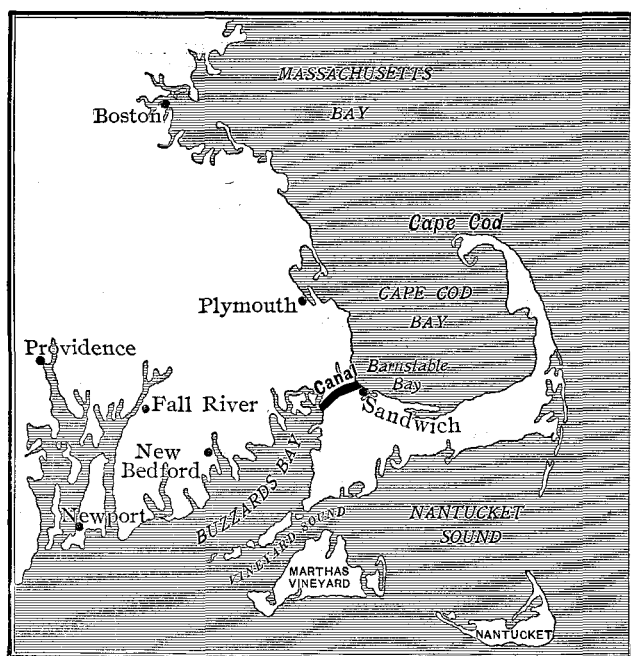


BUZZARDS BAY BRIDGE ACROSS THE CANAL

Lifted with little exertion by a weight of 1,200 tons of cement suspended at the other end



Cutting Cape Cod

By Sylvester Baxter

UNTOLD ages have passed since cosmic forces amputated the "Right Arm of Massachusetts." To-day the hand of man repeats that colossal operation in geologic surgery. The slow attritions of wind and weather and the wear of water took centuries to complete what now is wrought in a few swift years that are but as the flash of a scalpel in comparison. Creative man, served by elemental powers and making the historic Cape Cod peninsula once more an island, outdoes Dame Nature at her own handiwork.

The march of time restored to the continent its lost member, but the scars left behind taught man just where to proceed with his own island-making. So, curiously enough, the great power dredges and steam-shovels that represent the surgeon's knife in this task are now following precisely the lines taken by the rude instruments of nature when they severed the peninsula from the mainland.

Cape Cod has mightily affected the course of history. At its tip end the

Pilgrims of Plymouth first set foot upon the New World's ground. They had left good friends behind among the Dutch in Holland, and now they were bound to New Amsterdam to settle in the neighborhood of compatriots of these. But here at Cape Cod their course was diverted to bleaker shores. Otherwise New York and Boston might have been one. But since they were two there has grown up the greatest coastwise trade between two great cities anywhere in the world. Long Island Sound is the pathway for this trade. Added thereto is the enormous intercourse between the more southerly ports—Chesapeake Bay and beyond—and all along the New England coast north of Cape Cod. Coastwise commerce, as a rule, never makes short cuts across the sea out of sight of land. It hugs the shore for the sake of the facile guides to navigation that the landmarks and the lights afford. At present its northward course carries it through the narrow Vineyard Sound, across the shallow Nantucket Sound, with its shifting and tortuous channels, along the back of

Cape Cod, over the boisterous waters and the most dangerous lee shore on the coast, and thence into Massachusetts Bay.

The sheltered water-path of Long Island Sound prolongs itself in a general direction of about northeast-by-south through Block Island Sound and across the interval of open sea off Point Judith and Newport into Buzzards Bay, normally the easterly end of this great inclosed waterway. With Cape Cod again an island, a thronging commerce will course now lonesome waters, and Long Island Sound will practically be extended into the fairly sheltered expanse of Cape Cod Bay, the distance between Plymouth Harbor and Boston Light the only remaining stretch of open ocean.

To a commerce that now, in round numbers, amounts to twenty-five million tons a year this will save a distance of sixty-six miles, besides the still more valuable consideration of avoiding costly delays in waiting for favorable weather to round the Cape, and averting the dangers that, according to incomplete records for sixty years, have wrecked at least 2,131 vessels and caused the loss of something like seven hundred lives.

