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A MODEL OF THE
METROPOLITAN DISTRICT
OF BOSTON



MASSACHUSETTS
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COMMONWEALTH OF MASSACHUSETTS

A DESCRIPTION
OF THE
TOPOGRAPHICAL MODEL
OF
METROPOLITAN BOSTON

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WITH ORIGINAL ILLUSTRATIONS

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THE MODEL OF THE METROPOLITAN DISTRICT OF BOSTON—Bird's-eye View from the East. [G. C. Curtis, Sc.]

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A DESCRIPTION OF THE TOPOGRAPHICAL MODEL OF METROPOLITAN BOSTON.*

CHAPTER I.

THE MODEL.

The relief showing the topography included within the Metropolitan District of Boston, exhibited at Paris, 1900, is a solid piece of plaster, thirty feet in circumference, weighing about a ton. The scale is approximately five inches to the mile, 1:14000, and a vertical multiplication of six, the area included being nearly five hundred square miles, with a diameter of twenty-five miles. Sea level is shown at mean low water, thus revealing the beaches, marshes, flats and tidal streams.

Boston proper is the centre, and the region within a radius of twelve and a half miles is included. It embraces the Middlesex Fells, Wakefield and Reading, with parts of Burlington, Lynnfield and Peabody, on the north; parts of Salem and Marblehead, all the islands in the harbor, with Nahant and Nantasket, on the east; the Blue Hills, Dedham, Quincy, Braintree and Hingham on the south, including portions of Cohasset, Randolph, Canton and Norwood; and on the west, Needham, Riverside, Waltham and Lexington, with parts of the towns of Dover, Wellesley, Weston and Lincoln.

The model is best viewed from the east, as in the frontispiece, looking from the open ocean up through the harbor to Boston proper. The season is supposed to be summer, the time of day morning. The coloring, though necessarily conventional, is founded on a natural classification and treatment, with values approximating those found under natural conditions.

The model is based on the most accurate and detailed map yet produced of the area, compiled by the author from about three hundred of the latest maps, including the United States Coast Survey, United States Geological Survey, Metropolitan Park Commission, town, city, private and original surveys, photographically reduced or enlarged from the manuscript.

In August, 1899, the model was begun, a two years' task being completed by working double hours. Twenty-one people averaged to help, including modellers, sculptors, painters, draughtsmen and engravers.

* In reading, open out frontispiece and map in back. A magnifying glass will improve detail.

Though skilled with their hands, they had previously done none of this work, and all had to be trained.

The size and detail distinguish the model, it being the largest of the kind yet produced in the United States, and by far the most accurate. Such novel features of detail as houses, railroads, trees, bridges, towers and rocks are located precisely as mapped, and modelled in most cases with the additional aid of original photographs. The detail can be judged from there being some 250 miles of railroad, with cuts, double and single tracks, bridges, embankments, carefully modelled to scale and graded; 300 miles of stream, modelled and painted; and 200,000 trees, each separate, and located from the best maps and original surveys, the pine trees being distinguished by both form and color from deciduous. There are 26,000 blocks, correctly located according to the maps, and 2,750 miles of streets, modelled to scale in both form and location, making a network over all the model, all the streets in Boston, as well as throughout the suburbs and country, having been similarly reproduced. Dwelling-houses to the number of 157,000 are located and built up from their mapped ground plans. It is believed that a method for the accurate location and modelling of trees, houses, streets, railroads and rocks has heretofore not been employed in America.

As the foundation for the model a huge marble-top table was built in a circle ten feet in diameter, upon which was scratched with a steel point the meridians and parallels of longitude and latitude at intervals of one minute. This gave a true and unchangeable foundation, without which, accuracy on such a model could not have been maintained.

The construction of the map was an undertaking in itself. Access was granted by the government departments at Washington to their manuscripts and several hundred separate photographs were made. These were fitted to the longitude and latitude on the table, thus forming a huge map, bringing together the Coast and Geodetic Survey charts, the Metropolitan Park Commission maps, the Geological Survey revised town work, and private surveys. These were all contoured to twenty feet, and in many of the reservation maps, contours with an interval of two feet were used.

A wax model was then constructed, based on an exact tracing of all the features from the maps. This was the longest part of the work, and took six months of constant labor from seven in the morning until ten in the evening. The wax model was adjusted to the surface of the marble table, which represented sea level, and moulds made from it. From these ten plaster casts were taken. It took two men to handle each of these pieces. The sections were remodelled and then put together on a large iron frame, and formed into one solid piece, weighing about a ton. The iron frame was made in the form of a reversed arch, of two and one-half inch steam pipe

for the rim and smaller pipe as ties. Over this was stretched a netting of three-sixteenth inch galvanized iron wire, upon which the pieces were set in a bed of plaster and tied to the frame with burlap and excelsior.

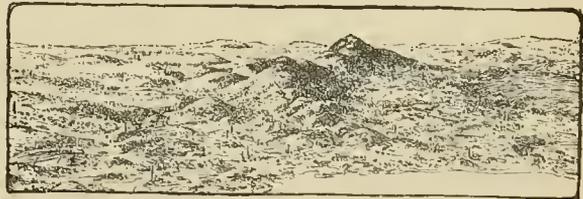
The next process was to dry the casts, and then came the painting; this, though seemingly a large undertaking, — since every road and house on the entire five hundred square miles had to be outlined, the roofs colored, the streams lined in and trees and fields painted, while the sea-shore line was cut out in blue, — being one of the shortest parts of the work.

The packing of this model presented a somewhat novel problem. Its surface was first protected by a strong wooden cover, about which a waterproof bag was placed, the whole being lifted by derricks into a packing case forty-two feet in circumference, and set within a system of car springs. This proved a successful method.

Few will realize the amount of work necessary to produce such a model, but a careful study reveals some of it. The city of Boston, with the gilded dome of the State House, its principal buildings, the Common frog pond, and the Public Gardens, with lake, bridge and even the walks, are shown. The suburban towns, whose location is described in chapter III., with church spires and clustered villages, stand up as light spots against the green fields and darker trees.

The Blue Hills, with heavily timbered slopes and granite cliffs and the observatory on the summit, loom up on the south-west edge highest of all. The Charles River winds in and out across the model, and the population is seen to cluster within

its wide valley in Boston, Cambridge, Somerville, Brookline, Watertown, Newton, Waltham, Dedham, Needham, *et al.* On the north the Middlesex Fells



CUT 2. — Blue Hills Range — from the East.

stands upon the plateau, studded with ponds and reservoirs, and covered with rocks, along whose sides is a good sprinkling of trees. Nahant's beautiful rocky shores and sandy beaches are plainly shown in natural colors, even the low seaweed-covered rocks along the water's edge are accurately modelled. The tidal flats have been located from the latest charts and painted a halftone between land and sea. Lynn Beach, the Lynn Woods (full of glens and ponds), the rocky shore of Swampscott and Egg Rock, come in on the north-east. The islands in the harbor, — the Brewsters, the barren Graves, and the Shag Rocks, — stand out light against the deep blue ocean. On the south lies Nantasket Beach, along which Atlantic and Point Allerton are prominent hills. Hingham

harbor, with its rocky islands, the Weymouth Back River (east) and the Weymouth Fore River, west of which is the Hough's Neck peninsula, with broad Quincy Bay on its inner side, may be carefully studied, as they lie near the edge of the model. Egg Rock Light on the island one mile east of Nahant, Boston Light with its tall white tower on Lighthouse or Little Brewster Island, the Narrows or Bug Light on the end of Great Brewster Spit, Deer Island Light (a red iron cylinder standing out of the water on the bar east of Deer Island), Long Island Light on the north end of Long Island, eighty-four feet above the sea, two low-range lights on the north end of Spectacle Island, showing a safe channel to the inside harbor, — are the beacons. Buoys, painted correctly, red on the right, black on the left of the ship channel on entering, and spindles, iron rods supporting a ball, are placed in position, as are all other charted day marks. By these a navigator can readily find his way.

The planning and construction of the model were left largely to the sculptor, a geologist trained at Harvard University, and the size and character of the work brought many novel problems to be studied. With no precedent to follow, and a very short time to complete the model, many difficulties had to be overcome. However, the work progressed as fast as the maps could be compiled.

It is advocated by several prominent educators that the model be permanently installed in some public building, such as the Boston Public Library, where it would form an interesting map for public instruction, especially for the schools, and a handy reference for all residents of Greater Boston.



CUT 3. — South-east Shore of Nahant.

CHAPTER II.

TOPOGRAPHY OF THE METROPOLITAN DISTRICT.

The Metropolitan region of Boston* contains an assemblage of topographic forms, increased in interest by the entrance of a division of the Atlantic Ocean into its very midst.

* Situated between 40° 10' and 42° 31' north latitude, and 71° 49' and 71° 19' west longitude.

The present surface of the land is founded on the underlying geological foundation, and in the Metropolitan region this includes a good variety of representatives: plutonic rocks, once existing as intensely heated masses deep below the surface, exemplified by the granitoid rock of the Blue Hills; aqueous and stratified rocks, composed of sediments laid down in ancient seas, as the Braintree shales, the Roxbury conglomerate, and the rocks of Nahant (seen in cut No. 3), which contain some of the earliest known organic forms; eruptive rocks, formed of the ejections from volcanoes, as the volcanic rocks in Nantasket and Quiney; metamorphic rocks, due to alterations of older rocks through heat, the subjection to burial and pressure, and to changes brought about by the atmospheric agents, found in the "felsite" of the Middlesex Fells and the Somerville slates. In addition to this instructive geological assemblage is the great mass of unconsolidated material brought about through action of the glaciers at the time of the ice invasion, which formed a covering of débris over a great portion of the hard rocks, appearing sometimes as isolated hills, though more frequently as large irregular masses of sand and gravel. The ice plucked boulders from ledges, and in some localities dug basin-like hollows in the bed rock. The transported material—rock waste picked up by the ice, known as glacial drift—blocked up many of the old valleys, thereby producing the lakes, ponds and swamps which are to-day so numerous throughout the region. The drift filled the channels of many rivers, turning them out of their old courses, and by thus diverting them inaugurated, when they chanced upon the hard rocks, the falls and rapids in our streams. The upper falls of the Charles in the narrow Hemlock Gorge will serve as an illustration of this sort of glacial innovation.

