

depth of the river being increased by the use of fixed dams. From Oswego River the canal extends easterly, following the river to and across Oneida Lake, and through the valley of Wood Creek to the city of Rome. Here the canal crosses the divide by a series of locks and enters the valley of the Mohawk River.

The canal in the valley of the Mohawk between Utica and Schenectady will be provided with nine movable and two fixed dams; eight of the movable dams will have a maximum lift of 15 feet and a maximum depth on the sills of 20 feet; and these structures will serve to control the high floods of the Mohawk. The canal enters the Hudson River at Waterford by a series of five locks, which will bring it down from an elevation of plus 151 feet to tide level. From Waterford the important branch known as the Champlain Canal runs north to the lake. As far as Fort Edward the location lies in the Hudson River, and beyond Fort Edward it will be on an entirely new location, making entry into Lake Champlain through Wood Creek, which will be canalized by the use of fixed dams. The Canadian government has planned the construction of a waterway, with a depth of 12 feet, from the mouth of the new canal through Lake Champlain to Montreal.

Naturally, a work of this magnitude, passing through an undulating country and through several important cities, involves an immense amount of structural work in the way of dams, locks, bridges, and other masonry and steel work. There will be a total number of fifty-four locks, whose lift will vary from 6 feet to a maximum of 40½ feet, these taking the place of the seventy-two locks of the old canal. All of the locks will be 45 feet wide with a workable length of from 300 to 310 feet. The masonry work throughout the whole canal will be of concrete. All lock gates will be of steel, electrically operated. For the control of rivers and streams and the impounding of water for summit supply, there will be thirty-five dams of the fixed and movable types.

The total quantities of excavation and construction are necessarily very large, including in round numbers 58,000,000 cubic yards of dredging, 55,000,000 cubic yards of earth excavation, 11,000,000 cubic yards of rock excavation, and about 10,000,000 yards of embankment and back filling, making a total of about 133,000,000 cubic yards. In the masonry structures will be four and a quarter million cubic yards of concrete. The total length of the canal is 442 miles.

The Legislature in 1909 created a Canal Terminal Commission, whose task was to inspect the canal harbors connected with the Barge Canal, as well as harbors where canal freight is either shipped or delivered, and to report to the Legislature their findings. We hope to give a digest of this report in due course in the columns of this journal. In this connection it is of interest to note that the interest of the Federal government has been enlisted in the project to form a large terminal harbor in Jamaica Bay, with entrance channels at sufficient depth to accommodate seagoing vessels. This improvement will have an important bearing on the question of canal terminal facilities.

#### The Anthracite Coal Beds of Alaska.

BY DAY ALLEN WILLEY.

The extent of its gold and copper deposits has given Alaska its principal reputation for mineral resources. The quality and area of these ores have called public attention to them to the neglect of other minerals, and the bulk of the mining in the territory has been done to secure these ores. Consequently coal mining and lumbering are practically undeveloped industries.

Although the geologist and mineralogist have been investigating in Alaska for a period of years, most of the work has been confined to the region along the coast and the territory traversed by navigable rivers such as the Yukon. Owing to the difficulty of examin-

ing and mapping the interior and especially the northern portion of Alaska, accurate information of its mineralogy is available in but a small fraction of its total area. Here, however, the study of the formation has been so thorough that the existence of very large deposits of coal has been revealed and accurate estimates made showing the locations of the veins, also the thickness, while the quality of the fuel has been carefully analyzed by elaborate tests. It may be added that the conclusions of the United States Geological Survey agree with the reports of experts who have been sent to Alaska to get data for mining and investment companies.

The investigation of the coal-bearing area has been largely centered in the vicinity of the coast, and two regions have been so thoroughly examined as to prove that fuel is another resource of Alaska of great importance. Though Tertiary coal-bearing rocks are known to cover a considerable area in the southern part of Admiralty Island and on adjacent islands of southeastern Alaska, the included coal of this region has little present fuel value. The beds are from a few inches to two or three feet in thickness, and the coal is of a low-grade lignitic character. There are two known areas of high-grade coal—the Bering River field, in the Controller Bay region, and the Matanuska field, north of Cook Inlet. The Bering River field, lying about 25 miles from tidewater at Controller Bay, embraces 2.64 square miles containing anthracite and 20.2 square miles bituminous coal. The coal-bearing rocks trend to the northeast into the unsurveyed high ranges, and it is quite possible that there may be an extension of the coal fields in this direction. Coal

square miles. Up to the present time there has been no means of transporting this coal to market, so that, as stated, no mining has been done, but many beds have been opened in prospecting.