Since the days of the Pilgrims there have been numerous projects for a canal across Cape Cod. But on June 22, 1909, actual construction was begun by the Boston, Cape Cod, and New York Canal Company. On that day Mr. August Belmont, as president of the Company, turned the first shovelful of earth. It may be noted that, in addition to the financial attractiveness of the project, there was for Mr. Belmont a sentimental motive. On the maternal side, that of the Perrys (being a grandson of Commodore M. C. Perry, who opened up Japan to the modern world), Mr. Belmont is a lineal descendant of the pioneer settler of Cape Cod, Edward Freeman, Governor of Sandwich. And the spot where Mr. Belmont started the work with a silver shovel, near the

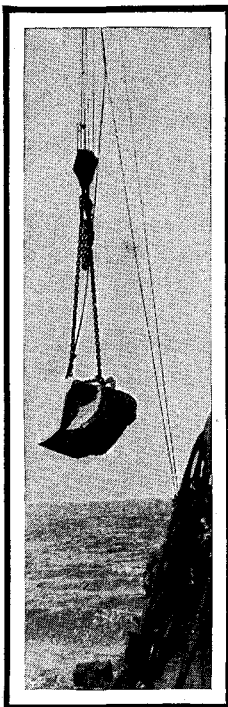
Bournedale railway station, had been a portion of the extensive domain of his ancestor.

Commercial conditions now encourage, and even demand, the construction of the canal where formerly they might have made it of doubtful value. Engineering progress now makes the project financially feasible, although the mechanical resources of the eighties and early nineties might have made it a doubtful proposition.

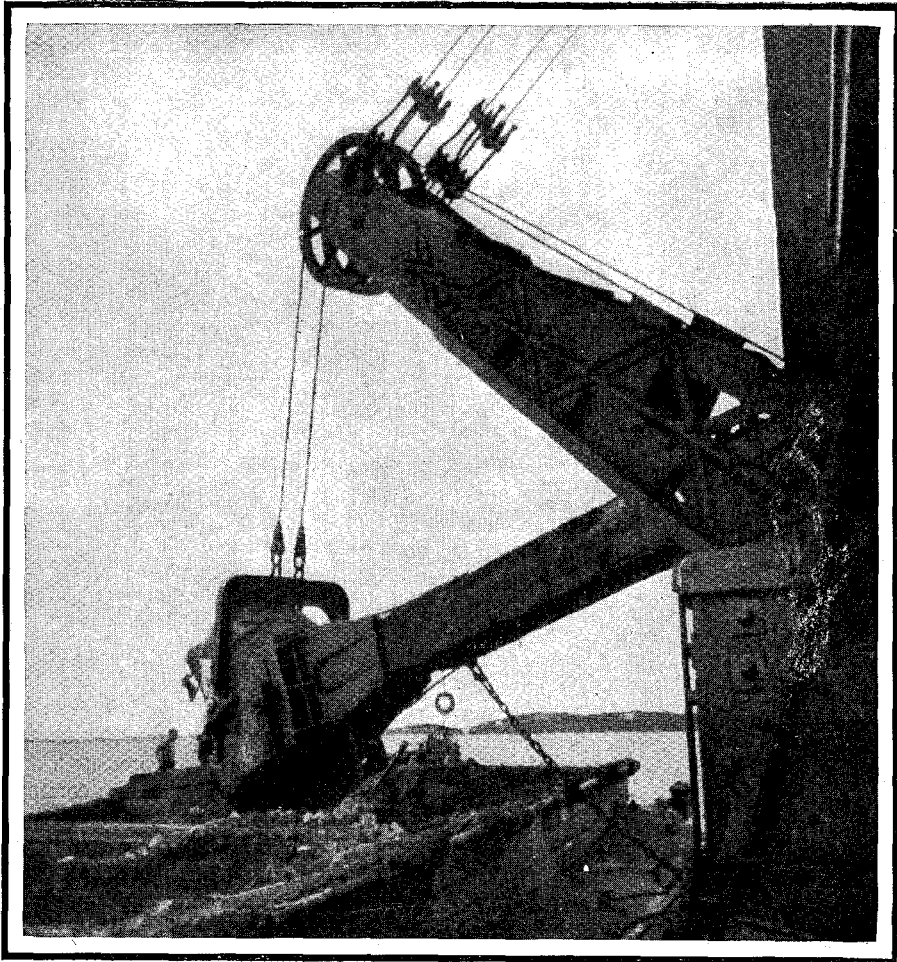
The chief engineer selected for the work was Mr. William Barclay Parsons, who built the New York Subway. There is a difference in height of the tides to the north and south of Cape Cod; the tidal rise on the north side is from nine to twelve feet and more; on the south it is only four or five feet. With all that difference in water-levels, would there not be such a violent flow through the canal as to make navigation very largely impracticable? But there are three hours between the periods of slack water on the two sides of the Cape. Flood tide on the north, for instance, comes three hours later than on the south; when it is high