The present topography descends from the external land forms which developed during earlier periods, some conception of which is of such importance that without it no rational idea of the meaning of the present surface can be obtained. When looking over the region about Boston, the feature which appeals strongest to the trained observer is the hilly upland, below which lie the broad, thickly-populated lowlands and the narrow valleys of the small streams. Above the level sky line of this plateau rises the range of the Blue Hills, as may be seen in the sea level view on the last page. This upland, whose continuity is so much broken by the great valley lowlands of the Charles and Neponset that it is likely to be unremarked save when especially sought for, is in fact a part of the great slanting highland which slopes from less than a hundred feet at the very seacoast, as at Nahant, Swampscott and Nantasket, to elevations of from 1,500 to 2,000 feet in Vermont and Western New Hampshire near the Massachusetts line. The rock structures are not in sympathy with the upland surface, but stand at all angles with it; in fact, they are contorted

and deformed in true mountain form, both in mass and in minute internal characteristics, for this region was once a range of high mountains, which now through the gradual process of weathering has been lowered to its "very roots." The mountain-levelling forces thus eventually produced a great lowland worn down close to the sea, with streams of feeble current, winding through a vast level region, without falls or rapids, the monotonous plain broken only by a few of the resisting hard rock hills. A lowland of this kind has been termed a "penplain;" the isolated hills rising above it called monadnocks, from Mount Monadnock in New Hampshire. The Blue Hills are a good illustration. The old penplain is now the slanting upland, which was upraised bodily so as to tilt gently to the south-east. By this elevation the streams were given opportunity to cut down into the old lowland, through which, powerless to deepen their channels, they had previously flowed, and to open out wide valleys in the softer rocks.* The broad expanse of the lower courses of the Charles, Mystic and Malden rivers is a local example of such a valley lowland. On this lowland the great body of the Metropolitan population lives, the upland being more sparsely settled, and in the case of the Middlesex Fells and Lynn Woods is reserved for parks, while the monadnocks which rise above it, like the Blue Hills, are devoid of habitations.



CUT 4 — An Esker Cut for Road-ballast — King Oak Hill, Weymouth.

Glaciation. — After the general dissection of the upland had been accomplished, the streams having cut down their channels and extended their ramifying branches so as to break the once continuous upland into separate hills, the region was invaded by a great glacier. This ice sheet covered the north-eastern portion of the continent, and in New England was thick enough to bury the highest hills. It descended the general slope of the upland toward the south-east, scraping along the loose soil, breaking off projecting ledges, and giving the surface a general scouring. The larger part of the material thus gathered was dragged along and spread out irregularly as gravel, boulders and clay, known as "drift." In some instances the bed rocks were left bare, as in the Fells, but frequently the

* See "Monograph on the Physical Geography of New England," by Prof. W. M. Davis, National Geographical Society, No. 9, vol. 1, p. 284.

drift was collected in large quantities, and in special localities assumed the rounded form of drumlins (smooth lenticular mounds of drift simulating the form of an egg sliced above its longer axis — see cut 16) so common in the Metropolitan District, the State House and Bunker Hill Monument standing on such hills. As the ice sheet melted away, sand, gravel and clay were washed forward from its retreating front. Some of the glacial plunder was laid down in lakes which were formed at that time, and appears to-day in sand plains, common in the region about Weymouth, Quincy and Newtonville. In places the drift took shape as serpentine ridges, called “eskers,” from tunnels under the ice (see cut 4), as at Auburndale and along the western border of the Weymouth Back River. The eskers furnish valuable road material, the sketch showing a cutting across one of these ridges made for such use. The drift also assumed the form of mounds and pits near the edge of the ice, which are known as

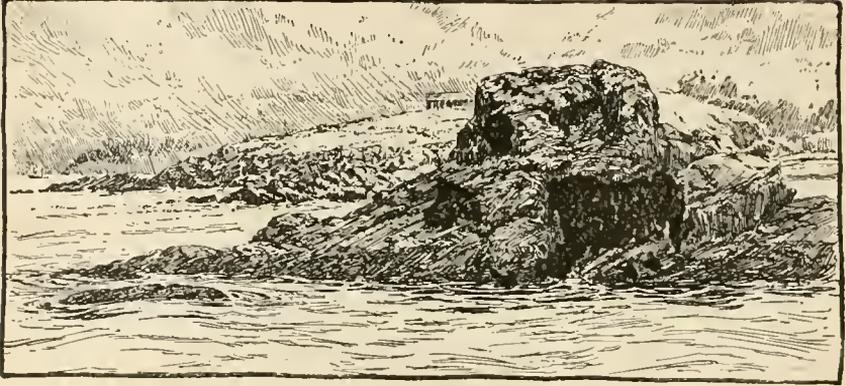


CUT 5. — Kames and Kettles — “Point of Holes,” Quincy.

“kames” and “kettles,” and are of frequent occurrence in this vicinity, being exemplified especially well at the “Point of Holes,” Town River Bay, as shown in the drawing above.

Submergence. — The event associated with the glacial invasion, and one which played perhaps the most decisive part in the location of Metropolitan Boston, was the depression of the land resulting in the drowning of the lower parts of the river valleys, changing them into bays, their old channels into estuaries, and producing a neighboring sea bordered by an irregular line of shore fretted with inlets and projecting points of land and dotted with reefs and islands. The harbor of Boston was thus made out of the old lower valleys of the rivers now entering its confines; the Charles, the largest or master stream of the region, opening the deepest channel, and thus affording the best protection for ships, and hence its shores the most attractive site for the early settlers. Outlying hilltops became sea-girt islands, as Egg Rock, Nahant, Little Nahant and Outer Brewster. Ridges rose above the water as narrow and broken reefs, like the Graves, the Shag Rocks and the Roaring Bulls, and projecting portions of the hard highlands appeared, as the buttress headlands of Swampscott and Atlantic Hill. Since these larger geologic events, ceaseless action of the weather, resulting in a slow though general decay of the surface rocks,

has been at work on the land, and during the same time the activities of a powerful sea have brought about numerous modifications.



CUT 6. — Points of Rock jutting into the Sea — Nahant East Shore.

Shore Action. — Along the shore the most exposed portions have been vigorously attacked by waves, those being least able to resist having succumbed. The hard headlands have been eaten back, cliffs and sea caves hollowed out, and softer portions etched away, leaving projecting points of rock jutting into deep water (see cut 6).

Rock Islands. — The Rock Islands, the now half-drowned hilltops, being a peculiarly distinctive feature in contrast to the drift islands in Boston harbor, the principal occurrences will be noted. Nahant and Little Nahant, though formerly separate rocks over a mile from the mainland, have



CUT 7. — Egg Rock — a "Monhegan."

now been connected by beach growth with the shore. The best example of the lone sea island, a high isolated rock, rising abruptly at a considerable distance from the mainland is Egg Rock (cut 7) — a drowned monadnock or a "monhegan" (from Monhegan Island, off the coast of Maine). This lighthouse island lies about two miles from the main and rises to a height of 67 feet. The outermost of the rocks which reach above low-water surface of the sea are the Graves (cut 8), a narrow chain of low-lying crags,

once the top of an old land ridge, now swept by the seas in hard gales. To the southward is a lower and more detached group, the Roaring Bulls,



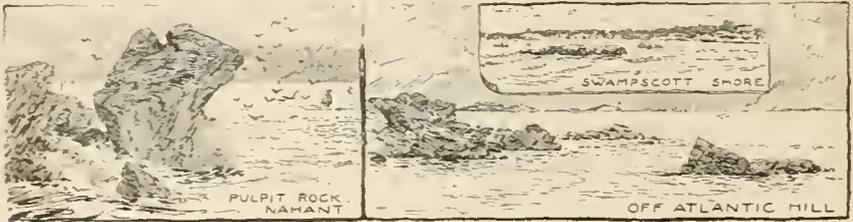
CUT 8. — The Graves.

barely visible at high water, and completely overwhelmed by surf in storm; and behind them a more substantial cluster, known as the Green Islands, connected at low water. The Calf Islands, on whose western end a few houses have been built, also joined at low tide, form a landward side to this collection of rocks. The largest rock islands—the Nahants having been attached to the main—lie to the eastward of the Calf Islands, on the very outer limits of the harbor; these are the Brewsters,—high barren rocks trending in a north-easterly direction. On the Middle Brewster, the inner one, about a dozen summer cottages have been built; the Outer Brewster rises to over 60 feet, commanding an excellent view of the harbor. The islands are composed of rocks formed deep within the earth, which, after ages of erosion had exposed them, rose as hilltops above the surrounding land; and now having been half submerged, lie in this greatly exposed situation, eaten back into steep sea cliffs and under-cut with sea caves (see cut 11). Connected at low water and contrasted by its low-lying, dark and ragged rocks, with the high and smooth slopes and light-colored glacial drift of Great Brewster, is Little Brewster, or Lighthouse Island (cut 9). Here is Boston Light, marking the north side of the main entrance to Boston harbor. To the eastward of Light-house Island, and parallel with the Outer Brewsters, is a chain of jagged ledges, the Shag, or Egg Rocks. Hardings Ledge and the Bare Rocks, lying about two miles off the Nantasket shore, is a low reef on which a spindle or day-mark warning is placed. The inner harbor has a number of smaller rock islands. Hingham harbor holds three of them. Slate Island lies at the mouth of the Weymouth Back River, Raccoon at the mouth of the Weymouth Fore River, with Rock Island to the west, surrounded by



CUT 9. — Lighthouse Island — Great Brewster behind.

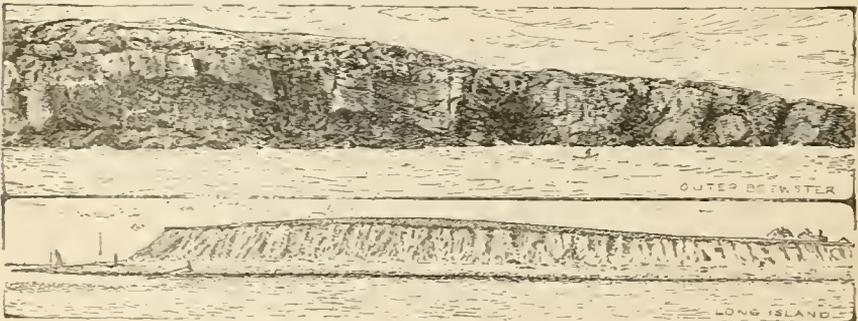
a growth of marsh. Hangman's Island and the Quarantine rocks appear near the middle of Quincy Bay. It will be noticed that these detached portions of the mainland do not lie in sympathy with the trend of the drumlins.