The chemical analysis of specimens of coal taken from a large number of veins practically covering this entire district gives the following results:

	Moisture.	Volatile Matter.	Fixed Carbon.	Ash.	Sulphur.
Anthracite—					
Bering River, average of seven analyses.....	7.88	6.15	78.23	7.74	1.30
Matanuska River.....	2.55	7.08	84.32	6.05	0.57
Bituminous—					
Matanuska River, coking, average of sixteen analyses.....	2.71	20.23	65.39	11.60	0.57
Subbituminous—					
Matanuska River.....	6.56	35.43	49.44	8.57	0.37
Koyukuk River, one sample.....	4.47	34.32	48.36	12.95	....
Nation River, one sample.....	1.39	40.02	55.55	3.04	2.98
Alaska Peninsula, average of five analyses....	2.34	38.68	49.75	9.22	1.07
Cape Lisburne, average of eleven analyses....	9.35	38.01	47.19	5.45	0.35
Anaktuvuk River, one sample.....	6.85	36.39	43.38	13.38	0.54

Since the anthracite coal deposits of Pennsylvania would be naturally contrasted with Alaskan as a fuel element, some analyses of the more notable Pennsylvania grades may be given:

Pa. Region.	Water.	Volatile Hydrocarbon.	Fixed Carbon.	Fuel Ratio.	Ash.	Sulphur.
Wilkes-Barre.	2.49	4.34	83.97	19.33	8.55	0.65
Lehigh.	1.72	3.52	88.00	..	5.66	0.61

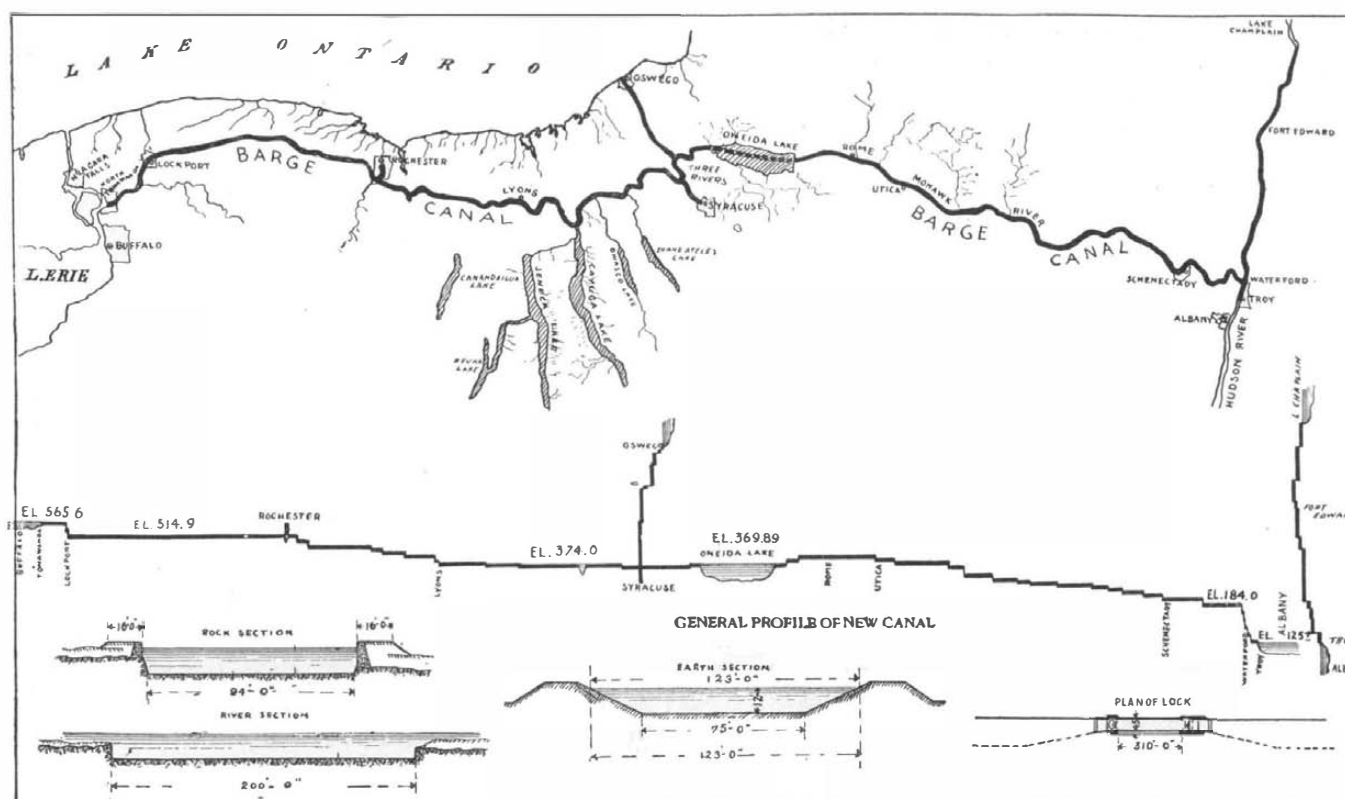
A comparison of the analyses of the coal in the Matanuska field and the two regions yielding the highest grade of anthracite in Pennsylvania would indicate that the Alaskan is of slightly better quality for generating heat. Its percentage of fixed carbon, 84.32, is greater than the percentage in the Wilkes-Barre region, while the percentage of ash is 2.05 less than the other. The proportion of sulphur, 0.57, is the least in any anthracite coal found thus far in America.

