GENIUS AT WORK

Images of Alexander Graham Bell

Dorothy Harley Eber

A STUDIO BOOK
The Viking Press New York

For Vera Williams Harley, and in loving memory of
George Ernest Esmond Harley, who first told me stories of Nova Scotia

First published in 1982 by The Viking Press
625 Madison Avenue, New York, N.Y. 10022

Library of Congress Cataloging in Publication Data
Eber, Dorothy.
Genius at work.
(A Studio book)
Bibliography: p.
1. Bell, Alexander Graham, 1847–1922. 2. Inventors—United States—Biography. I. Title.
TK6143.B4E23 621.385'092'4 [B] 81–11670
ISBN 0–670–27389–9 AACR2

Printed in the United States of America
Set in Baskerville
Designed by Michael Shroyer

Contents

The Hydrofoil Years

"Mr. Baldwin is designing another boat from which he and Alec expect wonderful things," wrote Mabel Bell in August of 1908. In fact the boat, built during the summer of the A.E.A.'s existence, was designed in the hopes of its becoming an airplane. The aim of its designers was that it should rise up out of the water on hydrofoils and then take off and fly. This failed to happen, and so the *Dhonnas Beag*—Gaelic for "little devil" and dubbed thus by a Beinn Bhreagh workman, according to C. R. Roseberry in his *Glenn Curtiss: Pioneer of Flight*—became the first Bell-Baldwin hydrofoil model to move over the water under its own power.

At least seven years earlier, as a result of his investigations into aerial takeoff, Bell had begun to think in the direction of hydrofoils—boats with ladders of slanted blades attached to their hulls on which they rise above the resistance of the water.

Bell had recorded in his notes as early as September 2, 1901: "Whatever resistance the water may offer to a body going through it at a certain velocity—THE AIR WOULD OFFER LESS RESISTANCE. If, therefore, with increase of speed the boat or vessel could be elevated more and more out of the water so that the chief part of the resistance should be the air, would not the engine power be more economically utilised under such circumstances? Would not, for example, torpedo boat destroyers be able to go at greater speed with the same engine power than they do now if they were so constructed above as to utilise the resistance of the air to lift them—at least partially out of the water?"

These thoughts stayed in his mind. The idea was not new: back in 1861 a hydrofoil boat had been tested under tow in England and in the early 1900s William E. Meacham in the United States and Enrico Forlanini in Italy had pioneered hydrofoil development. (Bell was later to buy their patents.) "I consider the invention of the hydroplane as the most significant of recent years," he wrote in 1906.

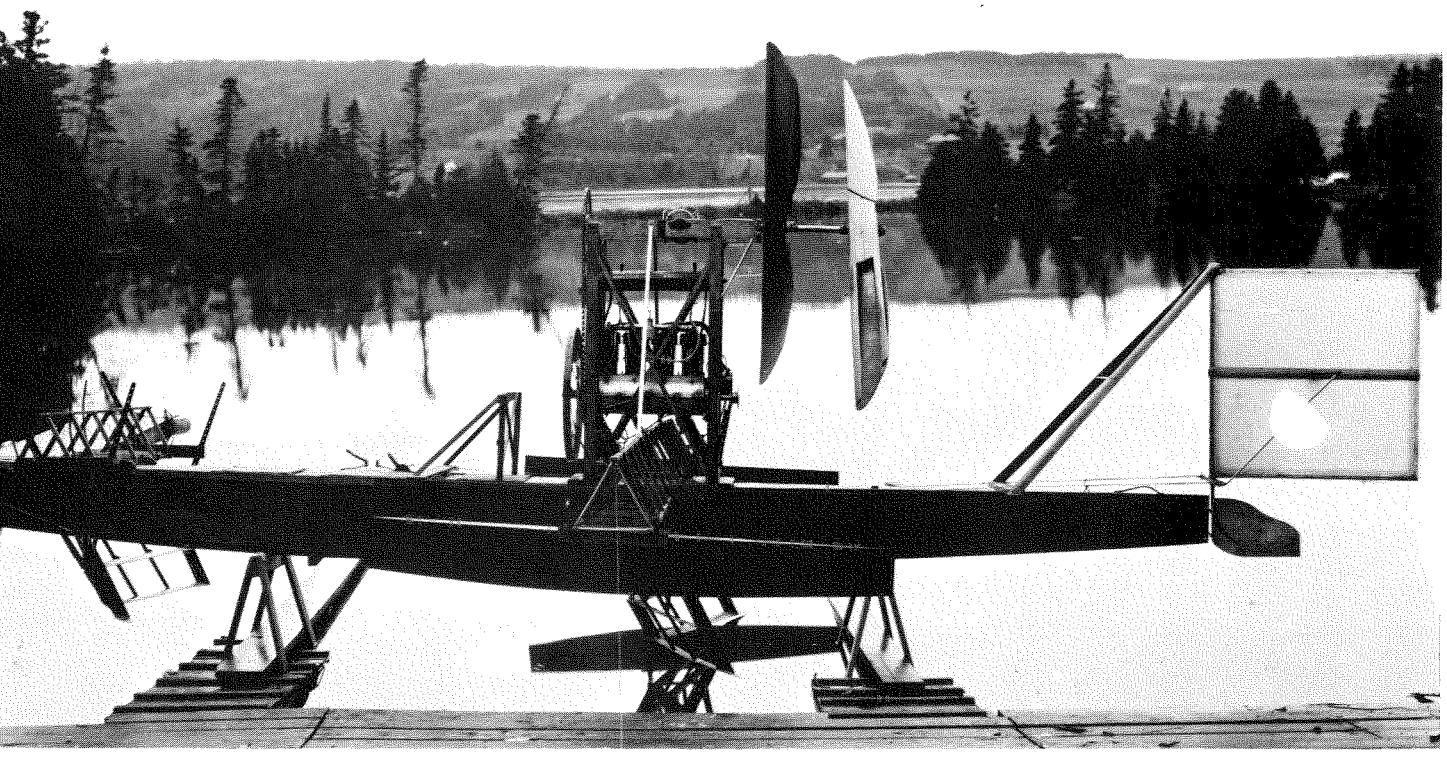
Tests with the *Query,* a second model, were made in 1909. Then, during a world tour that lasted from 1910 to 1911 and on which the Baldwins accompanied the Bells, the entire party visited

