delicious coolness, while the autumns are unusually pleasant. During the winter months the temperature has maintained an average of 42° F. above zero for the last four years. Situated in the Minnekahta valley and sheltered on all sides by heavily timbered hills, cold winds and sudden changes of temperature are practically unknown. The winter temperature in the valley is from 20° to 25° higher than in localities only a dozen miles distant. It is said that the protection afforded by the hills is supplemented in no small degree by the millions of gallons of hot water flowing through the valley.

The visitor will find the accommodations prepared for his entertainment on a par with the charming scenery and genial climate. The largest hotel, the Evans, is constructed and equipped throughout in accordance with the latest and most approved methods. It is fully up to the standard of the best hostleries of the day. Other excellent hotels are the Gillespie, the Hot Springs, the Catholicicon, the Davis, and the Parrott House. Cottages are also on hand for those who desire them. The hills afford attractive spots for camping out.

Adjoining the Evans House, and in full keeping with the elegant and elaborate appointments, is the Evans Sanitarium, containing sixty bath-rooms and embracing all varieties of baths. The Stewart Sanitarium, recently completed, also affords facilities for all kinds of bathing, including an excellent plunge bath. The Catholicicon Sanitarium, now under construction, will add another to the attractive retreats of the Hot Springs. This structure, with the bath-house, will have a measurement of 100 x 75 feet, and will contain over 100 bath-rooms. The plunge bath is one of the prominent features of Hot Springs. It is constructed of stone, wood, iron, and glass and has 100 dressing-rooms. The building is 75 feet wide and 250 feet long, heated by steam and lighted by electricity. The water is at a natural temperature of 96° F. the year round. It increases in depth from three feet at one end to eight feet at the other. The springs

at this resort are eight in number. The "Minnekahta" is the name given to a great Indian spring, the word being a synonym for health, pleasure, and recreation. It is said that the waters of this spring were in use by the Sioux and other tribes long before the approach of civilization. The natural temperature of this spring is 98° F. It furnishes the drinking fountain of the Evans House, the Evans bath-house, and the Minnekahta bath-house. An analysis by Prof. Charles B. Gibson, of Chicago, resulted as follows:

ONE UNITED STATES GALLON CONTAINS:	
Solids.	Grains.
Magnesium sulphate.....	4.32
Sodium sulphate.....	25.62
Potassium sulphate.....	Trace.
Iron peroxide.....	Trace.
Sodium chloride.....	13.79
Potassium chloride.....	16.32
Calcium sulphate.....	2.46
Silica.....	2.46
Total.....	62.51

These waters are perfectly transparent, have a pronounced alkaline reaction, and contain no organic matter. Following are analyses of two of the other springs:

ONE UNITED STATES GALLON CONTAINS:		
Solids.	Mammoth Mineral Spring, Grains.	Lakatah Spring, Grains.
Sodium sulphate.....	23.26	8.82
Potassium sulphate.....	5.63	3.33
Calcium sulphate.....	36.11	16.29
Calcium chloride.....	5.59	5.50
Ammonium chloride.....	.02	.05
Magnesium chloride.....	4.11	3.14
Calcium phosphate.....	.30	.31
Magnesium nitrate.....	.30	.15
Magnesium phosphate.....	.10	.10
Magnesium carbonate.....	3.51	3.04
Iron sesquioxide.....	.15	.26
Alumina.....	.27	.02
Silica.....	1.55	1.83
Organic and volatile matter.....	12.11	8.05
Total.....	92.71	53.79

These waters are of the sulphated-saline and calcic variety. According to a report of the National Association of Railway Surgeons, which visited the resort several years since, "treatment by the Hot Springs water may be said to stimulate all the secretions and organic functions; to promote digestion and assimilation, and to favor tissue metamorphosis and excretion, thereby relieving internal congestions, stimulating blood-making, increasing the appetite, and favoring new and healthy tissues at the expense of the old and inactive." This treatment may, therefore, be confidently recommended in "gout and rheumatism after the inflammatory stage; in neuralgia, especially when depending upon gout; in metallic or malarial poisoning, paralysis not of organic origin, and neurasthenia; in the early stages of Bright's disease; in syphilis and functional diseases of the liver and stomach; in catarrhal affections of the respiratory tract . . . and in chronic diseases especially of the squamous variety."