While the area of the Matanuska region is limited in comparison with the Appalachian field, it is but a small area of the territory known by examination to contain deposits of anthracite and bituminous, many

available for use by the construction of railways. That Alaska contains great deposits of high-grade fuel is shown by an estimate of the beds in the southwestern section alone. On a conservative basis the total area of these fields is 957 square miles, and the area positively known to be underlain by coal embraces 85 square miles. The latest estimated area of the Pennsylvania anthracite region—the greatest producing region in the world for this grade—is 480 square miles. While the 957 square miles of southwest Alaska include also bituminous and lignite of a grade suitable for use, the lignite is contained in only about one-fifth of the area, or less than 200 square miles, the remainder representing bituminous and anthracite territory; but as already stated, the experts who have explored this region agree that the anthracite deposits that can be economically mined and made easily accessible by rail to seaports form a fuel resource of such proportions that it would supply Alaska and the Pacific States for an indefinite period.

The formation in the Matanuska is such that many of the veins can be reached by short tunnels without the need of vertical shafts, while the expense of elevating may also be avoided. The veins frequently outcrop on the surface. In short, the natural location permits mining at a minimum cost.

The beds referred to are not distant from the extensive copper mines located near the Copper River and exploited by the Guggenheim syndicate. In connection with this industry a railway 75 miles long has been completed to the coast at Cordova harbor for the purpose of making shipments to smelters in the States by water. The importance of the Matanuska coal has



Plan, profile, and sections of the New York State barge canal.

#### RAPID PROGRESS OF THE NEW YORK STATE BARGE CANAL.

beds varying from six to twenty feet in thickness are exposed in this region, with some local swellings, giving a much greater thickness. In quality the coals vary from an anthracite, with 84 per cent of fixed carbon, to a semi-bituminous with 74 per cent of fixed carbon, and include some varieties that will coke. There has been much prospecting in these coals, but in the absence of railways no mines have been developed, though a small output from one bed has been taken to the coast in barges.

The Matanuska may be considered the most important for commercial purposes thus far discovered in the territory, owing to its accessibility. This field lies about 25 miles from tidewater at Knik, a northerly embayment of Cook Inlet. As Cook Inlet is frozen during the winter, however, the distance to an open seaport must be measured to Resurrection Bay, on the east side of Kenai Peninsula, about 150 miles from the coal field. There are several months of the year when Cook Inlet could be used as a waterway.