water in Buzzards Bay it is mean tide in Cape Cod Bay. Under these conditions a canal of the length and cross-section planned for will have for the mean tide a current of about two and one-half knots, or marine miles, an hour, flowing now northward, now southward, according to the stages of tide at the two ends. This will be the maximum current at or near the points of high and low water, running at that rate for a very short time, and then decreasing to slack water. Thereupon the flow will gradually increase in rate, turning to the opposite direction. The longer period of flow will be in the southerly direction, in consequence of the higher stages of tide on the north side. Such a current will not at all interfere with navigation. Indeed, vessels going against it will have a better steerageway.

Will it pay? A prompt subscription of \$12,000,000 seems a sufficient answer. Were it a



PLACING THE FIRST
STONE ON SAND-
WICH BREAKWATER



THE DREDGE ONONDAGA EMPTYING ITS NINE-YARD BUCKET

Government undertaking this aspect might seem of minor account.

Quite remarkably, the Cape Cod Canal is the only great waterway enterprise in recent years undertaken by private capital. All the great canals of the world, with two exceptions, are either government affairs or have been taken over by governments. The Suez and the Manchester Canals are the exceptions. Both were built by private corporations, but the majority of the stock in the Suez Canal is now owned by the British Government, and that in the Manchester Canal by the city of Manchester. The Suez Canal proved from the start a highly profitable enterprise, and the indirect profits from the Manchester Canal justify it as a municipal investment. But the disastrous French investments at Panama gave water-

way undertakings a bad repute with capital. The great ship canals of the United States and Canadian Governments at the "Soo," with a traffic enormously in excess of that of Suez, would have been remunerative as private enterprises.

The situation at Cape Cod is analogous to Suez conditions; a great existing traffic awaits its realization, with prospective new traffic encouraged by the facilities offered. Careful figuring as to assured uses made a gratifying exhibit for the Cape Cod enterprise.

Ten or fifteen years ago, when so great a proportion of the coastwise commerce was conducted in sailing craft, the financial outlook might have seemed dubious. Now even sailing vessels, under the inducements of low towage charges and a saving in time, would very largely use the

canal. But sailing craft are to-day giving place to steam more rapidly than ever. The company that owns the largest fleet of sailing colliers on the coast—huge schooners with five or six masts—lately built two great steam colliers and announced that it had built its last sailing vessels. Regularity and frequency in trips have turned the balance for economy and profitable returns in favor of steam. Ten years ago 5,259 coastwise cargo-carriers arrived at Boston. The proportion of sailing vessels was 26 per cent. Last year the arrivals were 5,187, and only 14 per cent carried sails. The proportion is now only 12 per cent. With a slight decrease in the number of arrivals the commerce actually increased enormously in the ten years, the gross tonnage being nearly eighty per cent greater.

Besides its service to commercial shipping, an appreciable value of the canal is for the multitude of pleasure craft along the New England coast through the summer. The tendency towards motor vessels in yachting is as great as that in commercial navigation from sails to steam. The canal will make the pleasant sheltered waters south of Cape Cod safely available for the thousands of motor craft around Boston, while New York yachtsmen will gain easier access to the picturesque shores of northern New England.

Coal to the amount of 9,000,000 tons is now carried around the Cape every year. The greater part of this trade goes either in steam colliers or in large barges towed by powerful ocean-going tugs. The newer barges are specially built for the trade, and have enormous carrying capacity. The trade is conducted either by large transportation companies or by the great coal-carrying railways. The latter own big fleets of barges and towboats, and endeavor to make their trips on schedules as regular as possible. This policy is sadly deranged by the necessity that keeps tows lying storm-bound or fog-bound at Vineyard Haven or at Provincetown. Several days often pass in waiting for a good chance to round the Cape. The danger is great; insurance rates are correspondingly high. It makes a great difference in profits whether a fleet can make two or three round trips a month. Much new traffic should be created because of the

canal; it will encourage towing by extending the stretch of sheltered waters along the coast. The canal projectors conferred at the start with all the great coal-carrying interests and were assured that they would certainly use the canal.