CUT 10.—Skerries.

Skerries. — Detached portions of ledges lying close to the shore from which they have been severed, illustrated by the examples drawn, are called skerries. They abound along the Swampscott shore, Dread Ledge (see cut 21) being an example. The eastern and southern sides of Nahant have also a goodly sprinkling, and they are common about the rock islands forming the Brewster group, and off Atlantic Hill, Nantasket.

Sea Cliffs and Caves. — Sea cliffs and caves, which are formed in the process of marine consumption of the land, occur throughout the harbor,



CUT 11.—Sea Cliffs and Caves, Outer Brewster — Cliff in Drift, Long Island.

and are strongest in expression where the highest land meets the greatest exposure to the most powerful waves. The Outer Brewster (cut 11) has some fairly good caves. Nahant (see cuts 3 and 6) offers cliffs 60 feet high, and the south side of Atlantic Hill is a good example of a cliff headland. Winthrop Head (see cut 12) is a remarkably fine type of the sea

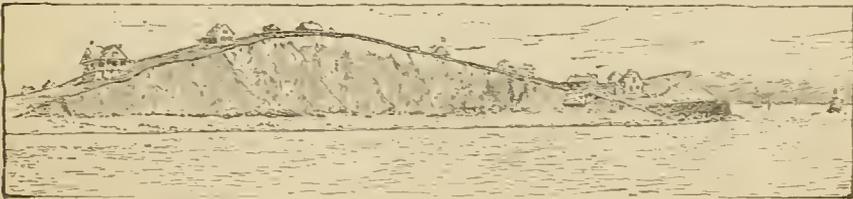
cliff in soft drift; Great Brewster (cut 14). Point Allerton (cut 13) and Long Island (cut 11) are further illustrations.

Sea Erosion on Glacial Drift. — The action of the sea on drumlins is so well illustrated in Boston harbor that it is considered the best field known for such study, for which reason the following account is given.



CUT 12. — Winthrop Great Head —
a Half-eroded Drumlin.

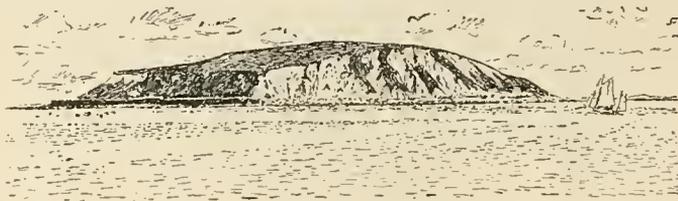
The yielding glacial drift has been variously attacked according to its exposure and relation to the transporting abilities of waves and currents, and large quantities of this material have been removed. To-day a number of the loosely constructed hills stand in what are apparently perilous places, so that it seems that the sea must wash them away in the next storm, but some protecting influence is usually at work. Point Allerton (cut 13), on the end of Nantasket Beach, boldly confronts the open Atlantic, yet its face is nearly grassed over, as seen in the sketch below, which shows that the hill is not retreating so fast as some within the harbor. Two natural methods of preservation are common; the breakwater of boulders left from the retreat of the cliff or the destruction of a fellow drumlin, and the forward growth of a beach, shutting in the cliff from the sea. The great drumlin of Point Allerton is protected on the north by the reef of boulders from the little drumlin, whose stump alone remains, as may be seen from the sketch below, and on the east by not only its own boulders but those from similar hills now destroyed. These erratics receive the brunt of the sea, and further protection to the cliff is given by a narrow beach. Grovers Cliff is likewise fronted by a long reef of boulders, which stretches about a mile into the sea before its scarp. The Great Brewster (cut 14) which owes something to the shelter from the rock islands about it.



CUT 13. — The Point Allerton Sea-cut Drumlins.

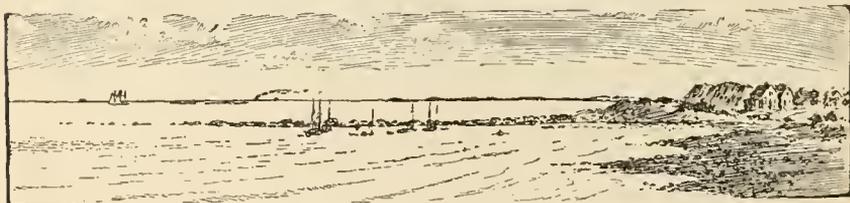
has been preserved in its exposed position by both its own boulders and the waste of the surrounding islands formed into a connecting bar. The east and south sides, protected by a breakwater, are now much grassed over, but the erosion on the northern side has taken on new activity and is cutting away at an old grassy slope, which had previously lain immune.

When the soft material composing the drumlins is entirely carried away through the action of the sea, boulders of various sizes, which were col-



CUT 14. — Great Brewster from the North-east.

lected in the glacial hill, are left behind, and these, since they bear testimony to the former location and existence of the drumlin which contained them, may be termed “*witnesses.*” Such “*witnesses*” have been noted in connection with Winthrop Head, Point Allerton and other sea-cut drumlins. They predominate at Point Allerton, and in Nix Mate they are the sole survivors (see cut 16). At “*Ocean Pier,*” as may be seen in the sketch below, they have out-lived the drumlin, which is said to have disappeared almost within the recollection of the oldest inhabitant.

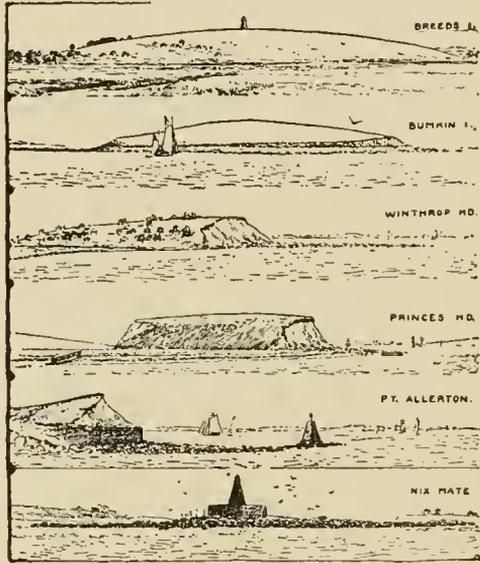


CUT 15. — Ocean Pier, Revere — the “*Witness*” of a Lost Drumlin.

The bar of boulders south of Winthrop Head, the Great and Little Faun off Deer Island, are of similar origin.

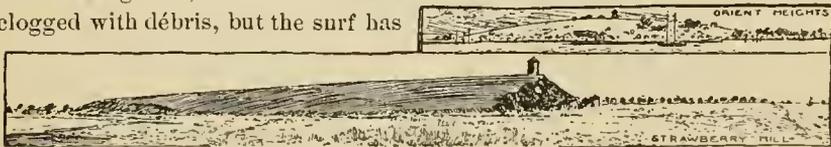
A series of natural examples of the stages of drumlin erosion may be selected from Boston harbor, with intermediate illustrations of the process of destruction between the intact lenticular hill and the skeleton of boulders left on its disappearance. In the series shown below (cut 16), Orient Heights on Breed’s Island has been taken for the perfectly preserved drumlin, and though some little cutting has doubtless taken place on its flanks,

it serves well as a type. Bumkin Island, off Hingham harbor, illustrates the first stages of cliff cutting, the waves having nipped both ends and eaten away about a fifth of the drumlin. Governor's Island, in the upper harbor, the location of Fort Winthrop, could have been substituted. Winthrop Head is a most excellent specimen of the drumlin half eroded; its perfect contour, the height and the fronting reef of boulders, make it a type example. Prince's Head, on the southern shore of Peddock's Island, is an illustration of the drumlin more than half destroyed, about three-fifths. Great Brewster (cut 14) is perhaps beyond this stage. Point Allerton, with one-fifth left, illustrates the remains of a nearly vanished drumlin. The boulder reef at Nix Mate marks the finale of a drumlin, and its former existence is also established by the appearance on the Admiralty charts of the year 1781 of "Nick's Mate Island," a drumlin about one-quarter of a mile long.



CUT 16. — Destruction of Boston Harbor Drumlins.

The most effective protection for the seaside drumlin is, while it endures, a beach formation growing in front of the cliff, broad and high enough to completely shut out waves from its base. Strawberry Hill (cut 17), the half-eroded drumlin in the middle of Nantasket Beach, is an excellent illustration. The base of the cliff, between which and the sea half a mile of beach has grown, is now somewhat clogged with debris, but the surf has



CUT 17. — Drumlins protected from the Sea.

not long ceased to break at its foot, for the face is not completely grass grown, and much of the sharpness given through the former activity of the waves is still retained. The cut above permits a comparison with the drumlin of Orient Heights, and the positions of their respective water

towers is suggestive of the history of the two. At Breed's Island they have placed the stand-pipe in the middle of the hill, while on Strawberry Hill the edge of the cliff had to be resorted to as the highest point. On the southern and beach-protected side of Strawberry Hill, as well as on the harbor side, there is a low, grassy cliff which must have been cut before the completion of the Nantasket Beach barrier. A portion of the sea work in the inner harbor is doubtless likewise due to the more powerful action of waves and currents before it became so sheltered by beaches on the north and south.

Beaches. — The beaches have played an important part in the modification of Boston harbor; they may be regarded as highways along which shingle from the shore and bottom is transported by waves and currents. The pocket beach, numerous pretty illustrations of which occur along the rocky shore of Lynn and Swampscott and at Nahant, lies in re-entrant



CUT 18. — A Pocket Beach — Swampscott.

curves between protruding headlands, a collector of along-shore waste (see cut above). The travelling beach, which serves as a transport for shore material, is found in the district in two varieties: one connects islands with the mainland, the other forms a narrow barrier along the shore, tending to shut in the drainage from the land. Lynn Beach is an excellent example of the island tying variety, and in Little Nahant the process is repeated. Nantasket Beach is of similar nature, though instead of connecting rocks with the mainland, it has linked drumlin to drumlin and tied this long chain to the rock headland at Atlantic Hill. Revere Beach illustrates the second variety. It nearly encloses the waters of the Saugus River, having been thrown across the old bay, forming a lagoon, now filled with the sediments which have built the Lynn marshes. Throughout the harbor numerous short beaches have utilized the waste from glacial drift in joining neighboring islands; thus have the hills which make up Paddock's Island been brought together, the two drumlins of Spectacle Island joined, and numerous smaller coalitions brought about. The earlier stages of this process may be seen in bars covered by high water, as between Nut Island and Hough's Neck, Great Brewster and its neighbor, or Prince's Head and the main island.