Opposite page:
Bell in his dressing gown in his later years, perhaps working far into the night. (I. D. Boyce)

Forlanini, where both Bell and Casey Baldwin rode Forlanini's hydrofoil on Lake Maggiore at what Mabel Bell estimated was express-train speed—forty-five miles an hour.

As soon as the Bells returned to Canada in the summer of 1911, work on a new hydrofoil began. From that date on until the outbreak of World War I, the Beinn Bhreagh workshops constructed and refined hydrofoil models to Baldwin's designs: the HD-1, which when rebuilt became the HD-2, the HD-3, and an unsatisfactory hydrofoil sailboat. (The letters "HD" stand for "hydrodrome," for in both hydrofoils and flying machines Bell was faithful to the terminology of his friend, the ill-fated pioneer Samuel Pierpont Langley, who called his test models "aerodromes," from the Greek words *aero dromos,* "air runner." Bell and his A.E.A. associates sometimes referred to their planes as "dromes" and talked of "droming" Baddeck Bay.)

The *Dhonnas Beag,* the first Bell-Baldwin hydrofoil to travel under its own power. (1908)



On his return from the 1911 tour Baldwin became manager of the estate and the laboratory. Bell, then sixty-four, moved his office to leave the lab to Casey. "He transferred up to the kite house by the kite field where they had the *Frost King* stored when they were using it," says Mayme Morrison Brown, recalling the move. "It was more quiet there. It was a great big building. They had used it as a hangar but they renovated and the room was all fixed up with his old rolltop desk, very ancient, and all scarred and burned with his pipes and cluttered with his tobacco and everything." (According to Freddie Pinaud, who had heard it from his father, one of Bell's favorite sayings was, "There is no thinking without smoking.")

Although about to enter the last decade of his life, Bell, in his study at the Point House, continued his habit of working till the small hours. The Beinn Bhreagh household, under Mabel's direction, continued to supply perfect backup services, of course, although the odd slipup is recorded. "You know I was up all night preparing instructions for Mr. McNeil relating to the apparatus to measure the lift and drift of hydroplanes," Bell wrote in a note left for Mabel on such an occasion. "I wrote two notes to him fully illustrated by diagrams and enclosed with them the rough models he had made and put them on the kitchen table at daybreak with a note to Charles telling him to send them down to Mr. McNeil at the laboratory. . . . Charles reports the cook found them this morning and thought someone was trying to play a joke upon her and put them in the stove. Please make a ROW. . . ."