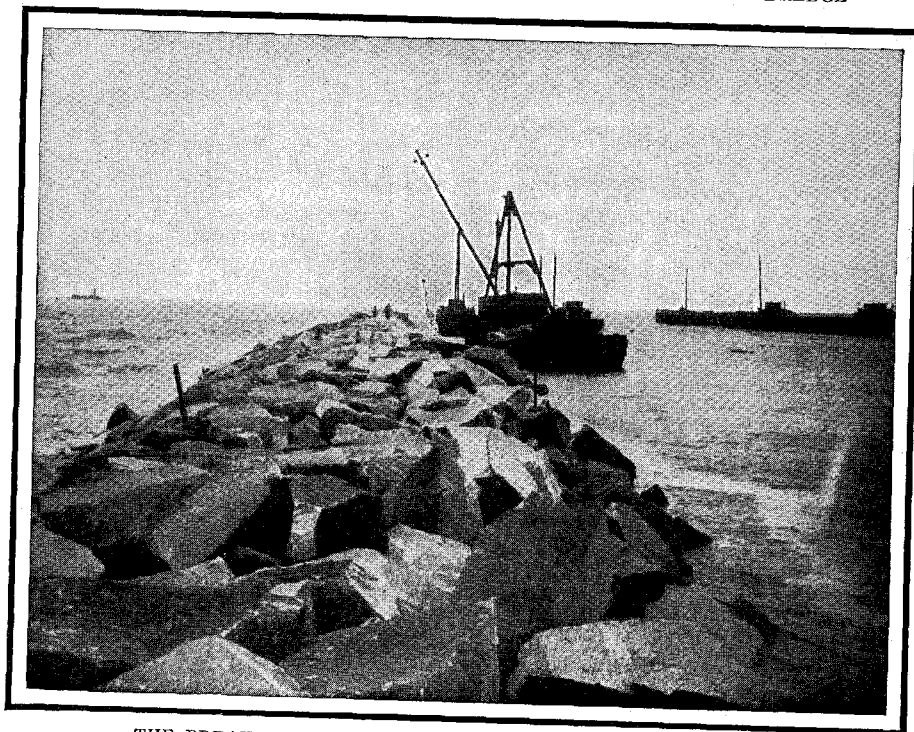
Another main source of revenue is the passenger traffic. Nearly five hundred thousand people annually now journey by water between New York and Boston, or points beyond the latter city, and between Boston and southern ports. All this traffic will go by canal, and travel by water should greatly increase with the enhanced comfort and convenience. The great boats of the Fall River line will run through to Boston. This change should promote new pleasure travel between both New York and Boston and Cape Cod. A highly disagreeable feature of the east-bound steamboat travel from New York is the necessity for changing to the trains at Fall River or Providence extremely early in the morning—much of the year before daylight. To arrive in Boston, as well as in New York, directly by boat, and without the affliction of dust, smoke, and cinders, will be greatly appreciated.

The stranger who holds the commonly accepted idea of Cape Cod scenery will find the landscape along the route of the canal in striking contrast to the waste of sands and barren, wind-swept moors that he looked for. The valley cut by the prehistoric channel runs narrowly for several miles between steep wooded hills on either side—hills that would look fairly high anywhere inland in southern New England. At places there is barely more than room for the highway and the railway track beside the pleasant stream—the gentle Chagres of our little Panama—that flows its rapid way towards Buzzards Bay, its limpid flood kept surprisingly full even through a midsummer drought from the leeching of the waters from nature's sandy reservoirs back in the hills. This is the Manomet River—mis-called the "Monument" through the false hearing that has perverted a historic Indian name.

It seems a pity to destroy such a charming valley. Looking at the pretty stream, it is pathetic to think how it now matters little that its admirable name has been distorted, since in a few months more the Manomet will have vanished for good and



FROM THE HUGE PIPE POURS A FLOOD OF SAND AND WATER
PUMPED FROM THE BOTTOM OF THE CANAL BY THE SUCTION DREDGE



THE BREAKWATER AT THE SANDWICH ENTRANCE, BUILT OF
THOUSANDS OF TONS OF GRANITE BROUGHT FROM MAINE

all throughout its entire course, swallowed up by the wide canal whose salt current will take over unnoted the sweet waters that percolate from the bordering hills. Only the estuary, hitherto always navigable in a small way, will remain, though transformed to a canal section by deepening and straightening. One fancies how the big craft will soon be passing through this idyllic Old Colony valley that now betrays as in a faint aroma the history that saturates it; the stately Sound steamers with their snowy sides and towering superstructures, the big steamships, the trains of tugs and barges, the warships, and the countless little craft—all running where fields and woods and roadside old Colonial homesteads now lie. And one thinks how picturesquely interesting these hills will look to the passengers—yet how changed from now!