The coal of these deposits as investigated by Alfred H. Brooks, the eminent mining expert associated with the Geological Survey, varies in quality from a sub-bituminous to a semi-bituminous, with some anthracite, and is included in folded and faulted Tertiary or Eocene shales, sandstones, and conglomerates, aggregating 3,000 feet in thickness. The coal beds vary from 5 to 36 feet in thickness, and the total area known to be underlain by coal aggregates 46½ square miles. However, as much of the field is covered by gravels and none of it has been surveyed in detail, the coal-bearing area may be much larger. The total area of what may prove to be coal-bearing rocks is approximately 900

caused the company to begin the building of a railroad to this field, as a route is available over which a railway can be easily constructed owing to the formation of the country. It will be about 175 miles in length. Another road has also been surveyed over the route already referred to, terminating at Resurrection Bay. This would allow water transportation at all seasons of the year because of the freedom from ice, while the depth of the bay is such that the largest ocean carriers can take on cargoes at the coal piers. Up to the present time this great coal field has been unproductive on account of no transportation facilities, the only operations being for test purposes. This region is of unusual interest at present owing to the Congressional investigation of the timber and mineral resources of the territory in connection with the Ballinger-Pinchot controversy.

Coal was found near Cook Inlet by the Russians as far back as 1855, but the entire output of the territory has been insignificant, as shown by the product of less than 10,000 tons of all kinds in 1909—none of it anthracite.

#### THE "UTAH"—OUR LATEST DREADNOUGHT.

The spirited drawing on the front page of this issue represents our latest dreadnought, the "Utah," recently launched from the yards of the New York Shipbuilding Company, Camden, N. J. She is shown steaming in a gale of wind against a heavy Atlantic sea; and, in spite of her great length of 521½ feet, the huge vessel, as she rides over the long Atlantic rollers, will do her full share of pitching and rolling as she climbs and descends each majestic sea. Several cable lengths to starboard is a sister ship that is running down the slope of a sea whose crest is sufficiently high to hide all but the funnels and masts.

These conditions are no mere creations of the artist's fancy; for we have recently seen a series of pictures taken on our fleet, when it was steaming northward in a heavy gale on the Pacific, in which only the tops of the funnels and the fighting masts of some of the vessels are visible, the ships lying deep in the trough of the waves.

But although the "Utah," in spite of her full load displacement of over 23,000 tons, will be to some extent the sport of the elements, her great weight and size will make her a far steadier gun platform than is afforded by the 16,000-ton "Connecticut" or the 12,000-ton "Maine"; and herein lies one of the most important advantages of the big over the medium-size warship. The "Utah," which is a sister ship to the "Florida," now nearing completion at the New York navy yard, is 521½ feet long, 88 feet 2½ inches wide, and on a normal displacement of 21,825 tons her draft is 28 feet 6 inches. At normal displacement, it should be explained, she will have a full supply of ammunition, and two-thirds of full supply of stores and fuel. The ship is an enlarged and improved "North Dakota," with 3 feet more beam, 1 foot 7 inches more draft, and 1,825 tons additional displacement. She is equipped with 4-screw Parsons turbines of 28,000 horsepower, which are designed to give her a contract speed of 20.75 knots. She will carry 2,500 tons of coal and 400 tons of oil fuel, and steam will be supplied by boilers of the Babcock & Wilcox type. The "Utah" will be manned by 60 officers and 954 men, her total complement being 1,014. This is about the number of men that were carried on the old wooden three-deckers of the largest size, and in this ship for the first time the crew of a modern battleship equals that of one of the olden days.

Like the "North Dakota" and "Delaware," the "Utah" carries ten 12-inch guns in the main battery. They are mounted in pairs in balanced turrets, the disposition of which is shown very clearly in our engraving of the ship. The foremost pair of guns has an elevation of about 33 feet above the normal waterline. The second pair has a command of about 40 feet. The guns of turret number 3 have a command of about 32 feet, and those in numbers 4 and 5 of about 25 feet. All of the guns being mounted on the center line, they can all be trained on either broadside. Dead ahead the "Utah" can fire four 12-inch guns, and the same number dead astern. It will thus be seen that maximum broadside fire is gained at the expense of end-on fire, for the "Minas Geraes," recently built for the Brazilian government, can fire eight guns ahead or astern, and the German and British battleships six guns. Most of the fighting, however, in all probability, will be done broadside to broadside; and the center line disposition, which originated in the Bureau of Construction and Repair, is probably the most effective that can be adopted.

The secondary battery consists of sixteen 50-caliber 5-inch guns. Eight of these are carried on the gun deck within a central battery; four aft on the same deck; two in sponsons upon the main deck just abaft of the bridge, and another pair on the same deck well forward toward the bow. This gives a broadside of eight 5-inch and an end-on fire of four 5-inch ahead and astern.