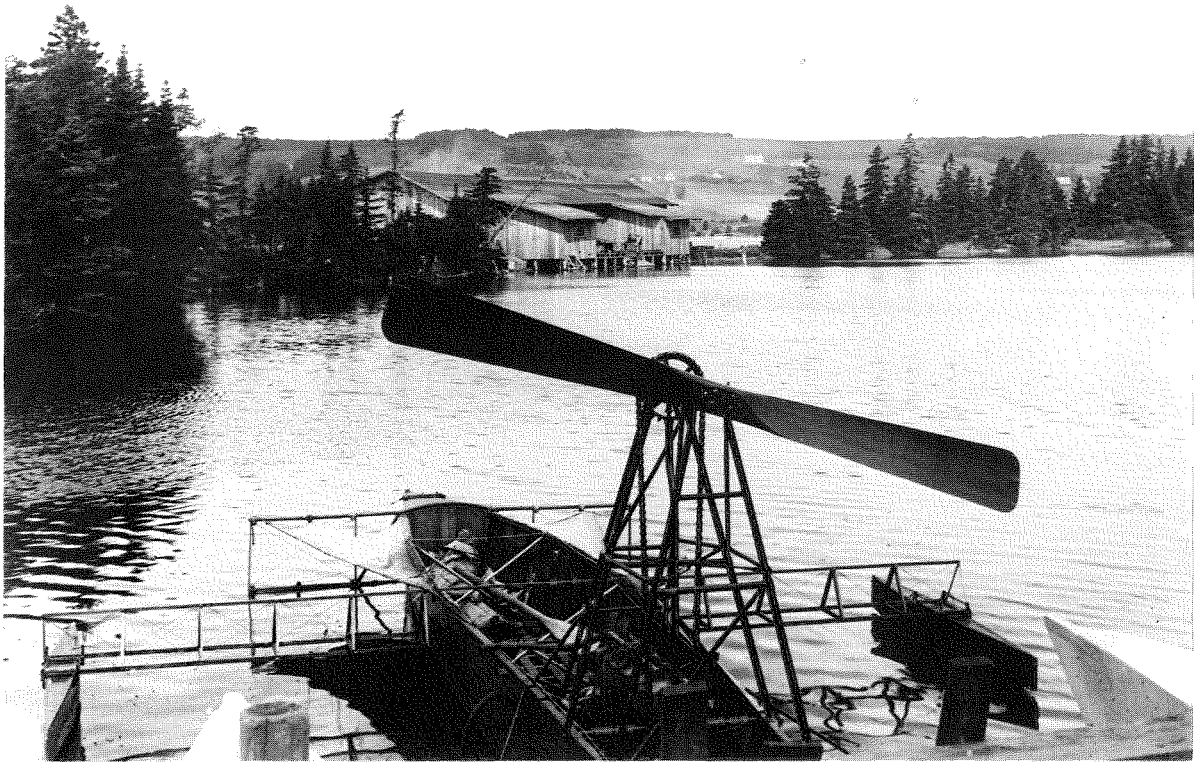
Unlike various assistants and associates who worked with Bell on the telephone and the graphophone and shared in his successes, Hector P. McNeil, perhaps the most inventive of the Beinn Bhreagh laboratory workers upon whom Bell relied, was to end his life not much richer than he had started. The rewards that might have accrued today to a holder of a joint patent on a universal connector did not materialize. McNeil died blind. When his eyesight failed, Bell sent him to specialists in Boston but nothing could be done. His eyes had been ruined, it is said in Baddeck, by a doctor who had given him the wrong drops.

Domestically, these later years in which his interests seemed to focus on the water were good years for Bell. Perhaps he missed the lively collaboration he had enjoyed during the lifetime of the A.E.A.—although frictions had erupted among "the boys"— but he had a compatible associate in Casey Baldwin and also found great pleasure in the frequent company of his growing grandchildren, in whose education and well-being both he and Mabel had enormous interest. "Send me some of the latest sayings of Graham and Barbara," he would write. Or, "Wish Elsie and Daisy and all

The hydrofoil *Query* under tow on Baddeck Bay. (John Michael McNeil, 1909)

the children could be here in this beautifully cool, bracing air and out of the 'atmosphere of doctors.' Doctors are all very well in emergencies, but . . ."

The Bells and their daughter, Daisy Fairchild were supporters of the progressive theories of education that were becoming current. In the summer of 1913 a Montessori class for the grandchildren was held in a Beinn Bhreagh warehouse, and in autumn of the same year Mabel sponsored the first Montessori school in Washington in her own house. Frequently the new theories paralleled Bell's own beliefs regarding the way knowledge is best absorbed. As Melville Grosvenor, his eldest grandchild, grew up, Bell began to devise simple scientific experiments to intrigue him and the other grandchildren.