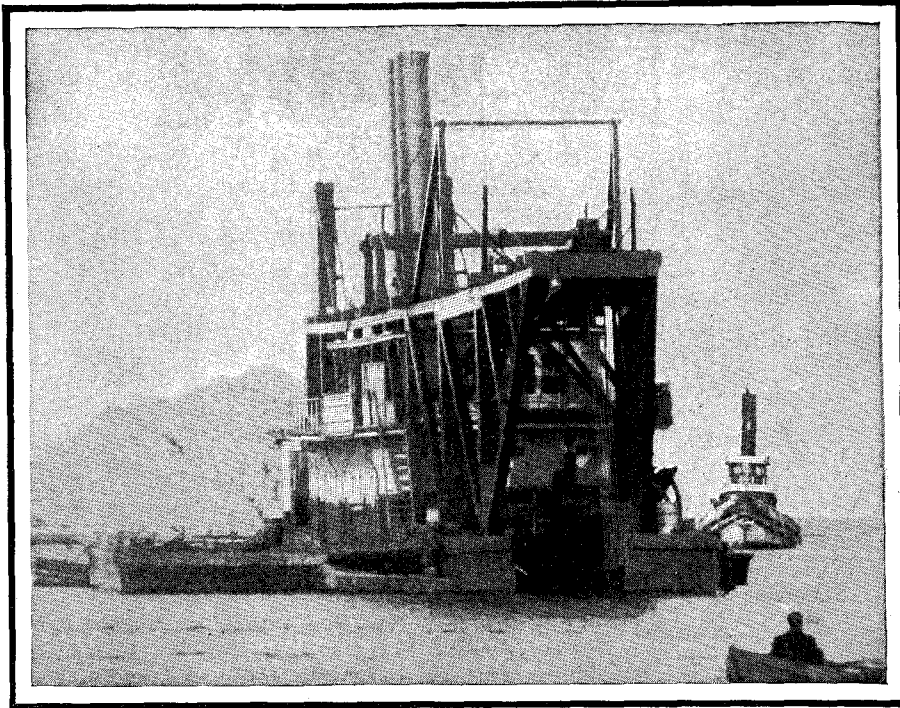
Through this valley, and across the wide levels near the shores, the line of the canal makes the figure of a Cupid's bow upon the map. A straight course would take the canal through the hills, where the problem of a Cape Cod Culebra would make the cost prohibitory. The mile or more added to the length of the canal is immaterial; the line curves gently all the way, with no abrupt bends. There is always a clear view ahead for vessels.

Construction is proceeding actively at both ends. Upon the spectator the visible progress most impresses itself at the north end. On the south the dredges are chiefly at work upon the long approach channel through the shallow waters at the head of Buzzards Bay—practically an underwater prolongation of the canal about four and one-half miles long, such as in Panama Bay on the Pacific side of the Isthmus. On the north the submerged section of the canal runs out from the shore to the same thirty-foot depth only a little more than half a mile. Here a breakwater three thousand feet long is under construction. This will guard the approach from the washing of sand that scours down with the current along the mainland coast. Otherwise a strong northeaster might completely obliterate the channel in a few hours. Already the line of the breakwater runs far out into the sea, making a safe roadstead for the fleet of stone-laden craft here congregated.

Never before has such animation been seen in these hitherto lonesome waters. Heretofore commerce has always given this part of the coast a wide berth. The present spectacle slightly forecasts the aspect when here will run a main track of it. Barges and tugs are always coming and going, laden with rocks from the coast of Maine, where stone superabounds. Every week, for more than a year, thousands upon thousands of tons have been dumped to form this breakwater, whose jagged summit bites the waves like a long row of gigantic black teeth. Floating derricks are at work upon a good job of stone dentistry, plugging the crevices in the artificial reef with chunks of granite to make it wave-proof, and then laying a level course of capstones to give the whole structure a presentable engineering shape. Inland the line of the canal runs through the wide marshes, already completed past Sandwich village and rapidly approaching its entrance upon the hill section of its course at Sagamore, in the township of Bourne. For a mile at the northward end the canal has a bottom width of three hundred feet, the extra hundred feet added to give north-bound barges mooring room along the bank for making up the tows out into the bay.

History is repeating itself along here. Cape Cod, long addicted to cranberry culture, and now one of the great summer pleasure-grounds of America, is seldom thought of in connection with manufacturing. Yet two generations ago the now vanished salt-works of the Cape represented an investment of \$2,000,000. And well past the Civil War there flourished at Sandwich one of the oldest glass-works in the country. The now tranquil village, its beautiful streets shaded with tall elms, was then the busiest and the roughest place on the Cape, its tough young foreigners the terror of peaceable Yankee boys in other villages subject to their occasional raids.