Hot Springs is the county seat of Fall River County, and is located about seventy miles south of Deadwood. The town has a permanent population of 3,000. Its proximity to extensive pine forests, in addition to the favorable features of location above mentioned, assists in preserving a mild and agreeable climate, and has brought the resort into much favor with persons afflicted with hay fever, asthma, and incipient phthisis.

James K. Crook.

HOT SPRINGS, GARLAND COUNTY, ARKANSAS.

POST-OFFICE.—Hot Springs. Hotels: Arlington, Eastman, Pullman, Avenue, Park, Bloomington, Josephine, etc. According to Cutler's Guide to the Hot Springs, there are as many as five hundred hotels and boarding-houses in the city.

ACCESS.—Via the Iron Mountain Route, the only line running to the Hot Springs. All lines leading into St. Louis connect in the Grand Union Depot with express trains of the Iron Mountain Route. From the south the best route is via Cairo, Columbus, Memphis, or Texarkana, connections being made at each of these points with Iron Mountain express trains. The springs are 55 miles southwest of Little Rock, the State capital, and 22 miles from Malvern, where trains on the Iron Mountain connect with the Hot Springs Railroad leading directly to the springs. Sleepers come through without change at Malvern. The Hot Springs are situated on the Mountain Creek and in the valley of the same name. They issue from the western slope of the Hot Springs Mountain, a spur of the Ozarks, at an elevation of from 700 to 800 feet above the Gulf of Mexico. The mountains on either side attain an altitude of 1,200 feet. The climate in this region, as a general rule, is mild and balmy and not subject to extremes of either heat or cold. Sunstroke is unknown, and the summer nights are generally cool and pleasant, light blankets, as a rule, being required before morning. The pure mountain air and constant southerly breezes unite in forming a healthful and invigorating climate. The lowest temperature observed in 1891 was 16° F., the highest 98° F., the average for that year being 84° F., or somewhat higher than the average for a series of preceding years. The rainfall for 1891 was 70.86 inches.

These springs have been known and utilized as a health resort since early in the century, and during that time they have acquired an extended reputation in the treatment of certain diseases. A city of considerable size and containing numerous excellent hotels, sanitariums, bathing-houses, and public buildings has been developed about them. Some of the handsomer and more commodious bath-houses were erected at a cost of from \$10,000 to \$50,000. Among the more prominent of these are the Eastman, Park, Alhambra, Superior, Palace, Magnesia, Ozark, Horseshoe, Rammelsburger, Lamar, and Maurice pavilions. The discharge of water from the springs amounts to 335 gallons per minute, or 482,000 gallons per day. These waters are nearly all concentrated in large, air-tight tanks, built by the United States Government, and are sufficient to bathe 19,296 persons daily, allowing twenty-five gallons for each bath. The springs are now seventy-two in number, another having recently been added to the list, according to a late annual report of the local board of health. From the United States Engineer's Report to the Hot Springs Commissioners we obtain the following table of temperatures of the springs:

Number.	Temp. (Fahr.)	Number.	Temp. (Fahr.)	Number.	Temp. (Fahr.)
1	77.0°	25	111.0°	49	131.0°
2	76	26	106	50	145
3	124	27	127.5	51	144
4	124	28	145	52	143
5	80	29	80	53	144.5
6	103	30	134.5	54	146
7	115	31	147	55	122
8	121.5	32	124	56	133
9	122	33	140	57	128
10	121.5	34	120	58	Sipage.
11	105	35	135	59	137
12	111	36	110	60	134.5
13	135.5	37	120	61	135
14	137	38	128	62	109
15	134	39	125.5	63	83
16	131	40	112	64	135
17	Sipage.	41	157	65	141
18	83	42	Sipage.	66	87
19	84	43	144	67	Sipage.
20	83	44	Sipage.	68	131
21	106	45	111	69	83
22	122	46	Sipage.	70	89
23	125	47	144.5	71	94
24	113	48	91		

Highest temperature, 157° F.; lowest, 76° F.