From my house on Crescent Grove I can look across the bay to the Beinn Bhreagh point, where the great bald-headed eagles circle against the trees, and see Bell's old kite house. These summers it is occupied once again by Daisy's daughter Barbara Fairchild Muller, one of the younger grandchildren, and her husband, Leonard. "We were all influenced by the scientific way of thinking," she told me. "Of course, I was pretty young . . . it was for and with my brother Graham and my cousin Melville that he set up the experiments to illustrate various principles of physics. . . . The only one I remember clearly is to have been asked to fill a bottle with very hot water and then to cork the bottle. Time after time when we later checked the bottle—cool—it was not full and we were told to repeat, refill, recork, recheck. Still, the bottle never stayed full when it cooled off. Great mystery for a six- or seven-year-old!"

A scientific exhibit that made a vivid impression on all the grandchildren, Barbara Muller recalls, was the array of unborn lambs, pickled in alcohol, that lined the shelves of Bell's sheep house. She is intrigued by the suggestion that long before there was general interest in the matter her grandfather worked on the problems of birth control. Could these bottled specimens, she wonders, have had an effect on local rumor and led to the speculation that Bell did research in this field? For their part, the grandchildren found the exhibit of absorbing interest. "[The lambs] started from about a quarter of an inch all the way up to about four inches long. We used to go up and gawk. Oh, we were too young to find them upsetting. We thought it very interesting to know what baby lambs looked like before they were born."

A witness to life at Beinn Bhreagh in the years 1917 to 1920 was the young Edith (Polly) MacMechan Dobson, daughter of Archibald MacMechan, a Dalhousie University professor and author of *There Go the Ships* and *The Halifax Disaster.* Like so many who worked for the Bells, Polly MacMechan found her life irrevocably changed by her summertime association with the family. In 1917 she was nineteen, a young girl "full of life" and an obvious favorite, remembers Norman Bethune, the doctor's son who worked over at Beinn Bhreagh then. Subsequently she toured the world with her naval husband and bore twin daughters in Australia. She lives today in a Halifax apartment. Visitors there swiftly succumb to the charm—a mix of consideration and verve—that must have made her a formidable organizer of Beinn Bhreagh activities (charades, farmers' banquets, French babies relief) and a knockout as the admiral's lady she eventually became. I sat with her, eating lobster-paste sandwiches ("You've had a plastic lunch on the plane") while she evoked the secluded but productive life of the

Opposite page
Above:
An early hydrofoil at the launching wharf, with the boat sheds in the background. (Notman Studios, 1912–1916)
Below:
Bell and Hector P. McNeil with hydrofoil models, 1912.

Bells during and immediately after World War I, a period when spirits ran high but a certain formality prevailed—"We always seemed to be wearing those big hats at picnics!"

"Casey Baldwin was one of Mr. Bell's young men," she explained. "Mr. Bell loved young men—having them about him—and after the Aerial Experimental Association, Casey stayed on doing experiments with Mr. Bell. As a wedding present Mr. and Mrs. Bell gave Casey and Kathleen, a second cousin of my mother's, a bungalow on the Beinn Bhreagh property. In 1916 I had just got out of school in England and Kathleen was up in Halifax for fun—going to parties—and she said, 'Wouldn't you like to come down to Baddeck and visit us in the summer?' Well, I just adored it . . . all the sailing . . . it was the kind of life I loved

The Bells' Grosvenor grandchildren: Gertrude, Carol, Melville, Lilian, Alexander, and Mabel, about 1914.

. . . and of course I saw a lot of the Bells that summer. Mrs. Bell wrote me in February [1917] saying would I consider coming as her secretary? Gretchen Schmitt had been her secretary, but the Bells were starting a boat-building program for the Canadian Navy . . . small boats, the plant was quite small . . . and they were going to have girls working in it and were turning their original house on the property into a residence for them. Gretchen was going to take charge. She was very conscious of her German name, and was determined to do something for the good of the war. She was Gretchen Anton Smith by then; she had changed her name by deed of poll.

"I didn't know anything about being a secretary . . . it was really the '14–'18 war that started careers for girls . . . and I was awfully afraid I wasn't going to be able to do it. But Mrs. Bell was very helpful and there was nothing formal about it. Mrs. Bell was in complete charge of the household. I arranged the picnics and all the comings and goings.