Spits. — Reefs attached at one end, called spits, are exemplified by the pebbly reef stretching southward from the boulders of Nix Mate (see cut 19),

and terminating in a hook-like point, and the Great Brewster spit, trailing westward from the island to which it is attached. Windmill Point, Pemberton, is a spit raised above high tide.

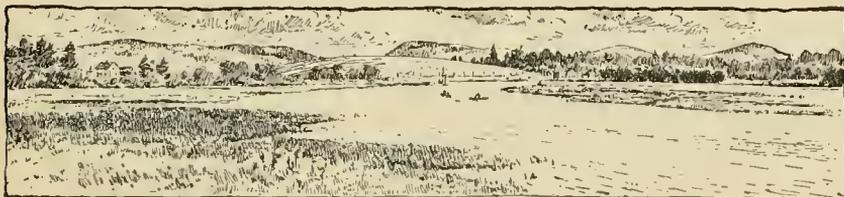
Tidal Flats. — Another form of transported deposit occurs in the silts and sands which have collected along the borders of the mainland and islands. At a glance, the infringement of these muddy shoals on nearly every sheltered place in the harbor will be perceived. Only in the mouths of streams where the current is powerful, in narrow



CUT 19. — A Hook Spit — Nix Mate.

passages with strong tides, or about exposed positions where the waves are too active to allow the deposition of fine sediment, have these flats been excluded. In the upper harbor a lee from the strong ebb tides has allowed the mud to collect along the outer sides of Governor's and Apple islands, while at Deer Island, Winthrop and Nantasket it appears on the inner side. Though a portion of the sediment is brought from the land by rivers, much has been derived from the sea, and especially in the wasting of the glacial drift. Thus the construction of sea walls along the bases of the most rapidly degrading cliffs has aided in the preservation of the harbor.

Tidal Marsh. — The tidal marsh is a prominent feature in the Metropolitan region of Boston. Most frequently it represents the fillings of ancient estuaries and bays by deposits derived both from land and sea; organic matter, such as grass and seaweeds, adds to the process, and wind-blown sand is frequently an important contributor. The rivers also bring their loads of fine sediment from the land, dropping them in their quiet estuaries as deltas. By such processes have the extensive marsh lands which border the many miles of shore come into existence. The mouths of the Sangus, Malden, Mystic, Charles, Neponset (see cut 20) and Weymouth rivers contain thousands of acres of such land.



CUT 20. — Marshes in the Neponset Estuary.

CHAPTER III.

LOCATION OF TOWNS.*

The cities, towns and villages included within the area of the model (the population being stated, since it bears a certain definite relation to the distribution of buildings) have been classified in four divisions:—

1. Northern border and Fells plateau.
2. Maritime.
3. Blue Hills and Neponset River.
4. Western border and Charles River.

NORTHERN BORDER AND FELLS PLATEAU TOWNS.

Reading.

On the extreme northern border is the town of Reading, with a population of 4,417.† It lies on a flat divide or watershed, between north and south flowing drainage, at the head waters of the Mystic, Saugus and Ipswich rivers. The northern division of the Boston & Maine Railroad passes through the western part of the town. Reading Highlands is a village about a mile west from the centre of Reading.

Wakefield.

Wakefield, lying about a mile and a half south of Reading, between Quannapowitt and Crystal lakes, is on comparatively high land, about 140 feet above sea level, at the head waters of the Malden and Saugus rivers. It has a population of over 8,000. There is a junction of three divisions of the Boston & Maine Railroad in the town, the Northern, Newburyport and Wakefield branches. Greenwood is a village a mile south, on the northern division of the Boston & Maine Railroad.

Stoneham.

Stoneham lies about a mile and a half south-west of Wakefield, somewhat isolated, on the comparatively high plateau of the Middlesex Fells, 160 feet above the sea. It is the terminus of a special division of the Boston & Maine Railroad, the Stoneham branch. Population, 6,284.

Woburn.

Woburn lies two miles west, above the shore of Horn Pond, which is the uppermost lake of the Mystic chain. It is on the southern division

* Refer to map, last page.

† Census, 1895.

of the Boston & Maine Railroad, having a population of 14,178. North Woburn two miles north, Montvale one and a half miles east, and Cummingsville a mile west are outlying villages.

Burlington.

The eastern portion of the town of Burlington (population, 574) comes in on the north-western circumference, west of Woburn. Burlington lies on high land, at the head waters of the drainage which reaches the Merrimac, the Ipswich and Mystic rivers.

Lexington.

Lexington, 200 feet above sea level, lies on the highlands which divide the drainage flowing into the Concord and Shawshine rivers on the north, and to the Charles River on the south, through Hobbs Brook. The town lies on the Arlington branch of the Boston & Maine Railroad, with a population of 3,498. North Lexington, composed of a few scattered houses, lies close to the border of the model, being on the same railroad a station east from Lexington.

Winchester.

Winchester is built along the steep western slope of the Middlesex Fells, on the shores of Wedge, Abbajona and Judkins ponds, which belong to the chain of lakes in the Mystic valley, and empty into the Upper Mystic Lake, through a small, strait-like brook called the Abbajona River. Winchester is on the southern division of the Boston & Maine Railroad. Population, 6,150.

Arlington.

Three miles south of Winchester, on the edge of the plateau, lies the town of Arlington, situated between the Mystic lakes and Spy Pond, with Arlington Heights one and a half miles west on the top of the plateau from 200 to 300 feet above sea level. On the Arlington Branch of the Boston & Maine Railroad. Population, 6,515.

Belmont.

Belmont lies two miles further west, along the escarpment, or the steep edge of the hills, frequently alluded to as the "Rim of the Boston Basin." Population, 2,843. On Massachusetts Central and Fitchburg railroads. Waverley is a village one mile south-west from Belmont, on the same railroads.

Melrose.

Returning again to the towns in the Middlesex Fells; a low, amphitheatre-like depression may be seen in the very heart of the rocky heights. This holds the city of Melrose, in the upper valley of the Malden River, of

which Crystal Pond, in the northern part of the town, is a small expansion. Melrose Highlands is a village one mile north and Wyoming a station one mile south from the centre of the town on the western division of the Boston & Maine Railroad. Population, 11,965.

Saugus.

Directly east of Melrose, among the irregular groups of rocky hills, dissections of the Middlesex plateau, is Saugus, on the Saugus branch of the Boston & Maine Railroad. Population, 4,497. North Saugus is a mile above, and East Saugus a mile below on the river passing through the entire length of the town, and bearing its name. Prankers Pond is a widening of the stream, about a mile in length, just above Saugus.

Lynnfield.

At the head of the Saugus River the southern portion of the town of Lynnfield — population, 818 — comes just within the circle of the model; Pilling's Pond, lying about three-quarters of a mile south-east, falling on the circumference. South Lynnfield, on the eastern division of the Boston & Maine Railroad, is just south of Suntaug Lake, the circular sheet of water, containing a small island, just inside the area.

Peabody.

The outlying southern portion of Peabody comes in just east of Lynnfield, Needham Corner being represented by a score of buildings on the north-eastern limits. Bartholomew and Brown's ponds — the larger — are small bodies of water within the town of Peabody. Spring Pond, the largest of the three, at the corner of the towns of Peabody, Salem and Lynn, is fed by Tapley Brook, which crosses the edge of the model.

Salem.

The outskirts of Salem stretch for nearly three miles along the wild and broken country of the border. This swampy, irregular land is difficult for habitation, few roads appear, and scarcely a house.

MARITIME TOWNS.

The maritime towns come next in order, including those connected by tidal waters, as well as those on the sea-coast.

Marblehead.

Marblehead obtains just a small corner, — Beach Bluff, — where the land meets the ocean on the north-east.

Swampscott.

Just south, the bold, rocky headlands (between which lie the short re-entrant beaches — pocket beaches — see cut 18) of Swampscott protrude into the open sea, making a firm buttress at the entrance of Boston Bay. Off this headland is a small rock island, Dread Ledge, on which the government has placed a day mark, shown in the cut above. Swampscott lies on the Marblehead branch of the Boston & Maine Railroad, with a population of 3,259.



CUT 21.— Dread Ledge — Swampscott.

Lynn.

Next southward along the coast comes the city of Lynn. Population, 62,354. With its clustered houses, blocks, factories and numerous tall chimneys it is a distinctive feature in the landscape. Directly behind, or north-west of the town, lies a much diversified country, full of steep, rocky hills, deep glens and over a score of lakes, known as the Lynn Woods. This is a natural park of over 2,000 acres. Lynn Beach stretches southward from Red Rock and forms a barrier behind which lies Lynn harbor, which, with the exception of a narrow channel leading to the wharves, is mostly bare at low water. The eastern division of the Boston & Maine Railroad and the Revere Beach & Lynn Railroad run into the city.

Nahant.

It is a mile and a half along the ribbon of sand, from the inner base of Lynn Beach, Red Rock, to its junction with the rock again in Little Nahant. Here the cliffs become more steep and rugged as they face the



CUT 22.— South-east End of Little Nahant, Lynn in the Distance.

open sea. A short stretch of boulder, pebble and sand connects the rock of Little Nahant with that of Nahant proper.

This sea-girt island of rock, now connected by thread-like beaches to the mainland, presents more variety of form than any other piece of shore in the Metropolitan District. It maintains an average height of about 60 feet

along two miles of coast, and in places rises above this elevation. The shore increases in irregularity from the north toward the east, and at a point nearest Egg Rock skerries begin to appear, re-entrants make scallops in the shore, and bold and ragged points of rock jut into the sea (see cut 6). The "East Point," as it is named, is the most wave-exposed headland in the region, and its remarkable rocks present forms of marine action whose carving is unequalled by any other in the District if not on our Atlantic coast. The south side, facing Boston harbor, is lower and has the form of a bay, one mile across and half a mile wide, between Pea Island and Bayley's Hill. The shore of the bay itself is divided into five pocket beaches between low headlands of rock. The southernmost of these beaches shuts in the land drainage, forming a sheet of water, — Bear Pond. The rocky shore continues from Bayley's Hill to the westernmost headland, Bass Point, where the western shore, bordering on Lynn harbor, takes a north and south direction. A wharf, at which steamboats land, is shown on this side. Nahant has a population of 865.