Those marked "sipage" are intermittent. All others are constant and unvarying in heat and quantity. All

the springs on the east side of Hot Springs Creek flowing from Hot Springs Mountain, except one under the Rammelsburger bath-house, are hot. All on the west side, except the Alum spring, are cold. No complete analysis of the waters seems to have been made since the now some what antiquated one made by Prof. E. Hills Larkin, in 1859. It is as follows:

ONE UNITED STATES GALLON CONTAINS:	
Solids.	Grains.
Magnesium carbonate.....	0.13
Calcium carbonate.....	3.97
Sodium sulphate.....	.38
Potassium sulphate.....	.23
Calcium sulphate.....	.11
Sodium chloride.....	.01
Calcium silicate.....	.46
Sodium.....	Trace.
Bromium.....	Trace.
Iron sesquioxide.....	.10
Alumina.....	.45
Silica.....	1.87
Organic matter.....	.70
Water (?).....	.14
Total.....	8.55

The water also contains a considerable quantity of free carbonic acid. Persons taking the baths here should always do so under the supervision of one of the local physicians. Those affected with organic disease of the heart or recognizable physical signs of consumption are not allowed to bathe, as the thermal action of the water is liable to be prejudicial to such cases. If the lungs are but slightly involved, careful bathing may be permitted. Furthermore, cases of simple cardiac palpitation are not excluded. As each case must be treated on its merits, and as detailed instructions are given by the local physician, it is unnecessary here to enter into a minute description of the bathing process at Hot Springs. Suffice it to say that patients are usually (not invariably) required to bathe six minutes in water at 96° to 100° F., two to six minutes in the vapor bath-rooms, and five to twenty minutes in blankets according to the time required to induce perspiration. The course here has been found especially beneficial in diseases of the genito-urinary system, especially syphilis, and in gout, rheumatism, and neuralgia. The baths are also recommended on high authority in various skin affections including eczema, psoriasis, urticaria, impetigo, prurigo, rupia, etc.

The city of Hot Springs itself is well drained and well lighted, and has ample police and fire protection. It now claims a population, resident and visiting, of 21,000. About 50,000 persons visit the place annually, and this number is ever on the increase. The United States Government Army and Navy Hospital, recently erected, cost \$200,000. It is said that the Arlington Hotel, with its bath-house attached, will have cost over \$500,000 when completed. Among other mineral springs within the limits of the city of Hot Springs, or in the neighborhood, are the following: Allen's Alterative Spring, situated on Central Avenue, in the heart of the city; Gillen's White Sulphur Springs, located three miles from Hot Springs; Mountain Valley Springs, situated twelve miles north of Hot Springs, at the foot of Blakely Mountain, in a beautiful Valley extending well up into the mountain range; and Potash Sulphur Springs, located seven miles east of Hot Springs on the Hot Springs Railroad, one mile from Lawrence station.

James K. Crook.

HOT SPRINGS, MADISON COUNTY, NORTH CAROLINA.

POST-OFFICE.—Hot Springs. Mountain Park Hotel and boarding-houses.

ACCESS.—From the north and east by through Pullman cars on the Pennsylvania and Southern Railroads; from the west and northwest via Louisville, or via Cincinnati by the Queen and Crescent route to Knoxville, thence by East Tennessee, Virginia and Georgia Railroad (now a part of the Southern system). The location is 35 miles west of Asheville. The picturesque little village of Hot Springs is situated on the western boundary of North Carolina, only three miles from the Tennessee line, in the

heart of Big Smoky and Blue Ridge Mountains, on the banks of the beautiful French Broad River. The location is 1,700 or 1,800 feet above the sea level. The atmosphere is dry and invigorating and the climate mild and equable, there being a very large proportion of clear days. The springs have long been popular in the South, but in recent years they have come into high favor with Northern visitors also. They are about twenty in number, and the temperature of the waters ranges from 96° to 104° F. They form one of the only two groups of hot springs east of the Mississippi from Canada to the Gulf of Mexico. The following analysis was recently made by Professors Chandler and Pellew, of New York:

ONE UNITED STATES GALLON CONTAINS:	
Solids.	Grains.
Sodium chloride	1.08
Potassium chloride	.62
Potassium sulphate	1.62
Calcium sulphate	20.04
Magnesium sulphate	7.20
Ammonium bicarbonate	Traces.
Calcium bicarbonate	9.02
Iron bicarbonate	.10
Sodium phosphate	Traces.
Alumina	.04
Silica	3.14
Organic and volatile matter	Traces.
Total	42.86

The waters are quite similar to those of the Arkansas Hot Springs. Several of the springs have been encompassed in the limits of a fine, large bath-house, which is divided into sixteen separate pools, nine feet long by six feet wide and four to five feet in depth. The water pours into these pools directly from the springs. The visitor will find here all of the modern appliances and improvements which go to make up a first-class bathing establishment of the day. Guests are received at all times of the year. With its lovely mountain scenery, its exhilarating climate, its thermal waters, and many other natural attractions, combined with a hospitable and scientific management, this resort is well deserving of the wide reputation which it has obtained. *James K. Crook.*

HOT SULPHUR SPRINGS.—Middle Park, Grand County, Colorado.