"The only thing I absolutely had to do was to be ready for Mr. Bell at eleven o'clock to take notes. The routine was that he used to have breakfast upstairs in his study and then get up. From eleven to twelve I'd write down in longhand everything that had happened—if somebody had arrived to stay or somebody had gone, who came to dinner the night before. It was like a diary. I took the domestic things; there were two facets, so to speak. At the office it was all technical, and his secretary Catherine MacKenzie took that. You see Casey's handwriting quite often, too, and Kathleen's and maybe Mr. Byrnes', the estate manager. Mr. Bell used to call them in and get them to put down their reports in the book. And there are occasional notes in shorthand. Those are Mr. Bell's secrets. He had his own private shorthand,* which nobody could translate. Something he made up himself, I think. Top secret!

"Those two young men who came down two or three years ago to ask questions for the Baddeck Museum said how would I like it if they photostated every page of the Home Notes where I was mentioned. Well, I said that would be the greatest fun. It's just like looking into another life. I go back and say I can't believe that happened. And then of course it brings a picture to my mind. Isn't the formality charming: in the family Mr. Bell did call me Polly, but in the notes I'm Miss MacMechan."

* Probably the system of shorthand developed by Alexander Melville Bell from the notation system for Visible Speech, his universally applicable phonetic alphabet.

In the Beinn Bhreagh Home Notes of February 20, 1920, I found the following exchange:

Mr. Bell: I want Miss MacMechan to promise to do something for me that will not involve physical or mental exertion. What do you say, Miss MacMechan?

Miss MacMechan: I have a guilty feeling that I know what Mr. Bell is going to ask, but I promise.

Mr. Bell: Follow the instructions of the Sydney Board of Health regarding preparedness to meet an attack of flu—by going to bed and resting quietly. Miss MacMechan has caught cold and is evidently feeling miserably this morning.

Bell's routine rarely varied, Polly discovered. "Mr. Bell's lunch used to come up on a tray and he'd finish dressing and come down and John was always there with the horses and very often Mrs. Bell used to drive with him down to the office.

"When I arrived, the hydrofoil, the HD-4, was being built in the sheds on the Beinn Bhreagh property below the bungalow. Casey did much of the supervising. Mr. Bell was getting to be a pretty old man then . . . not all that old, but he was heavy and getting round about the sheds was not too easy. Casey oversaw it. If Mr. Bell had an idea, he'd very often sketch it, and then if it was going to be made in the workshop, Casey used to draw it to scale and make it more exact.

"Mrs. Bell used to go down to meet him, too. She'd send John home with the horses, and they'd walk the last half mile home along the upper level road, which was all downhill.

"Mrs. Bell always wanted him to take more exercise, and he wasn't keen on doing it! He used to try to get out of it, although he loved swimming. There were stories that before my time he used to go down about midnight and get into the water and light a cigar and float about the lake with his hands behind his head. The neighbors thought that was quite something!

"It was a lovely household to be in; Mrs. Bell was a genius at running a big household. Now the grandchildren have built houses all over the property, but then two sets of grandchildren arrived to stay at the Point. There were five or six Grosvenors and three Fairchilds with all the things they wanted to do. And all the other relations and visitors all summer long. The Bells were more than hospitable!

"As you know, Mrs. Bell was completely deaf. It came from scarlet fever when she was just a little thing. She had a perfectly wonderful mind and it was bad luck. I did as I was told, but a lot of people couldn't make her understand. She said, 'People make faces at me; just *talk* to me.' People would mouth at her, and that

was defeating for her. Of course, you had to turn your face towards her . . . never speak with your head turned away. The grandchildren realized from the time they learned to talk. As little things they would climb on her lap and talk right to her."

In adult life the grandchildren have often attested that they knew their grandmother was a remarkable person. But they never seemed to think of her as handicapped. They followed their grandfather's example and took her affliction as a mtter of course. In their younger years he kept them up to the mark. At family mealtimes—sometimes there would be sixteen or seventeen at the table—the grandchildren were never allowed to chatter privately among themselves. Bell would interrupt and say, "You must tell your grandmother." Speaking to Joan Marshall, a broadcaster who interviewed a number of Bell grandchildren for a Canadian Broadcasting Corporation program, Elsie's daughter Lilian Grosvenor Jones said, "It always made a tremendous impression on me . . . the *theme,* it always seemed to me as a child . . . the sound and the silence. He was always trying to re-create sound for her and she was always trying to understand that sound. . . . She couldn't remember sound. And she wrote once that she imagined it was something like the sound of humming of the bees.