The protection of the hull, both below and above

water, and of the guns is exceptionally well worked out in these vessels, being in this respect an improvement even on the "North Dakota" herself, one of the best protected ships ever built. In the first place, with a view to limiting the destructive effects of a torpedo blow, particular attention has been paid to the question of cellular and compartmental subdivision. Even in the event of most serious underwater injury, such as might be done by a floating mine, the ship is able to concentrate on any compartment or set of compartments such a great capacity of pumps, that she would be able, by the aid of these alone, greatly to mitigate the effects of such a blow.

The armor plan of the "Utah" is probably the most complete and effective yet put upon any ship. The main belt, over 8 feet wide, has an average thickness amidship of 11 inches. Above this is a second belt 8 feet wide of an average thickness of 9 inches. The lower waterline belt is continuous from stem to stern, and the upper belt extends from the wake of the forward to the wake of the aftermost turret. The turrets of the 12-inch guns have from 12 to 8 inches of protection. The 5-inch secondary battery amidships is protected by 6½ inches of armor, and a similar thickness protects the casemates of the six guns at the bow and stern. Between each pair of 5-inch guns is a splinter bulkhead of 2-inch armor and back of each battery is a longitudinal wall of 3-inch armor, which closes in each 5-inch gun. To reach the base of the smokestacks any shell would have to pass through 9½ inches of armor—a superb protection.

It will be noted that the ship is provided with two of the new lattice-work fire-control masts with which all our latest ships have been equipped. The handling of the boats is done by two boat cranes placed abreast of each other, one on either side of the after smokestack. In this ship, as in all our dreadnoughts, the officers are berthed on the main deck forward below the forecabin deck, the crew accommodation being aft. This places the officers near the bridge and conveniently to their post of duty.

The keel of the "Utah" was laid March 15th, 1909, so that considerably less than a year has elapsed between the laying of the keel and the launch. In less than a year from the present time, if all goes well, this fine ship will have her trials, a speed in warship construction which is greatly to the credit of the New York Shipbuilding Company. Particular interest will attach to the trials of this vessel, for the reason that she will be the first of American battleships to be propelled by 4-screw Parsons turbines.

#### American Homes and Gardens for March.

The current number of American Homes and Gardens contains pictures of interesting California bungalows costing from \$1,000 upward; an article on the furnishing of the apartment by a well known author; an article on the interior decoration of the home, devoted to appropriate wall papers for the various rooms of the house; and views of a number of interesting houses, showing interiors, exteriors, and floor plans. The fourth prize garden of the American Homes and Gardens competition is also published in this issue, as well as garden notes devoted to fifteen good lilies. There is also an article on open-air orchard heating; and an article on the combined forcing bed and storage pit. One of the most interesting articles of the paper, one which is profusely illustrated, describes the water gardens of California. Trimming street and lawn trees, a timely subject, is well treated by an experienced writer. The historic mansions of the Rappahannock River are always interesting, and the illustrations of "Kenmore," the home of Betty Washington, is one of the important features of this number.

#### The Current Supplement.

The current SUPPLEMENT, No. 1783, contains an unusual number of timely and interesting articles. Dr. M. Wilhelm Meyer asks "What would we do if one of these days the sun were extinguished?" He considers the problem most instructively. Prof. O. N. Witt, the distinguished German chemist, contributes an article on the development of technological chemistry during the last forty years. An abstract is published from a paper read before the Society of Civil Engineers by M. Georges Claude on some interesting industrial applications of liquid air and oxygen. A most interesting equatorial telescope is in operation at the Urania-Zürich Observatory in Switzerland. This instrument is described by Mr. F. C. Perkins. Some photographs are reproduced which were taken by a photographer whom Latham recently took aloft with him at Lonservy, France. The pictures are probably the first ever published in this country taken from an aeroplane. Mr. Marconi's Nobel prize lecture on progress in wireless telegraphy is concluded. Lieut. John C. Soley, U. S. N., writes on the seismic period of 1909. As the result of investigations carried on during the last seventy-five years, it has become possible to establish on a firm basis criteria for instituting exact comparisons of the structure of the brain in the various groups of vertebrata. These criteria are discussed in an article entitled "The Evolution of the Brain."