Post-Office.—Hot Sulphur Springs. Hotels.
Access.—Via Union Pacific Railroad, 50 miles west from Denver to Georgetown; thence by daily stage 50 miles to springs, passing over the Snowy, or main range, of the Rocky Mountains, at 11,250 feet altitude.

These springs are located in the Middle Park on the banks of the Grand River, 7,625 feet above the sea level. This river forms the only drainage outlet to the Middle Park, a mountain basin 90 by 50 miles in extent. The enclosing peaks vary in height from 9,000 to 14,000 feet.

The prevailing weather in this section is clear, with westerly winds. There is considerable snow in winter, with a steady range of temperature of about 32° to 50° F., but occasionally dropping to 20° or 25° below zero. As many as twenty-two of the springs are well situated for improvement, but, according to the latest reports we have had, the baths now in use take water from only three or four. The exact flow of water cannot be stated, but it is believed to be greater than that of the Arkansas Hot Springs. A strong smell of sulphureted hydrogen pervades the neighborhood of the springs, and with a favoring wind may be noticed for a considerable distance up the valley. The channels through which the waters flow are lined with a soft yellowish-white, velvety substance having the odor of sulphur (probably a confervoid growth known as sulfuraria). This substance is evidently not a sediment, as it stands up like the pile of velvet or plush, and is not deposited in layers, while the water itself is as clear and bright as that of any mountain spring. It is said to be very palatable and to rest well on delicate stomachs. The following analyses were made some years ago by Professor Mallett, Jr.:

ONE UNITED STATES GALLON CONTAINS:

Solids.	No. 1—Red sulphur, temp. 100.3° F.		No. 2—Sulphur, temp. 91° F.		No. 3—Alum. sulphur, temp. 97.3° F.		No. 4—Little sulphur, temp. 119° F.		No. 5—Big sulphur, temp. 80.3° F.		No. 6—Bath sulphur, temp. 119° F.	
	Grains.	° F.	Grains.	° F.	Grains.	° F.	Grains.	° F.	Grains.	° F.	Grains.	° F.
Calcium carbonate	10.08	.....	.....	.....	8.46	3.68	6.43	.....	.....	.....	.....	.....
Sodium carbonate	58.57	50.45	20.37	29.42	39.37	22.42	.....	.....	.....	.....	.....	.....
Magnesium sulphate	.....	.....	5.26	.....	.....	.....	.....	.....	.....	.....	.....	.....
Magnesium carbonate	6.57	4.14	.....	.....	2.66	1.93	.....	.....	.....	.....	.....	.....
Sodium chloride	14.61	.....	13.29	12.18	13.97	13.11	.....	.....	.....	.....	.....	.....
Sodium sulphate	8.48	8.97	17.53	14.25	9.85	.....	.....	.....	.....	.....	.....	.....
Sodium silicate	.....	1.46	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Potassium sulphate	.50	.07	1.03	7.03	.96	1.69	.....	.....	.....	.....	.....	.....
Free carbonic acid	2.94	.....	8.42	.42	9.49	4.69	.....	.....	.....	.....	.....	.....
Silicic acid	.....	.....	.61	.54	1.31	1.36	.....	.....	.....	.....	.....	.....
Lithia	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace
Iron	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace
Ammonia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	101.75	65.09	66.51	74.96	80.56	74.81	.....	.....	.....	.....	.....	.....

The supply of water furnished for this analysis was insufficient to detect solids present in minute quantities. The lithia was discovered by means of a spectroscopic in the residue left after evaporating 300 c.c. of the water. No gaseous constituents are shown, as the analyses were made from bottled water, which had been standing for some time after removal from the springs, and it is believed that the sulphureted hydrogen (or other gas) which may have been present had either escaped or been oxidized to sulphuric acid.