Revere.

Returning to the mainland proper, and passing southward along the extensive Lynn marshes, the mouth of the Saugus River, in which the Pines River, a tidal creek, is confluent, is met. The Point of Pines lies



CUT 23.—The Revere Drumlins.

at the mouth of the Saugus on the blunt end of the barrier beach, of which Revere Beach — the State reservation — is a part.

A group of drumlins (cut 23) rising in Revere directly from the marshes from 160 to 200 feet, and all trending in a north-west, south-east direction, is now met. The Revere Beach & Lynn and the eastern division of the Boston & Maine Railroad pass through Revere. Revere Beach station is two-thirds of the way along the beach from the Point of Pines. Crescent Beach is at the southern end, at the foot of the first drumlin. Beaumont occupies the next hill, or drumlin, south. The population of Revere is 7,423.

Winthrop.

The Revere group of drumlins extends eastward into Winthrop, where nearly all meet the sea. The action of the sea on these peculiarly shaped yielding gravel hills has produced the rare topography included

within this town, and the forms themselves are remarkably typical of their kind. Grover's Cliff is the headland south from Beachmont. This cliff is cut in the larger hill of a somewhat irregular group of drumlins, and is over 60 feet in height. The escarpment is in the compact yet yielding materials—sand, clay, enclosing pebbles and boulders—of which the drumlin is composed. The hill has been worn back nearly one-half of its former extension, being attacked both on its northern flank and eastern end, though the carving which the sea and weather have sculptured into the cliff has now been largely destroyed by dumpings. A mile and a half further south along the beach,—of boulders and pebbles near the cliffs, grading into fine sand near its middle,—is another headland, an isolated hill rising abruptly to over 100 feet above the sea. This hill has the general form one of the Revere drumlins would present were it cut in two in the middle, *i. e.*, on its shortest diameter. This is precisely what has taken place at Winthrop Head: the outline of the hill rising from near the western base continues upward on the regular curve of the neighboring hills to the usual level top, then suddenly breaks off, pointing into the sky (see cuts 12 and 16).

A short sand beach bending into crescent shape connects Winthrop Head with a small hill a mile south, Point Shirley, a truncated drumlin, protected by a quarter of a mile of beach foreland. About half a mile beyond the hill the line of beach breaks its continuity, the tides maintaining a narrow passage about 100 yards across, known as Shirley Gut. Winthrop has a population of 4,102, and is connected by the Winthrop branch of the Revere Beach & Lynn Railroad. Deer Island forms the end of the Winthrop peninsula, being composed of hills trending similarly to those of the Revere group, the northernmost being sliced off along its longer axis, the larger at the southern end presenting a smooth, nearly perfect drumlin. Penal institutions and the sewerage pumping station are to be seen on Deer Island; the outlet of the North Metropolitan Sewer is abreast of Deer Island Light.

Chelsea.

Directly behind Breed's Island (see cuts 16 and 17), across the estuary known as Chelsea River, is an extension of the Revere group of drumlins rising from surrounding marsh land, on which is situated the city of Chelsea. Population, 31,264. A division of the Boston & Albany and the Eastern division of the Boston & Maine Railroad pass through Chelsea.

Everett.

Across the tidal creek "Island End River" a broad lowland rises from the marshes which merge into the drumlins on the east. Several thousand small, detached houses are located on the slopes of this swelling ground,

in the city of Everett. Mount Washington is the name of the high drumlin which borders on the line between the towns of Everett and Chelsea. The eastern division of the Saugus branch runs into the town. Population of Everett, 18,573.

Malden.

North-west from Everett, near the head of tidal water on the stream which cuts its narrow valley through the Middlesex Fells, is Malden. Population, 29,708. It lies on the edge of a plateau, stretching forward upon the valley lowland and back a short distance into the hills. The Saugus branch and the western division of the Boston & Maine Railroad pass through Malden. Oak Grove and Edgeworth are stations north and south, respectively, of Malden; Maplewood and Linden being two villages along the foot of the highlands at the head of the Pines River.

Medford.

The town west of Malden has a location at the head of navigation on the Mystic River, — distinguished by its tortuous meanderings, along its course through the marshes. Medford is likewise built along the southern escarpment of the Fells, and has grown back into the hills by following up the valleys of small, south-flowing streams. Wellington is the village and station where the western division sends off the Medford Branch Railroad. West Medford lies at the foot of the Mystic Lakes, on the Lowell division of the Boston & Maine Railroad. Population of Medford, 14,474.

Somerville.

Medford extends along both banks of the Mystic River as far as the first bridge below the Medford bridge, where Somerville earns her right in the maritime group by a little over a mile of frontage on the Mystic estuary. Somerville is situated among a group of drumlins more irregular and mingled than those of the Revere hills, yet trending in the same general direction. College Hill, — holding the Mystic Reservoir, — on the Somerville and Medford line, is one of the most distinct drumlins of the group. Prospect Hill lies further east. Mount Benedict is a small hill at the south end of Fellsway Road. Winter Hill is the western station on the Lowell division, which runs between this and Central Hill, adjoining which to the west is Spring Hill. West Somerville is half a mile south of Collège Hill, on the Arlington branch. The Fitchburg Railroad runs through the southern part of the town. Population, 52,200.

Cambridge.

To the south of the hills of Somerville, on a nearly flat plain, bordering on the left bank of the Charles estuary, is Cambridge. Old Cambridge, with its many steeples, the buildings of Harvard University, — Memorial Hall the most prominent (see cut 24), — lies near the head of the last southern bend of the Charles; North Cambridge is near the Somerville line; West Cambridge, a station at the branching of the Fitchburg Railroad; Cambridgeport lies along the north shore of the Charles River basin, being built largely of warehouses and manufactories with numerous chimneys. Here is the broad “Esplanade” made from the sediments dredged from the river. The town extends as far east as the basin known as Miller’s River, — where the broad system of railroad tracks crosses the Charles, and the Charlestown district of Boston begins.



Cut 24. —
Memorial Hall
Tower.

Districts of Boston.

Charlestown. — The flat terminal yard of the Boston & Maine and Fitchburg railroads lies between Somerville, Cambridge and Charlestown, being a prominent feature in the topography; another lies to the north-east, across which runs a bridge into Chelsea. The larger part of Charlestown is situated on two coalesced drumlins, extensions of the Somerville group, on the top of the easternmost of which stands the Bunker Hill Monument (cut 25). The clustered blocks covering the hills, the church spires and the docks, with the navy yard occupying two-thirds of the eastern side, form the prominent features of the place.



Cut 25. — Bunker
Hill Monument.

East Boston. — Across the inner harbor lies the East Boston district, the closely built portion being situated for the greater part on three drumlins. The wharves on the north-west and south sides of the East Boston peninsula show prominently, as do also the roads diked across the tidal flats on the eastern side. The Boston & Maine, eastern division, and the Boston & Albany railroads run through the middle of East Boston; the Revere Beach & Lynn along the eastern water front.

Boston Proper.

Next comes Boston proper, composed of small drumlins, extensions from the Somerville group, the most prominent of which are Beacon Hill — on top of which stands the State House — and Copp’s Hill, at the North End. The greater portion of the city proper is composed of “made”

land, and a fair conception of the original dry land may be derived by noting where the streets begin to turn, or by eliminating everything on the flat portions of the model where the streets are below the twenty-foot contour. This cuts out nearly all the Back Bay section and the South End, except a narrow neck along Washington Street, probably of the nature of drift and barrier beach, and takes away the entire present wharf location, cutting out a cove about half a mile across from this district on the east (as far back as Faneuil Hall) and another of about the same area on the North End (reaching nearly as far south as Hanover Street).



CUT 26. — State House Dome.

The prominent topographical features shown in Boston may be stated as follows: the Common, its hill with the Soldiers' Monument, and the Frog Pond, trees and walks, separated by Charles Street from the Public Gardens, with its trees, walks, ponds, bridge and flower beds; in the north-west part of the city, along the Charles River, Charlesbank Park; Commonwealth Avenue with its double row of trees; the Fenway stretching southward from the Back Bay to Jamaica Pond, with drives and bridges.

Of the dozen or more bridges shown, the Harvard bridge, with its arches, connecting the Back Bay with the Esplanade at Cambridge, is most readily noted (cut 27). Next below is the



CUT 27. — Harvard Bridge.

West Boston bridge, from the Charlesbank to Main Street, Cambridge; next Craigie's bridge; then the railroad bridges of the Boston & Maine and Fitchburg systems; below the last two, the Warren and Charles River bridges, running from the north end of Boston into City Square, Charlestown. The drawbridges and their piers are modelled. Following around the water front to the south the order of bridges is respectively, Congress Street, South Terminal, Mount Washington, Broadway and Dover Street, connecting the city with South Boston.



CUT 28. — Steeple Park Street Church.

The wharves with their warehouses extend from the north-east end to South Boston, the most prominent being Battery, Lincoln, Lewis, Commercial, T, Long, Central, India and Rowe's.

Of the buildings, the State House, with its gilded dome (cut 26), stands on the top of the highest hill, first in prominence; just east is the tall Ames building; a little south, at the head of the Common, stands the high steeple of the Park Street Church (cut 28); on the opposite corner the tower of the Park Square station; at the south-west end of the Public Gardens the steeple of the Arlington Street Church; continuing down



CUT 29. — New Old South Tower.

Boylston Street, Trinity Church, with its pyramidal roof (cut 29); next the Museum of Fine Arts; and across Copley Square the Public Library, opposite which is the bell-tower of the New Old South Church, 248 feet high (cut 30). Other steeples, to the number of forty-five, were modelled.

All the railroads coming in from the south can be followed to their terminus, the South Union Station; all from the north, except those connecting with the East Boston Ferry, are obliged to come together in Charlestown and Cambridge, and to cross the bridges, as shown, to the North Union Station.



Cut 29. —
Tower Trinity
Church.

South Boston.