Industry is now booked to return to this section upon a vast scale. Already the modest car-works established a half-century ago at West Sandwich, now Sagamore, have lately expanded into one of the largest concerns of the sort in the country, making Sagamore a busy little incipient city. These works border the railway track on one side and the line of



THE BIG SUCTION DREDGE GENERAL MACKENZIE, WHICH EXCAVATES BY PUMPING SAND AND WATER FROM THE BOTTOM OF THE CANAL, SENDING IT IN HUGE PIPES TO THE MARSHES, WHERE IT FORMS LEVEL GROUND FOR INDUSTRIAL DEVELOPMENT

the canal on the other for a length of about a mile, and a branching out into other important lines of manufacturing is planned for. Already the first commercial utilization of the canal is at hand. Sagamore is booked to become an active seaport within a few months, opening up with a considerable commerce at the very outset.

Out in the completed section of the canal the big dredges are steadily, and with remarkable celerity, gnawing their way inland through the soft, sandy ground that underlies the marshes and the meadows. Occasional boulders dropped by the glaciers and distributed through the sand like plums in a pudding are the only obstacles to smooth progress. Not a few of these boulders weigh many tons, and they have to be dynamited out of the way.

With their galleried superstructures and their twin smoke-stacks at the bow, these dredges look like Mississippi River steamboats. A casual beholder passing in the train may fancy these dredges lying idle, for there is no movement of great scoops in connection with the massive framework at their bows. But the dredges are of

the suction type. All the time they are drawing up the water and sand and discharging the resultant thick liquid mixture through large conduits laid to the bank. There it flows over the ground in shallow lagoons, steadily and uniformly raising the level in a uniform mass of firmly settled sand. A good distance ahead steam-shovels form an advance guard along the line of the canal, breaking out the way for the work of the floating dredges, stripping the surface layer, and piling up the material in banks that securely retain the sand pumped in behind them. The canal as it grows thus belts itself with wide margins of level ground well suited for whatever occupancy may be called for. The marshes at either end are thereby lifted well above the tidal level and converted into valuable terra firma. Here high dikes are constructed out of the tough sods from the surface along the canal front. The steep-faced wall thus built along both banks makes a substantial fabric that effectively retains the pumped-in sand and keeps it from washing back into the canal. These dikes are built far

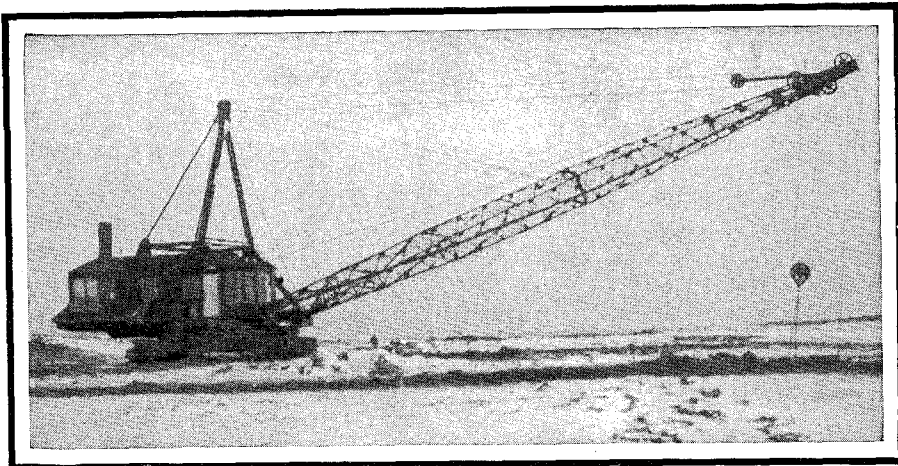
enough back to allow the deepening and corresponding widening of the canal when required.

As they advance, the powerful suction-dredges leave the canal finished behind them to its full depth of twenty-five feet at low water, and its corresponding completed bottom width of two hundred and fifty feet, as planned. At the car-works in Sagamore the canal expands into a capacious dock where the largest vessels can lie at the quay to discharge and load, and wide enough to provide a turning-basin where they can be warped around. The work progresses so rapidly under conditions so favorable for excavation that by the spring of 1911 the great car-works will be getting all their coal, lumber, and other heavy material directly by water, the most of it coming from the southward, and therefore brought around the Cape until the two ends of the canal meet.