## Correspondence.

### HOW TO MAKE THE "ALABAMA" AND "MAINE" INTO PRE-DREADNOUGHTS.

To the Editor of the SCIENTIFIC AMERICAN:

As a reader of the SCIENTIFIC AMERICAN, I am particularly interested in the articles on the naval development.

I wish to know through your paper why the following changes would not be practical in remodeling the battleships "Idaho" and "Mississippi." Bearing in mind the results gained by adding 20 feet in length to the "Maine" class over the "Oklahoma's," which equals 948 tons displacement, 5,603-horse-power, 2 knots speed, 2 6-inch guns with ammunition, and 400 tons of coal.

I would cut these ships in two, just aft the boiler rooms, and build 30 feet, keeping as near the same beam as possible 77 feet. This 30 feet would be used almost entirely for boilers, engines and coal.

I think that another set of boilers could be installed, adding one-half to the boiler power. A new set of engines would have to be built to handle the 15,000-horse-power thus developed, and I think that the speed would be raised at least 1¼ knots, not much of an increase, but enough to allow these ships to steam with the 18-knot "Louisiana" class without reducing the speed of the whole fleet to 17 knots. I would replace the 8-inch guns with four 10-inch 45-caliber guns and add two 7-inch and four 3-inch guns to their present batteries. Thus we would have the following results:

Present.	Remodeled.
Length, 375 feet to.....	405 feet.
Beam, 77 feet to about.....	78½ feet
Displacement, 13,000 tons to about.....	14,500 tons
Horse-power, 10,000 to about.....	15,000 H. P.
Speed, 17 knots to about.....	18¼ knots
Bunker capacity, 1,750 tons to about.....	2,100 tons
Battery, 4 12-inch, 4 10-inch, 10 7-inch and 16 3-inch guns. The armor to remain the same as originally designed.	

This would be a rather costly change, but when a warship is needed the expense is a small item, and these two ships, with the increased speed and heavy batteries, would be a welcome addition to our first line of pre-dreadnoughts.

W. W. BASS.

Chicago, Ill.

[Such changes as are suggested by our correspondent would be too costly for the benefits secured. It would not be possible to install four 10-inch guns—the weights of guns, turrets, etc., would be prohibitive. The money would give more fighting value if applied to entirely new ships of the dreadnought class.—Ed.]

#### Death of Prof. Amos E. Dolbear.

Prof. Dolbear died at Bedford, Mass., on February 23rd at the age of seventy-four. He was widely known as an inventor of electrical devices. Perhaps his investigations in wireless telegraphy brought him more into public prominence than any other, but the result was an infringement suit in which he unsuccessfully sought to restrain Marconi from continuing his experiments.

Prof. Dolbear took the degree of B.A. at Wesleyan University in 1866, and the degrees of M.A. and M.E. at the University of Michigan in 1867. From 1866 to 1867 he was Instructor in Chemistry at the University of Michigan. Then he occupied the chair of Assistant Professor of Natural History at the University of Kentucky from 1867 to 1868. From 1868 to 1874 he was Professor of Physics and Chemistry at Bethany, W. Va. From 1874 to the time of his death he was Professor of Physics and Astronomy at Tufts College. His scientific investigations included the study of light and electrical phenomena; the properties of the ether; magnetic telephony; static telephony; heavy current ammeters; cables for telegraphic and telephonic work; wireless telegraphy; and the properties of matter.

#### Comet B 1910.

Prof. Pidoux of Geneva Observatory, Switzerland, has cabled to Harvard College Observatory stating that he discovered a comet on February 20th in R. A. 0 h. 16 min. 22.1 sec. and Dec. +7 deg. 50 min. and 41 sec. The daily motion in right ascension was —22 min. 24 sec. and in declination —24 min. The new comet is not very far from Halley's comet. According to the corrected ephemeris of Crommelin the position of Halley's comet at the time was R. A. 0 h. 41 min. 29 sec. and Dec. +7 deg. 55 min.

According to Electrical Engineering, a definite proposal has been put forward for the construction of a tunnel between Denmark and Sweden, starting at Copenhagen, and connecting up with Malone. Connection would be made on the way with the small islands of Amager and Saltholm, and the electric trains which it is proposed to work through the tunnel would run on the surface on these islands, in order to reduce the underground journey as much as possible. If the scheme is carried out, it is estimated that the trip could be made in 1½ hour.