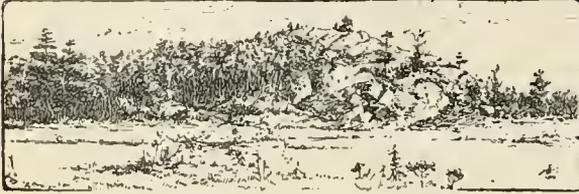
South Boston, lying south-east from the city proper, is built upon an extension of the Somerville group of drumlins and artificial land, similar to Boston. The reservoir appearing at the top of the highest hill, Dorchester Heights, is being replaced by a school-house. On the north-eastern end lies a broad expanse of flat, "made" land, terminal grounds of the New York, New Haven & Hartford Railroad, and the site of the new Commonwealth dock. On the eastern end of South Boston, or City Point, the Marine Park, with its crescent-shaped Pleasure Bay, is very prominent. On the northern end of the crescent, Castle Island, — a small drumlin, on which stands Fort Independence, has been joined by a wooden bridge, and on the south the Marine Pier completes the artificial bay; three small ponds have been constructed in the park. The broad Columbia Road reaches from City Point, along the northern reconstructed shore of Old Harbor on its way through Dorchester to Franklin Park.

Out-lying Districts of Boston.

Dorchester. — The leading out-lying districts of Boston are considered to be as follows: Dorchester, west from Dorchester Bay, — the mouth of the Neponset River, — the irregular glacial hills of which, averaging about 120 feet in altitude, extend westward into the higher lands of Roxbury. Between the two districts runs the Midland division of the New York & New England Railroad.

Roxbury. — Parker Hill is a high drumlin (over a rock core), on the eastern border of the Fens on which, at 200 feet, is the Parker Hill Reservoir. Between Dorchester and Roxbury lies Franklin Field, the broad, level play ground, and across the Blue Hills Parkway — a continuation of the Columbia Road — Boston's largest park reservation, Franklin Park, in which the roads, ponds, trees and rocks have been modelled from a very elaborate map.

Jamaica Plain. — West of the park, in the valley of Stony Brook, along the east shore of Jamaica Pond, lies Jamaica Plain, on the Boston &



Cut 31. — A Characteristic Rock Hill in Stony Brook Reservation.

Providence division. South of Jamaica Pond, connected both with Franklin Park and the Fenway by a park road, are the hills of the Arnold Arboretum, the tallest nearly 200

feet in height. This preserve connects with the Stony Brook Reservation of 460 acres, whose rocky topography (see cut 31) is shown along the head waters of Stony Brook.

Roslindale and West Roxbury. — On the eastern side of this connecting road, the West Roxbury Parkway, is Roslindale, on the West Roxbury branch of the New York, New Haven & Hartford Railroad; on the western side, reaching to the Charles River and on the same railroad, is West Roxbury.

Mattapan. — Mattapan lies about two miles east of Roslindale, at the Upper Falls, on the Neponset River. It is on the Midland branch railroad, and the terminus of the Milton branch. A metropolitan parkway passes through Mattapan to the Blue Hills Reservation.

Lower Mills is situated at the lower falls of the Neponset. Below the lower falls the river meanders for about two miles through tidal marshes (see cut 20), where on the northern side of its estuary lies the district of Neponset. The Old Colony and Milton Railroad branches joint here.

Brighton and Allston. — Turning back once more to the Charles River, the Brighton district is seen along the right bank, just west of the lower bend; the Chestnut Hill reservoirs lying to the south. Allston is on the eastern side of the bend, in the flat lowland country, both districts being on the Boston & Albany Railroad.

The population of Boston in 1895 was 496,920, and is figured in 1900 at 560,892.

Brookline.

Brookline, though not a port of entry, comes so near the basin of the Charles that it has been included in the maritime group. The town is situated on one of the highest districts in the vicinity of Boston, a large portion being over 200 and a number of hills reaching more than 300 feet in altitude. It is thus the head waters of a number of streams flowing in several directions, and a natural divide to drainage running north and west into the Charles, south into the Neponset and east into the harbor. The two basins of the Chestnut Hill Reservoir lie on the western border, Jamaica

Pond and the Fenway on the eastern, and the Brookline Reservoir half-way between. The villages are Longwood on the eastern border near the Fenway, Cottage Farm, and Reservoir Station on the western line near the Chestnut Hill Reservoir. The principal Hills are Walnut, near the southern line, over 300 feet, Aspinwall and Corey on the north-western end, the latter a fine specimen of the drumlin type. The population of Brookline is 16,164.

Quincy.

Continuing southward along the shore of Boston harbor, and crossing the mouth of Neponset River, one comes to the confines of Quincy. The town is irregular in outline, lying between the Neponset on the north and Weymouth Fore River on the south, with a very long coast line of 20 miles on the east, and the rocky elevations of the Blue Hills range on the west. A broad reach of marsh land extends into the Neponset estuary between the mouth of the Neponset River and broad Quincy Bay. At the base of this lies the village of Atlantic, on the Old Colony Railroad. On the outer end of the eastern extension of this marsh is Squantum, rising to over 100 feet, being made up of glacial drift and much rock. The rocky shore is irregular and interesting. From near the northern part a road has been built across the tidal flats to Moon Island, carrying the main Boston drainage sewer, which has its outlet reservoirs at Moon Head.

Southward comes the low Wollaston shore, sandy drift fronted by broad flats. The Half Moon is a detached portion of this shore surrounded by mud flats whose grassy top is covered at high water. Wollaston is a settlement stretching back into the group of hills between Sachem and Blacks creeks; a station on the Old Colony Railroad.

Quincy Centre is the next station south. It is at the head of Town River Bay on Town Brook.

Another peninsula three miles south of Squantum, extending two miles into the harbor, forms the southern limit of Quincy. This is Hough's Neck, composed of rock and glacial drift. Nut Island is a small drumlin half eaten away by the sea, connected to the hill at the end of Hough's Neck—a drumlin 100 feet high—by a bar of pebbles. At high water the outer hill is an island. Rock Island is an isolated rock surrounded by salt marsh, which connects it with Hough's Neck and the main land. Raccoon Island is a small rock island just east of Rock Island Head, the easternmost point of Hough's Neck.

Across the shallow bay indenting the eastern shore of Hough's Neck—Rock Island Cove—is the small hamlet of Germantown, on a flat, sandy plain.

The lower point on the opposite side of Town River Bay is Quincy Point. The hilly ridge jutting into the bay above Quincy Point is called the "Point of Holes," its significance being in the bowl-like depressions or glacial kettle

holes with which it is filled; the sketch (cut 5) is from the section of these mounds and hollows, lying along the river.

South Quincy is on Hayward's Creek — the second above the bridge. West Quincy lies back on the eastern foothills of the Blue Hills Range, on the Granite branch of the Old Colony Railroad. Quarry excavations will be observed in this portion of the town. Population of Quincy, 20,712.

Weymouth.

Weymouth and Weymouth Landing lie at the head of tide-water on Weymouth Fore River. The long, irregular peninsula between Weymouth Fore and Weymouth Back rivers includes several of the villages of the town of Weymouth, whose population is 11,291. North Weymouth is situated on a sandy plain, about one mile east of Quincy Point, directly behind Weymouth Great Hill, the high, roundish drumlin showing a cliff along the Weymouth Fore River. Grape Island — two glacial hills (one 80 feet) — and Slate, a rock island, lie at the mouth of the Weymouth Back River. The collection of buildings at the lower sharp bend in the river is the Phosphate Works. Between Great Hill and East Weymouth, which lies at the head of Back River, and at the foot of Whitman's Pond, — on the South Shore branch of the Old Colony Railroad, — is a very irregular, wooded country. A steep and narrow ridge extends from East Weymouth down the western side of the Back River; this winding serpentine gravel ridge, or esker, the bed of an old glacier stream, belongs to the assemblage of concomitant glacial forms, sand plains, kettle holes, and kames which predominate in this locality.

Hingham.

Another peninsula lying between the Fore River and the wide re-entrant north-east — Hingham Harbor — includes the lower portion of the town of Hingham. It is hilly and sparsely populated. Crow Point, the north-eastern hill, is the location of the Downers Landing steamboat wharf; and continuing south-west, Otis Hill, about 220 feet, Squirrel, 144 feet, and Bakers Hill, 198 feet, are the most prominent heights.

West Hingham is a small settlement on the South Shore branch of the Old Colony Railroad, on the lowland about one mile east of East Weymouth. Hingham harbor is broad and shallow, a narrow, tortuous channel winding in among its rock islands, Langley, the outer, Ragged, the western, and Sailors, the eastern. Button Island is a small lump in the upper part of the harbor, behind which lie the wharves of the town. Hingham is on the South Shore branch of the Old Colony Railroad. Population, 4,819. A peninsula consisting of several hills forms the eastern side of the harbor. World's End, two coalesced drumlins, is a

north-eastern extension, a narrow beach connecting it with Planters Hill, which is 120 feet above low water. On the eastern side of this neck of land is the estuary of the Weir River, which heads some half dozen miles back into the country.

Hull.

The eastern extension of the Weir River is the channel leading to the steamboat landing at Nantasket Pier, which is included in the town of Hull. The settlement on Atlantic Hill lies just on the border of the model, where the land meets the sea. This rocky headland, over 60 feet in altitude, gives a firm support to the southern limit of Boston Bay, to which is tied the dozen yielding glacial hills included in the long Nantasket spit. From Atlantic Hill to Point Allerton, the northern limit, there extends for over three miles the cleanest and most interesting sand beach in the metropolitan area, a portion of which belongs to the metropolitan reservations. No rocks outcrop on the spit north from its base at Atlantic Hill, and the beach is composed mainly of materials selected from the included drift hills, being for the most part of quartz sand, ground fine by the powerful action of the waves on this fully exposed coast. Nantasket is the beach settlement, with hotels and pavilions, between Atlantic and the next hill south, — Sagamore Head. The latter, 80 feet in altitude, is now protected from the waves by the beach before it. Directly behind, in the lagoon-like waters of Weir River, extends Hampton Hill, connected by marsh growth. The next hill south is White Head, likewise protected by a foreland of beach growth; directly west a narrow neck of glacial drift extends into the inner harbor. Bumkin Island (see cut 16), a small drumlin of over 60 feet altitude, with a cliff about it where it has been slightly nipped by waves, lies less than one-half mile north-west of the inner end of White Head. Continuing along Nantasket Beach, which now broadens, including on the inner side a considerable portion of marsh and a few salt water ponds (the earlier stage of marsh filling), enclosed by a narrow beach thrown up by waves sweeping across the inner harbor, comes Strawberry Hill. A water tower stands on the edge of the cliff of this half-destroyed drumlin. The base of the cliff has been shut in from the sea by half a mile of beach growth. Sand dunes appear both on the south side of Strawberry Hill, along the open sea, and on the northern, following close along the shores of the harbor. It will be noticed that the roads built up across this flat land run in nearly straight lines, — a characteristic of highways on lands of similar nature. A mile further south, at the end of Nantasket Beach, is another hill of the same kind as Strawberry Hill, — Point Allerton (see cut 13), a well-formed drumlin over 100 feet high, with a cliff of about 80 feet, cut back about a third of its length.