Incidental to the canal, but in importance and possible magnitude second only to that enterprise, is the opportunity in city development presented along its borders. The indications are that here will grow up a great industrial center, probably the most notable example east of the Alleghanies of the deliberate creation of an extensive manufacturing city almost *de novo*, from the ground up. In its possibilities the task seems comparable with the building of the new city of Gary on the Indiana lake shore by the United States Steel Company. It is doubtful if anywhere else on the Atlantic seaboard can conditions so uncommonly favorable to that end be found. The site is directly in the track of a vast commerce. It is the point where that commerce converges in its passage between the two greatest ports of the coast, and almost at the threshold of the second of them. There is transportation both by rail and deep water. Along the double water-front of sixteen miles manufacturing plants may be so located that both water-borne and rail-borne freight can be handled to and from ships, and on the other to and from cars, in the most economical way, saving all costs in rehandling. Raw material, including ores if desired, can thus be brought in large cargoes from all domestic and foreign ports; manufactured products can be shipped by rail or water to all

parts of the country. Among the hills that border the canal on either side are extensive sources for water supply.

From early days southeastern New England has been an important industrial region. It was the seat of the first extensive iron-works in the United States. To-day it is one of the most rapidly growing manufacturing sections of the country. Almost at the southern entrance of the canal, on the mainland side of Buzzards Bay, lies the great textile center of New Bedford. So, with the uncommon advantages of this location, the competent city planner should find a rare opportunity for the practice of his art. The problem should be attacked comprehensively, and with due regard to the several factors in the problem—commercial, industrial, residential. Thorough planning, with a far-sighted view to convenient and economical development, would in itself go far to assure the building up of a large city here. Around the southerly end of the canal the shores of Buzzards Bay have been developed for the highest class occupancy by summer homes. Historic Gray Gables, long President Cleveland's summer home, lies just south of the canal entrance. The immediate neighborhood of the canal will not be likely to be attractive for the best residential purposes. While the incessant movement of commerce will have a fascinating interest as a spectacle, there will naturally be much smoke and a great noise of steam whistling. But among the wooded hills bordering the canal there are fine opportunities for first-class residential uses, enhanced by the convenience of access provided by both water and rail transportation facilities. In the immediate neighborhood of the canal there should be good provision for a large industrial population. With due foresight, the surroundings can be given an attractiveness that will go far to assure health, contentment, prosperity, and a corresponding economic efficiency. The improvements already made at and around the railway station at Sagamore indicate admirable possibilities for continuing that sort of development on a generous scale. To this end there should be a cordial co-operation in planning for intelligent growth between the canal and railway



THE GIANT EXCAVATOR AT WORK

companies, private property-owners in general, and the local authorities.

The first developments for industrial uses in the "canal zone" will naturally be in the extensive level section between the existing nucleus at Sagamore and the northern entrance of the canal. This will tend to react upon Sandwich village close by, and revive in larger implications its old-time industrial character. Something like a square mile of salt marsh, owned by the canal company, has been filled in with over two million cubic yards of sand pumped out of the canal in the course of construction. It is proposed with the completion of the canal to set the big dredges at work upon cutting a series of transverse canals through this land, thus providing ideal sites for factories, water transportation, and railway facilities at their doors. This waterway and dock development will largely increase the commercial water-front offered by the main canal itself.

The canal work has caused the relocation of several miles of the New York, New Haven, and Hartford Railroad Company's track. Ordinarily such a proposition, together with a prospective loss of traffic diverted to the water route, would have aroused intense antagonism to the project on the part of the railway. Indeed, this was looked for by the canal people. So they were not a little startled when Mr. Parsons reported upon his interview with President Mellen of the New Haven. The comments of the latter may

be taken as typical of the modern enlightened railway attitude towards water transportation, as voiced, for instance, by James J. Hill in recent utterances. President Mellen said in substance that his railway's prosperity depended upon that of New England; New England's prosperity depended largely upon that of its mills; these had to look to other parts of the United States for their raw materials, such as coal and cotton, while mills in other sections had both great staples almost at their doors. The railway could not profitably carry such low-grade freights at sufficiently cheap rates. Hence they must go by water. Whatever cheapens water communication benefits the New England mills, and correspondingly the railway. For that reason he favored building the canal.