The waters are recommended in cutaneous, hepatic, uterine, neuralgic, gouty, and rheumatic disorders, and for the manifestations of tertiary syphilis. As with thermal waters generally, they are contraindicated in most acute diseases, in tuberculosis and cancer, in fatty degeneration of any important structure, in aneurism or organic heart disease, and in predispositions to cerebral, gastric, pulmonary, or intestinal hemorrhage. There are two hotels at the Hot Sulphur Springs and several private houses where guests may obtain accommodations. *James K. Crook.*

HOUSE SANITATION.—The primary objects of habitations is to secure protection from the influence of heat and cold, rain, sunshine, and storms, and thus promote the health and happiness, and indirectly also, the morals and culture of the human race. The influence of sanitary houses cannot be overestimated. Dr. Villermé, in an investigation in France from 1821 to 1827, found that of the inhabitants of arrondissements containing 7 per cent. of badly constructed dwellings, 1 person out of every 72 died; of inhabitants of arrondissements containing 22 per cent. of badly constructed dwellings 1 out of 65 died; while of the inhabitants of arrondissements containing 38 per cent. of badly constructed dwellings 1 out of every 45 died. The history of improved dwellings for wage-earners shows everywhere a lessened death rate.

1. *Site.*—One of the first requirements of a sanitary home is a salubrious building site with a thorough exposure to air and sunlight; the top of a small elevation is always to be preferred, because of better natural drainage, purer air, freedom from dampness, and greater safety from inundations. Hippocrates and Vitruvius have referred in their writings to elevation as a desirable factor. The tops of the highest hills are usually too much exposed to the wind, and when chosen in certain climates the house should be protected by trees on the windward side; next to the top of a hill, the slopes should be preferred with a southern, southeastern, or southwestern exposure, on account of the advantages of sunlight and greater cheerfulness. Sites located in depressions which receive the natural drainage from surrounding slopes should be avoided, as they are not only damp, but likely to be surrounded with cold air and chilling mists. It is scarcely necessary to insist that so-called "made soil" and close proximity to marshes and injurious industrial establishments should be avoided.

Next to the topography of the site the character of the soil is important in its influence upon the healthfulness of the home. In a general way a gravelly, sandy, or chalky soil of good depth on a slope makes the best building site, provided soil pollution has not taken place and the deposit is not upheld by some impermeable stratum of clay or rock near the surface. Clay, marl, peat, and made soils should be avoided, because they are damp and the presence of organic matter, apart from favoring the proliferation of disease germs, also tends to pollute the ground air which is in constant communication and interchangeable with the atmosphere. (See Dr. Charles Smart's article on *Air*, p. 159, Vol. I.)

While rock affords easy facility for surface drainage, Mr. T. M. Clark (REFERENCE HANDBOOK OF THE MEDICAL SCIENCES, first edition, Vol. III., p. 423) regards it as very objectionable, as the ledges are full of seams through which water usually flows, and the trenching necessary for the interception of the springs formed in this way is so costly that it is usually neglected, and cellars built on rock are in consequence generally damp.

The temperature of the upper layers of soil, and hence also its dryness, depend largely upon its exposure to the sun; but it is well known that heat is variably absorbed and retained in different soils equally shielded or unshielded by vegetation. The following table by Schubler shows the capacity of different soils of absorbing and retaining heat—100 being assumed as the standard:

Land with some lime	100.0	Clayey earth	68.4
Pure sand	95.6	Pure clay	66.7
Light clay	76.9	Fine chalk	61.8
Gypsum	72.2	Humus	49.0
Heavy clay	71.1		

It will be seen, therefore, that sandy soils are warmer and clayey soils are not only damp but also very much colder.

Unfortunately, "ideal building sites" are within the reach only of comparatively few, and steps must therefore be taken to render objectionable sites as sanitary as possible; for the purpose of securing dryness, attention must be paid to the prompt removal of surface water and of subsoil water, the site should be drained by means of suitable drains four to six feet below the floor of the cellar or basement; indeed this precaution should not be neglected even in comparatively dry soils in order to limit the fluctuations of the ground water. In the preparation of the building site it is always desirable to excavate sufficiently deep to get rid of surface pollution, and it is perhaps needless to insist that in grading no soil containing the rubbish and wastes of human life and occupation should be used. In isolated buildings the surface drainage should be directed away from the house and the environments improved, with due regard to light and air, by either favoring the growth of vegetation or by removal and pruning of excess and overproduction.