"And always when we would walk with them, he was always telling her the sound he heard . . . a cow bell or whatever it was."

On another occasion Barbara Fairchild Muller also remarked on how little aware she was as a child of her grandmother's deafness. "It took me a long time to know that my grandmother was deaf. We heard the servants talking and there were certain pronunciations of words—she would say 'cup-board' rather than 'cubbord'—and there was one experience with charades. She was great for charades, and once I was supposed to be something or other with curls and my hair of course was straight as a board. She was very annoyed with the maid because she had said, 'Iron them, iron them,' and they took me out and put my head on the ironing board and ironed each curl. You know what they came out like, and of course she had meant to say to use tongs! I can see myself—I must have been about nine or ten—with my head on the ironing board, having my curls ironed.

"She had a certain inflection in her voice. Deaf people do, although I have known deaf people in my life who had absolutely none. In teaching the hard of hearing they seem to be regressing towards sign language. We feel very badly that they are going back to it. There was only one time I knew Grandmama to use sign language. When we were children each one of us (when we were younger) slept out on the porch with them. I would hear her voice and then silence and then her voice and silence. He was

A granddaughter riding sidesaddle, about 1914.

Mabel Bell at her desk.

spelling into her hand and she was answering. I never saw Grandmama or Grandpapa use sign language. Never. Only lip reading. We all got pretty good at it. We really did."

"Mrs. Bell was a very wealthy woman," Polly MacMechan Dobson continued. "The Hubbards were people of great means; as you know, it was Mrs. Bell's father who really pushed Mr. Bell into getting the telephone on the market. If you read the books, you see that Bell did get a substantial sum from the telephone but the stock he had was infinitesimal. The dividend was paid just about the time of my birthday in November and he always gave it to me as a present; the dividend was twenty-five dollars. But Mr. Bell was very wise . . . he didn't want to be bothered with petty cash and money and bills and Mrs. Bell was more than willing. I was Mrs. Bell's secretary, so I paid the bills. That was fun, too—a great eye-opener for me as to what real money can do.

"The Bells brought everyone to Baddeck—they discovered it. Everyone beat a path to their door. There were no crowned heads in my time, and Helen Keller and the missionary Wilfred Grenfell were also earlier, but the lieutenant governor of Nova Scotia arrived one year and that was quite a to-do. He'd forgotten his dinner trousers—they'd never been packed. When she entertained, Mrs. Bell often gave fancy-dress balls. They were great levelers, though I didn't realize it at the time. But Mrs. Bell was extremely sensitive, and her Baddeck friends were often poor. Her Washington friends were rich.

"Getting to Baddeck was pretty frightful. You got off the train from Halifax at six-thirty in the morning and you sat on the platform at Iona until eight-thirty, when the *Blue Hill* steamed over from Baddeck, and about nine you got aboard and went back with it. If you were visiting the Bells, of course, they had lots of boats. But there's a story—it dates from before my time—about two people from Washington or Boston arriving early Sunday morning and asking the stationmaster at Iona to telephone the Point to say they were there. But the stationmaster wouldn't use the phone on Sunday. The Americans offered him anything—lots of money—and simply couldn't understand how anyone could have principles so strong . . . or be so pigheaded! They just had to sit there grilling on the Iona dock.

"But even in those days there was quite an American colony at Baddeck. Because of the Bells. Miss Augusta and Miss Caroline McCurdy, Mrs. Bell's cousins, were part of it. Miss Augusta could hear a little—you had to shout at her. . . . Miss Caroline couldn't hear at all—you had to write to her. You'd start, and she would get the sentence and finish it. Playing bridge with them was something. We did it all by signs—hearts, a hand over the heart; diamonds, a hand on the ring finger.

"Mrs. Bell's was the age of letter writing. People had time . . . in spite of the telephone! She had quite a vast correspondence and used to spend a good deal of time at her desk in the morning. And she wrote little sketches for acting. . . . One play she wrote was about the Cape North cable connection . . . the only cable connection then between America and overseas. We were always putting on charades and amateur theatricals in Baddeck to raise money for the war effort. And she was always getting things started . . . the Baddeck library was one of her projects . . . and the Young Ladies' Club.