From Point Allerton the shore takes a sudden bend to the westward along a barrier of pebbles, known as Stony Beach, the railroad passing

behind Point Allerton and in front of Nantasket Hill, on whose top fortifications are shown. Joined to this hill is another drumlin, about 20 feet lower, around which is the main settlement of Hull. Behind these two hills lies Little Hog Island, a low patch of glacial drift. Windmill Point is the westernmost extension of the Nantasket strip. It is a low spit made mostly of marine shingle, on whose inner side is the steamboat landing at Pemberton and the terminus of the Nantasket Beach Railway. Hull has a population of 1,044.

BLUE HILLS AND NEPONSET RIVER TOWNS.

Braintree.

Turning to the towns of the Blue Hills range, Braintree appears on a plain under the south-east slope of Blue Hill, and for the greater part between the upper courses of Weymouth Fore River and Town Brook, in whose drainage basin lies the chain of lakes including Great and Little ponds. Braintree Centre is at the junction of the Old Colony, South Shore & Granite branches of the New York, New Haven & Hartford Railroad. About a mile and a quarter south, on the Old Colony branch, is South Braintree; East Braintree being about an equal distance east of the junction, where the South Shore branch crosses the Fore River. Population, 5,311.

Randolph.

Randolph lies on a comparatively flat plain, which abuts against the steep southern slope of the Blue Hills. The land is relatively high, about 200 feet above mean sea level, being the source of streams flowing west into the Charles and east into Weymouth Fore River. Ponkapoag is the pond about a mile long lying along the western border of the town, Hoosiewhisick or Houghton's Pond is a small body of water on the plain just below the steep escarpment of Houghton's Hill, — a peak of the Blue Hills 430 feet high, — being the source of Monatiquot stream, which receives the southern drainage of the Blue Hills. The village of Randolph falls just without the model, on the Tamnton division of the Old Colony Railroad. Population, 3,694.

Canton.

A triangular portion of the northern part of Canton comes upon the area, consisting of the western slope of the Randolph plain, which carries the drainage to the Neponset River, here consisting of tortuous meanderings through the flat marshes which extend about half a mile on either side, — the Fowl Meadows, takings of the Metropolitan Park Commission. This portion of the Neponset River, modelled from the elaborate Board of Health maps, is one of the best examples of a stream meander-

ing in its low flood plain afforded by the Metropolitan District. The flat plain allows the construction of the straight line of railroad, built up several feet above the marsh. Canton has a population of 4,636, but the principal villages are not within the limits of the model.

Milton.

The town of Milton, containing the highest land in the Metropolitan District, lies between the northern slope of Blue Hills (see cut 2), including the crest of the range, — Great Blue Hill, — and the Neponset River. It thus includes not only the greatest elevation above sea level, 640 feet, but the maximum topographic relief as well, since it reaches low tide level in the Neponset estuary. More than this, the location is of geographic importance, since it is the highest peak so near our Atlantic coast south from Mount Desert, Me.

The Blue Hills form an isolated range of hard, crystalline rocks, about five miles long, and from one to two miles broad, rising abruptly from the plain on the south, and sloping gradually to the Neponset River on the north and west, and on the east to the sea. The steeper slopes of these little residual mountains are of bare rock, especially on the southern side, where there is little soil and the formation out-crops in steep faces which supply the lower slopes with a talus of heavy angular boulders. Numerous streams course down the gullies, and the frequent notches are obstructed with ponds and swamps. While the tops of the higher hills are generally bare, the slopes to a large extent are heavily wooded with deciduous and evergreen trees. The principal hills are as follows: Great Blue Hill, the extreme western limit and the summit of the range, on which stands the Blue Hill Observatory; and continuing eastward along the crests, Walcott Hill, 470 feet high, Houghton Hill, 431 feet, above Hoosiewhisick Pond, north of which is Hancock Hill, 510 feet, with its steep rocky eastern face; across the pass through which runs the road, Hillside Street, Tucker Hill, 449 feet. The next prominent hill directly east is Buck Hill, 500 feet. Randolph pass at 250 feet cuts across a range at the foot of this height, being the route followed by the street cars. On the opposite side is Hawk Hill, 436 feet. Chicatawbut, the second highest peak in the metropolitan area, is the large hill north-east. Rattlesnake Hill lies on the eastern end of the range, the last five hills being within the boundaries of Quiney. The Blue Hills range and adjacent lands, an area of about 5,000 acres, belong to the metropolitan park system, and its remarkably detailed map of the Blue Hills Reservation — scale 1 : 6,000, contour interval 5 feet, with individual rocks and trees — was used on this section. The Milton Branch Railroad comes into the northern part of the town along the Neponset River. Milton Mills, situated on this road, is at the lower falls of the Neponset. East Milton lies on the Granite branch of the Old

Colony Railroad. Milton Centre is on Pine Tree Brook, near Ice Pond, Blue Hills post-office near the head of the same brook, on the Blue Hills Parkway. Milton has a population of 5,580.

Hyde Park.

Hyde Park lies north of Milton, in the valley of the Neponset, at its junction with Mother Brook. The stream has by artificial trenching been made to tap the waters of the Charles and to carry a regulated amount through the lower Neponset on a shorter course to the sea,—an intervention of the natural methods of river piracy. The southern half of the Stony Brook Reservation showing the woods and a considerable amount of rock exposure, lies near the western border of Hyde Park. Brush Hill, 240 feet, stands on the southern town line, with a reservoir and standpipe on its top. Clarendon Hills is the settlement among the rolling lands in the northern part of the town, Fairmount the village near the junction of Mother Brook. Readville lies between the Neponset River and Mother Brook, at the junction of the Providence and Midland divisions and the Dedham branch of the New York, New Haven & Hartford Railroad. On the northern border of the Neponset River flood plain, the large elliptical race track of the New England Association is readily distinguished. The population of Hyde Park is 11,826.

Dedham.

The town of Dedham lies on the south-western border of the model, between the Charles and Neponset rivers, and includes the great bend of the Charles, where, meandering in its flood plain, the river flows some four miles to gain one-eighth of that distance, as can be judged by the “cut-off” ditch trenched across the marsh at the head of the bend. Near the southernmost portion of the bend the Mother Brook channel has been dug back to the Charles River in order to increase the water supply for the mills of the lower Neponset. A considerable portion of Dedham is covered with evergreen and hard-wood growth. Nearly a score of isolated villages are distributed throughout the town. Dedham village lies near the southernmost turn of the Charles on the Boston & Providence Railroad; East Dedham about a mile east on Mother Brook; Oakdale and Endicott within the large triangle made by the railroads. Green Lodge, the second crossing from the edge of the model, on the Boston & Providence Railroad; Islington, a village on the Midland branch, a little over a mile from the edge; and West Dedham on the western slope of Fox Hill, 323 feet high, on the very circumference, are outlying settlements which come within the limits of the model. The estimated population is 7,211.

Norwood.

The central portion of Norwood lies just outside the area, near the head of the brook which empties into the Neponset. Ellis Station, on the Midland branch of the New England division, a little over half a mile from the border, is the only village which appears within the area under consideration. The population of Norwood is 4,574.

WESTERN BORDER AND CHARLES RIVER TOWNS.

Needham.

Needham lies north-west of Dedham, occupying the big bend between the west and north banks of the Charles, the drainage all flowing into this river. The village of Needham is situated on the Woonsocket division, two miles from the edge of the model. Highlandville is on the same railroad one mile nearer Boston. Charles River village lies at the falls where the Charles River first comes upon the area. The greater portion of the river which lies in this town is modelled from very detailed maps, — of five feet and less contour intervals, — including those of the Brookline Water Reservation, the Newton Water Reserve, and the Hemlock Gorge Reservation. Trees, both evergreen and deciduous, are quite evenly distributed throughout the town. The population is 3,511.

Wellesley.

The eastern half of the town of Wellesley lies north of Dedham on the western border of the model, its eastern boundary being the Charles River, and Wellesley village, on the Boston & Albany Railroad, is cut by the circumference. Wellesley Hills is about one mile further east, on the same railroad, at the foot of Maugns Hill, 320 feet high. Wellesley Farms is another mile further east of the latter station. The population of Wellesley is 4,229.

Newton.

On the opposite bank of the Charles from Wellesley is Newton, the Upper Falls occurring where the river has been turned upon the hard rocks in the narrow Hemlock Gorge — a metropolitan park reservation. A carriage road crosses the river just above the falls, and a short distance below is Echo bridge, whose central arch of 130 feet span carries the Sudbury aqueduct. Newton borders the Charles River for some sixteen miles, the stream being on its western and the greater part of its northern border. With its fifteen villages Newton occupies one of the largest areas of any town in the Metropolitan District. Newton Upper Falls is the village (with several tall chimneys) just above the Hemlock Gorge, on the

Woonsocket division. Newton Lower Falls appears as a cluster of mills about two miles below the Upper Falls, the terminus of a branch of the Boston & Albany Railroad. Riverside is the next station below on the bank of the Charles. Auburndale lies a half mile further east, near the pond-like expansion of the river, where it is fretted with irregular coves, in which lie Auburndale and the River parks. West Newton is on the same railroad, one mile east, on the side of a 200-foot hill, on Cheesecake Creek. Newtonville is situated still a mile further east, on Laundry Brook, and the village of Newton on the lower reach of the Charles. Nonantum is on the Charles west of Newton, between Laundry and Cheesecake brooks. Chestnut Hill lies just west of the Chestnut Hill Reservoir on the eastern border of the town. Newton Centre stands on the highlands near Crystal Lake, in the central portion, about a mile west, on the Circuit Railroad. Newton Highlands is the next station west, at the junction of the Circuit road. Bald Pate Hill, 318 feet, and Oak, the western hill, 240 feet, are prominent heights in the southern part of the town. The population of Newton is 27,590.

Weston.