The relation of the Federal Government to the undertaking has some notable aspects. Canal construction is legitimately a government function. But since the Government has signified no disposition to enter upon this project, its remunerative possibilities make it a proper subject for private enterprise. The low-water depth of twenty-five feet is sufficient to meet all the normal demands of commerce. The largest of ocean liners would have no occasion to use the canal. The depth is also sufficient for all war-ships except those of the largest size, the battle-ship class. It would, however, be of the greatest strategic value to have the canal available for battle-ships. With the

North Atlantic coast threatened at any point by a hostile fleet it might make all the difference between victory and defeat were a short cut through the canal possible for our own battle-ships. The cost of one battle-ship would probably be sufficient for deepening the canal to the extent necessary. Another consideration lies in the circumstance that the Federal Government is about to undertake extensive operations to improve the Pollock Rip channel in Nantucket Sound, now tortuous, shifting, threatened with obliteration, and a most dangerous menace to navigation. But since the improvement and maintenance of this channel involve a cost of some millions, and since with the completion of the canal there will be little use for it, it may be questioned if the money might not be expended with greater profit upon assuring a battle-ship depth for the canal. Being a private and purely commercial undertaking, the canal company has no call to provide a depth greater than is warranted by the demands of commerce. Nevertheless, to guard against excessive cost and the engineering difficulties involved in reconstruction work of such character, all the bridge foundations, piers, etc., have been designed with reference to an ultimate low-water depth of thirty-four feet, and all the canal work has been planned so as to allow an easy widening to the three hundred feet that such a depth would call for.

The equipment of the canal for safe and convenient use involves some interesting questions. As a great commercial highway its unimpeded navigation at night as well as by day will be required. It is a water street, and will be brilliantly

lighted. Gas buoys at frequent intervals will mark a safe passage for vessels in the approach channels. Throughout the eight miles of the canal itself the way will be made clear by a succession of high-power electric lights, perhaps of the searchlight type, thus producing a succession of brilliant spots of light on the water surface. To this end a considerable power-plant will be called for. The electricity thus generated will operate the drawbridges, and may be available for other purposes—perhaps furnishing power for factories throughout the canal region.

According to present calculations, the canal will be finished in the fall of 1912. Momentous changes in the paths of coastwise commerce will then occur. Vineyard and Nantucket Sounds, now thronged with shipping, will revert to practically deserted waters. The now lonesome expanse of Buzzards Bay will undergo a change as marked as that witnessed upon the Red Sea with the opening of the Suez Canal. Historic Plymouth, always an out-of-the-way port, will lie upon the track of coastwise trade, and will be correspondingly accessible—to its great possible advantage as an industrial community.

Mr. Parsons, the builder of the canal, in his capacity as a member of the Advisory Board for Panama, favored a sea-level project. Here he is realizing a sea-level waterway of his own. And, coming about three years ahead of the completion of the great work at the continental Isthmus, the exercises at the opening of the canal at Cape Cod may properly be treated as a sort of dress rehearsal for Panama.



THE HERDER'S BEST FRIEND

The Sheep-Herder

By Randall R. Howard

THE sheep-herder, in his strange, lonely life on the range, almost wholly beyond the reach of civilizing influences, is not thought of as a wealth-protector or a wealth-producer. Yet this little-known, less understood sheep-herder of the interior is a vital link in a great Western industry. He is the sole protector, during the greater part of the year, of an estimated 31,000,000 sheep, valued at \$108,500,000. It is doubtful if any group of workers in the West have such a large amount of wealth so exclusively under their control for such long periods of time as do sheep-herders.

The sheep-herder applies to the Western sheep baron for a job. He may be tried out for a few days, and then he is given charge of a band of probably 1,500 or 2,000 sheep, valued at from \$6,000 to \$10,000. He may be assisted for a short time, until the sheep reach a good grazing section, and then the camp-tender leaves a supply of "grub," bedding, and a camp outfit, and the herder is alone with a

bleating, surging mass of wealth. And it will be at least a week, maybe two weeks, and possibly a month or more, before the sheep-herder sees another human being.

What might happen if the herder decided to take a day off, or if he should get sulky and stay in camp, or if he suddenly quit the job?

His sheep would scatter; coyotes and cougars would kill hundreds, other hundreds would never be found; and probably the band would wander on to poor range, and the tallow profits of the summer be lost.

However, the sheep-herder is usually an extremely faithful man. He is out of his blankets at daybreak to point the sheep toward the chosen range of the day. The sheep are hungry after eight or ten hours in the corral or on the bedding-ground, and they will feed for two or three hours without needing any care. The herder then returns to camp for breakfast. He has walked miles through the loose sands of the semi-arid region, or