"Mrs. Bell was a perfectly wonderful grandmother. She adored her grandchildren and really enjoyed them. She didn't want them to have holiday tasks. It was such a lovely life; there was practically nowhere that any harm could come to them. So they swam and they picnicked and they all did their thing. Graham Fairchild was always collecting snakes and dissecting them. He was encouraged to do so. Of course, Mrs. Bell had been absolutely taken up with Madame Montessori when she first met her and backed the first Montessori school in Washington. The Fairchild grandchildren were all Montessori children and Carol was, too, although I think the other Grosvenors were beyond it by the time she got started. So we went on the principle that nobody must do anything for the children; they must do everything for themselves. Sometimes the results weren't too good. The children

Edith (Polly) MacMechan Dobson, Mabel's secretary from 1917 to 1920, when she was about twenty-two.

J. D. Smith about 1919 with Winifred McNeil, principal of Red Head's one-room schoolhouse, and his mother, Margaret Ann Smith (right). Employees at Beinn Bhreagh often boarded at the estate's farm with the Smiths.

bathed themselves and washed their hair and did everything. But people began to notice that one of the little girls was scratching her head tremendously. The child's head was full of lice! It was a terrible time for the child—she had to be soaked in kerosene and her head tied up. There were two young men visiting that summer, and the child told them she had cooties in her head. They called her 'the Cootie Queen.' They were very self-sufficient children.

"Before dinner, with the younger children around, Mr. Bell used to play the piano which was in the hall. They were all pretty musical, and the younger children used to sing and march around to the tune of 'Nicodemus the slave was of African birth and bought for a bag full of gold.' The chorus was 'The good time coming is nearly here . . . it's a long, long time on the way! So come tell Elijah to hurry up Pop, and we'll wake Nicodemus today!' One of the children would be on the sofa pretending to be asleep and the others would march around singing while their grandfather played. Then to wake Nicodemus they'd get hold of the one who was supposed to be sleeping. . . . It was very enchanting and they all enjoyed it."

The grandchildren remember lots of singing. Says Lilian Grosvenor Jones, "We did a lot of spirituals, Scotch songs, and Gilbert and Sullivan . . . 'Tit Willow,' 'I'm Going to Marry Yum-Yum.' "

"I think it was Sunday night that we always had the sings. Grandmama would put her hand upon the piano and would sing along with us," Barbara Fairchild Muller recalls. The old songs from the land of Bell's birth apparently were the favorites. "You'd know he was Scots," remembers Mayme Morrison Brown. "You could hear 'Annie Laurie' all over the house. He could really bang it."

Polly MacMechan Dobson also recalls the musical efforts. "There were often charades and amateur theatricals and reading aloud. A lot of singing. That's another thing . . . I am absolutely tone-deaf, and I was always told at school to stop singing because I put the girl next to me off. Mr. Bell was determined that it didn't matter; he worked with me. He was so interested in everything to do with ears and tones and how you could teach people without them having any music in them. And I remember him sitting at the piano and getting me to try 'Love's Old Sweet Song' over and over again. And eventually he got me to keep the tune. It didn't stick, though.

"I think Mr. Bell's greatest characteristic was that he was a born teacher . . . he loved teaching. There are ways and ways of teaching, and some of them are very boring, but not with Mr.

Bell. He took so much trouble and interest with his grandchildren. In fact, his daughters used to say that the grandchildren had the best of him. When they were children it was 'Don't interfere with Papa; don't disturb him!' He was a genius at work. But by the time the grandchildren came along he was at their disposal.

"After dinner Mr. Bell really liked conversation. Very often the Baldwins came up for dinner, and Mr. Bell and Casey used to retire to the study shortly after. He and Casey would be up until two or three in the morning. Neither he nor Casey was an early riser. Mrs. Bell would have preferred otherwise, but she knew that was his pattern and the way he liked to work, and of course she had the greatest respect for his brain. They'd get interested in something they were thinking of trying; Casey would draw plans and they would talk and talk.

"It was the HD-4 that interested them most while I was there."

With the outbreak of World War I, Bell and Baldwin's work on hydrofoils halted. Bell's sympathies were with the British, but since his own country was not at war, he confined the production of the Beinn Bhreagh laboratory and boatyard to the construction of lifeboats for the Canadian Department of Naval Services. In 1917, when American involvement was certain, he turned again to the hydrofoil, convinced of its important military significance.

I hadn't been in Baddeck more than a few hours when I drove into Bethune's Garage and met Norman Bethune, who had once, I later learned, spent a dusty summer working on the famous "cigar boat." Like others in Baddeck, Norman Bethune succumbed to the lure of the mechanical age. But it was cars rather than aircraft or hydrofoils that took his interest, and Bethune's Garage—where they always wash the windshield—was Baddeck's first gas station, "except," says Mr. Bethune, "for the pump on the wharf."