2. *Building Material.*—The most common materials used in the construction of buildings are wood, brick, sandstone, limestone, granite, marble, iron, steel and other metals, glass, cement, mortar, asphaltum, and concrete. Of these materials, iron, zinc, copper, cement, slate, vitrified brick, and granite are quite impermeable, while others are not; depending upon the degree of their porosity and hygroscopic properties—according to Lang—

	Per cent. of water by volume.	Or, per cent. by weight.
Soft-burned bricks absorb	32.70	19.13
Hard-burned bricks absorb	28.20	16.50
Mortar burned bricks absorb	26.00	14.80
Portland cement absorbs	17.80	11.00
Limestone absorbs	17.70	7.26
Dolomite absorbs	14.70	6.50
Sandstone absorbs	10.80	4.34
Porphyry absorbs	2.75	1.05
Slate absorbs	.93	.35
Granite absorbs	.61	.23
Marble absorbs	.59	.22
Serpentine rock absorbs	.56	.22
Vitrified bricks absorb	.00	.00

A wall built of ordinary brick and mortar is capable of absorbing large quantities of water. Pettenkofer has calculated that 10,000 gallons are incorporated in a house built of 100,000 ordinary sized bricks. Bricks burned from clay containing much saltpetre and sulphate of sodium are especially objectionable, as a deposit is formed on the outside of the walls and moisture is attracted.

Galton, in his work on healthy dwellings, has shown that marble and limestone conduct more heat than an equal thickness of glass, bricks, plastering, and wainscoting. This appears to prove what experience has practically demonstrated, that frame and brick buildings are more readily warmed than marble and limestone structures of equal size and thickness of walls.

The hygienic importance of the properties of the building material cannot be underrated. Its porosity largely determines the interchange of air through the walls and the temperature of the rooms, thus greatly influencing ventilation and heating. The pores, as in the soil, contain either air or moisture; if air, the heat is conducted slowly, whilst water conducts heat readily. The hygroscopic properties of the material influence capillary attraction and diffusion of moisture, and consequently also the permeability and heat-conducting powers of the walls. Walls saturated with moisture absorb much heat and render transpiration of air impossible. It is for this reason that a house with damp walls appears much cooler to the inmates in summer than a dry one; but damp walls are decidedly objectionable, because they not only render the air of the room damp and impure and abstract more heat from the inmates, but also favor the growth of micro-organisms.

It will be readily understood that the application of paint, wall paper, and even calcimining will affect, if not completely check, the transpiration of air through the walls. For hot climates, frame and other forms of wooden buildings possess the advantage that they cool off very rapidly after the sun has disappeared, but because of their inflammability, short duration of life, and other sanitary disadvantages, such buildings cannot be recommended. But, as long as they are being extensively used in this country, special precaution should be taken in planning such buildings to prevent the entrance of cold winds at the junction of the wood walls and the stone underpinning. For this purpose Mr. Clark recommends a few courses of brick in mortar to be laid upon the cellar wall just behind the wooden sill; and as regards the exclusion of cold air through cracks or crevices in the cornice, he suggests the construction of a four-inch wall of brick and mortar on top of the plate which forms the top of the wall and supports the floor of the rafters, carrying it up until it meets the roof boarding. This wall, besides its use in keeping out cold winds, is also of some value in checking the spread of fire. Frame houses can be rendered cooler in summer and warmer in winter by double plastering inside and by covering the outside walls first with rough boards and a layer of Cabot's quilt and an exterior finish of clap-boards or shingles.

In spite of certain objections to brick, they are on the whole the most desirable material for ordinary dwellings; they resist fire better than any other material, and a hard-stock pressed brick of a light color is quite impermeable to moisture and makes a pleasing and hygienic outer wall. Next to brick, granite, marble, lime and sandstone are most frequently used, especially in connection with iron and steel in the construction of fireproof buildings. None of these rocks can resist the ravages of fire as well as brick; granite is better than marble, lime, or sandstone in this regard.

Micro-organisms in building material are especially numerous in the filler for ceiling spaces, which is frequently selected without regard to its source, old plaster and other rubbish being used; Emmerich has isolated the pneumococcus in such material, and Bonome found the bacillus of tetanus in mortar.

The latter being a mixture of sand and lime, the inference is that it was derived from sand, and that the spores were not destroyed by the action of the lime. Wall pa-