The eastern portion of the town of Weston comes on the border of the model west of Newton, the drainage flowing eastward into the Charles. The Cambridge water reserve basin lies along the eastern border of the town, receiving the water of Stony Brook and Hobbs Brook. Near by stands Norumbega Tower. Doublet Hill, 360 feet, lies south-west of this locality. The three villages included are Riverside, Stony Brook, a station on the Fitchburg Railroad near the head of the Cambridge water reservation, and Kendal Green, one mile west, on the same road between Cat Rock, a hill 300 feet high, north-west, and Bear Hill, Waltham, which is 340 feet. The population of Weston is 1,710.

Waltham.

Waltham is the next town on the Charles, below Weston and Newton. The closely built portion is situated along both banks of the river, in the vicinity of the falls, where numerous factories and chimneys are located. The great Hobbs Brook storage basin, the largest reservoir in the Metropolitan District, lies among the hills in the valley of the brook, on the western edge of the model. Meal or Hardy's Pond, from which Beaver Brook empties into the Charles, lies about a mile east of this large sheet of water. Prospect Hill, with two peaks, the elevations next in altitude — 482 feet — in the Metropolitan District to the Blue Hills Range, lies in the western and thickly wooded portion of the town. Prospectville is a small settlement under the western slope of the hill. Riverview is a station

on the Fitchburg Railroad. The population of the city of Waltham is 20,876. It is situated between the Massachusetts Central and the Fitchburg railroads.

Lincoln.

The northern portion of the Hobbs Brook basin lies in the town of Lincoln. The population of the town is 1,111.

Watertown.

Watertown lies along the north bank of the Charles, east of Waltham. The bridge crossing the Charles from Newton runs into the town proper, which is on the Watertown branch of the Fitchburg Railroad. Directly north, on White's Hill, 160 feet, is the water tower, and at the north-western corner of the town, in Mount Auburn Cemetery, stands the Mount Auburn observatory. The United States Arsenal grounds lie along the river bank at the second bridge. Bemis is a village at the western end of the town, on the same railroad and river. Union Market Station is one mile east of the centre of the town, to the west of which may be seen the Boston Union Stock Market sheds. East Watertown station is about a half mile further east. The population of Watertown is 7,788.

Metropolitan park reservations occur along the banks of the Charles River throughout the town, except where the government or town has taken land. In fact, both banks of the Charles, from Dedham south, with a few small exceptions, are devoted to public parks.

GEO. CARROLL CURTIS.

BOSTON, MASS., U. S. A., May, 1900.

APPENDIX.

The following are maps used in the construction of the model:—

U. S. COAST AND GEODETIC SURVEY.

Prints from M.S. maps, on scale 1: 10,000 from topographic sheets, Nos. 2190, 2197, 2180, 2155, 2115, 2204, 2177, 2114, 2146, 2147, 2154.

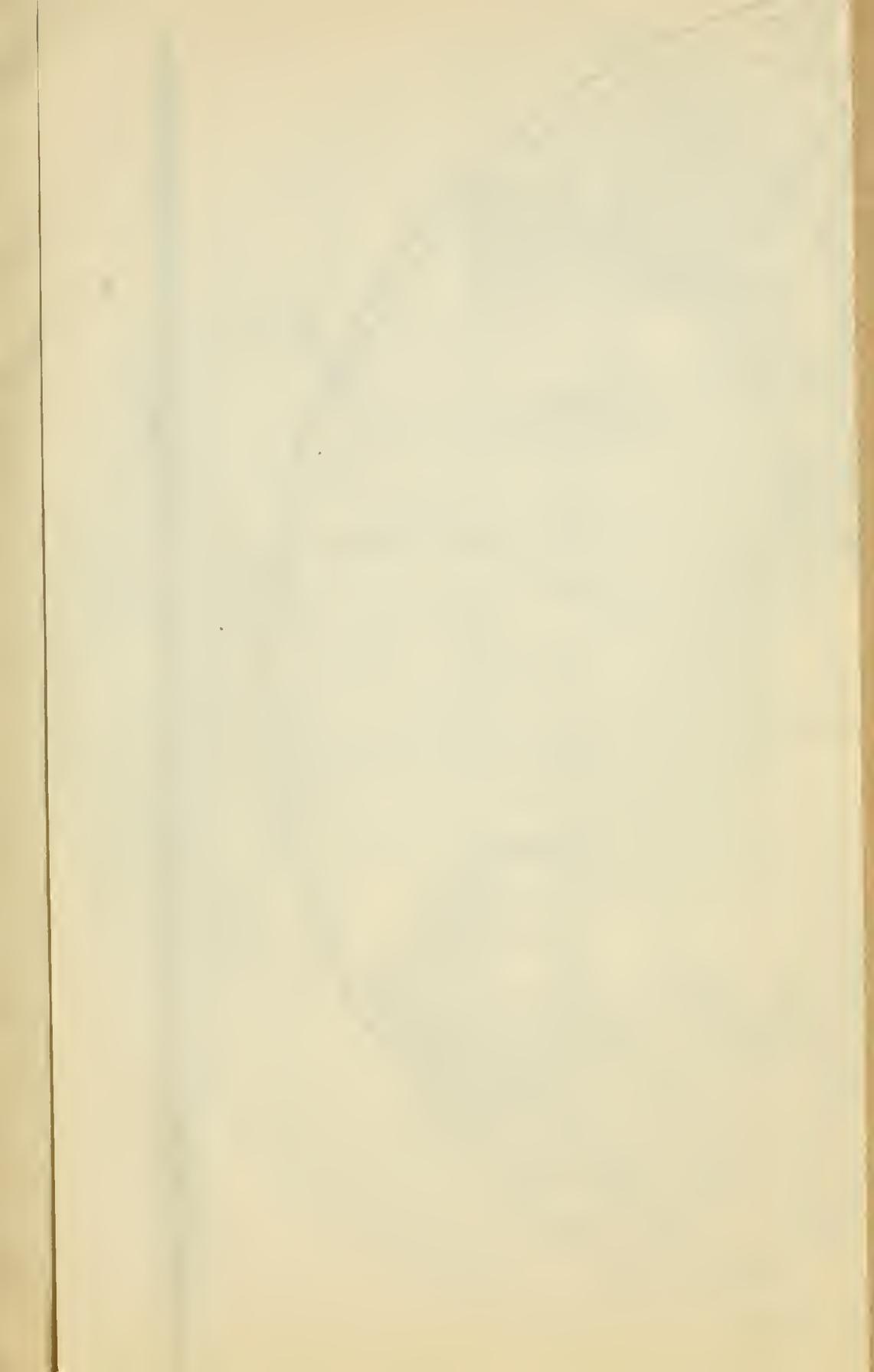
U. S. GEOLOGICAL SURVEY.

Photographic reductions from revised and recontoured maps of the following towns and places:— Belmont, Boston (Dorchester portion), Cambridge, Everett, Hyde Park, Lynn, Medford, Melrose, Newton, Revere, Somerville, Waltham, Winchester (uncontoured), Woburn (uncontoured), Watertown, Arlington, Brookline, Malden, Milton, Neponset River (Walpole to Milton Lower Mills), Roxbury, Saugus and Lynn (uncontoured), Wakefield, West Roxbury, Belmont Reservoir, Lexington, Swampscott, Lynn Woods, Milton and Quincy. Three sheets, including parts of Dedham and Randolph.

METROPOLITAN RESERVATION MAPS FROM OLNSTED BROTHERS.

	FEET.
Portions of Brookline,	*100
Peter's Hill,	40
Alewife Brook,	100
Charles River, Brookline Water Works to Spring Street,	100
Charles River, Nahanton Street to Hemlock Gorge Reservation,	100
Charles River, Spring Street to Mother Brook,	100
Charles River, Newton Lower Falls to Hemlock Gorge Reservation,	100
Charles River, Moody Street Bridge to Watertown Line,	100
Hemlock Gorge Reservation (two topes), one,	40
Hemlock Gorge Reservation, one,	100
Furnace Brook Parkway, Adams Street to Blue Hills Reservation,	100
Bolster Brook Parkway, Paul's Bridge to Blue Hills Reservation,	100
West Roxbury Parkway, Weld Street to Anawan Street,	40
Mother Brook Parkway, Charles River to Stony Brook Reservation,	100
Neponset River Reservation, Gulliver's Creek,	100
Neponset River Reservation, Glenwood Avenue to Mattapan Station,	100
Neponset River Reservation, Mattapan Station to Milton Station,	100
Neponset River Reservation, Neponset Station to Milton Station,	100
Neponset River Reservation, Milton Station to Atlantic Station,	100
Neponset River Reservation, Mother Brook to Neponset River, Stony Brook Reservation,	100
West Roxbury Parkway, Arnold Arboretum to Weld Street,	40
West Roxbury Parkway, Washington Street to Anawan Street,	40
Charles River Parkway, Grading Plan Magazine Street to Brookline Street,	40
Charles River Parkway, Extension of Esplanade to Brookline Street,	100
Charles River Parkway, Grading Plan for new bath-houses at Captain's Island Playground,	40
Furnace Brook Parkway, Quincy Shore to Adams Street,	100
Neponset River Reservation, Paul's Bridge to Walpole Line,	100
Charles River Reservation, Nahanton Street to Spring Street,	100
Charles River Reservation, Auburndale Park to Weston Bridge,	100
Charles River Reservation, Moody Street to Auburndale Park,	100
Charles River Reservation, Weston Bridge to Newton Lower Falls,	100
Blue Hills Parkway, Canton Avenue to Reservation,	40
Squantum Shore,	100
Mystic River Reservation, Boston Avenue to Craddock Bridge,	100
Mystic River Reservation, Craddock Bridge to Felloway,	100
Cambridge Common,	20
Fresh Pond,	100
Cotmore Lea,	20-10
Hitchings Field,	30
Rindge Field,	40
Dorchester Park,	40
King's Beach,	40
Craddock Field,	30
Mystic Valley Parkway North, Walnut Street to Fells Reservation,	40
The following lithographs:—	
Public Reservation Charles River,	800
Fells Reservation,	500
Park System, Boston Common to Franklin Park,	730
Stony Brook Reservation, Topo.,	400
Blue Hills Reservation, Topo.,	500
Wood Island Park,	100
Charlestown Heights,	50
Copp's Hill Terraces,	60
General Plan Franklin Park,	300
Franklin Field, Topo.,	300
Charles River Speedway,	200
Cambridge Field,	500
Mystic Valley Parkway,	100
Blue Hills Parkway,	500
Fells Parkway,	500
Charles River Embankment,	100

* One hundred feet to the inch.



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