Norman Bethune knew the Bells from his earliest childhood. "Mrs. Bell often came with the horses and the buckboard to pick up my mother," he recalls. During the kite experiments, an older brother, Roderick (Rory), and John Michael McNeil, the son of Hector P. NcNeil, Bell's assistant, went with Bell to Washington, D.C. for a winter. "Rory did nothing but fly kites and John Michael did nothing but take pictures."

One of Norman Bethune's first jobs (at the height of the 1914–1918 war, when he was sixteen) was to drive Charles Martin, a Washington photographer, around Cape Breton as he took photographs for a *National Geographic* article. Off North Ingonish, Martin hired a boat so that he could photograph the coast. On his return Martin found himself arrested. "They thought he was a spy.

Opposite page:
Mabel and Alexander Graham Bell. (Gilbert Grosvenor, 1914)

They took him up to Sheriff Doucet and the sheriff took him up to his house. Charlie wrote two, three telegrams, and I was sent to buy some oranges and a bottle. Nothing much happened for the afternoon. Then the messages began to arrive. There were dozens, and I'm sure there was one from the president of the United States."

A summer or two later Norman Bethune was employed at Beinn Bhreagh to work on the HD-4. "The hydrofoil—the cigar—was in the shed at the end of the large shop where they were building the lifeboats. They had it in the water, and there was a man from the United States Navy who was installing the motors. I was grinding the bevel on the hydrofoils. Oh, grind all day long, day after day. They came flat pieces of metal in different widths—two inches, three inches, and six inches wide and I suppose half an inch or three-eighths of an inch thick. There were square edges on them and we'd cut them off at a slant. I spent weeks on the grinding of the bevel. Boring? No, it wasn't at the time. Because there was enough to make it interesting. You had to make sure you didn't grind too deeply in one spot. And you'd run the pattern along to make sure the angle was the same. They were ground on an emery wheel. They had a generator—partly run by water, but they helped it out with a gas engine. I didn't assemble, but they were welded into struts to rise up on the water."

One afternoon Norman Bethune assisted Bell as he experimented with converting his telephonic medical probe (hastily invented in 1881 in an effort to locate the assassin's bullet lodged in the body of President Garfield and thus possibly save his life) into an underwater metal detector that might recover a load of metal fittings which had fallen off the Beinn Bhreagh scow.

"At the same time the cigar was going on, they were building lifeboats," Norman Bethune remembered. "One day Mr. Pinaud, the manager of the boatyard, told me Mr. Bell was coming down and I was to go to the pond near the warehouse. Mr. Bell was there with the coachman, John MacDermid, and the span of horses, and MacDermid was unloading some batteries and sort of a telephone and some wire. Dr. Bell called me by name, Bethune, because he and my father had been friends. He told me he had some work for me to do. This wire had a steel rod at the end of it, about six feet long and about as big around as my finger, and he told me to go out into the pond to wade about, and to touch things on the bottom with the rod. He was listening with the telephone, and when I touched anything he asked me to bend down and pick it up. It might be an empty bottle or a rusty plate. I just had sneakers on and my trousers rolled up above the knee.

"The purpose was . . . two weeks before, they had been trans-

porting some galvanized fittings that had come by rail for the lifeboats on their own scow. Many tons of these fittings. There was a sea running that day and as they turned from the channel into the wharf, the scow lurched and the fittings slithered to one side. The next wave that came, everything slid off. Tons and tons of this valuable metal . . . iron bars, eight to ten feet long.

"It's fairly deep out in the channel, and the idea was they might locate those bars by their sound and grapple for them.

"I suppose we were there two hours. I had one of those bars at a certain position near the shore, and he'd ask me to go and touch it once in a while so he could distinguish it by the noise it made. He was holding a telephone receiver and a wire in his other hand, and he'd move along the shore—I thought at the time it was mostly to keep in the shade!* But he got me to take my time rubbing things. He was interested—he seemed bouncy to me. His genius? Curiosity! And intelligence, of course. He was curious about everything. Even the most commonplace thing, he'd inquire into it.

"With the hot summer, and with all the dust from this grinding, I didn't like the job on the cigar too much, so I left the first of July. I never saw the cigar traveling. I went down to Sydney and drove a car for the steel company for six months and then opened the garage here in Baddeck.

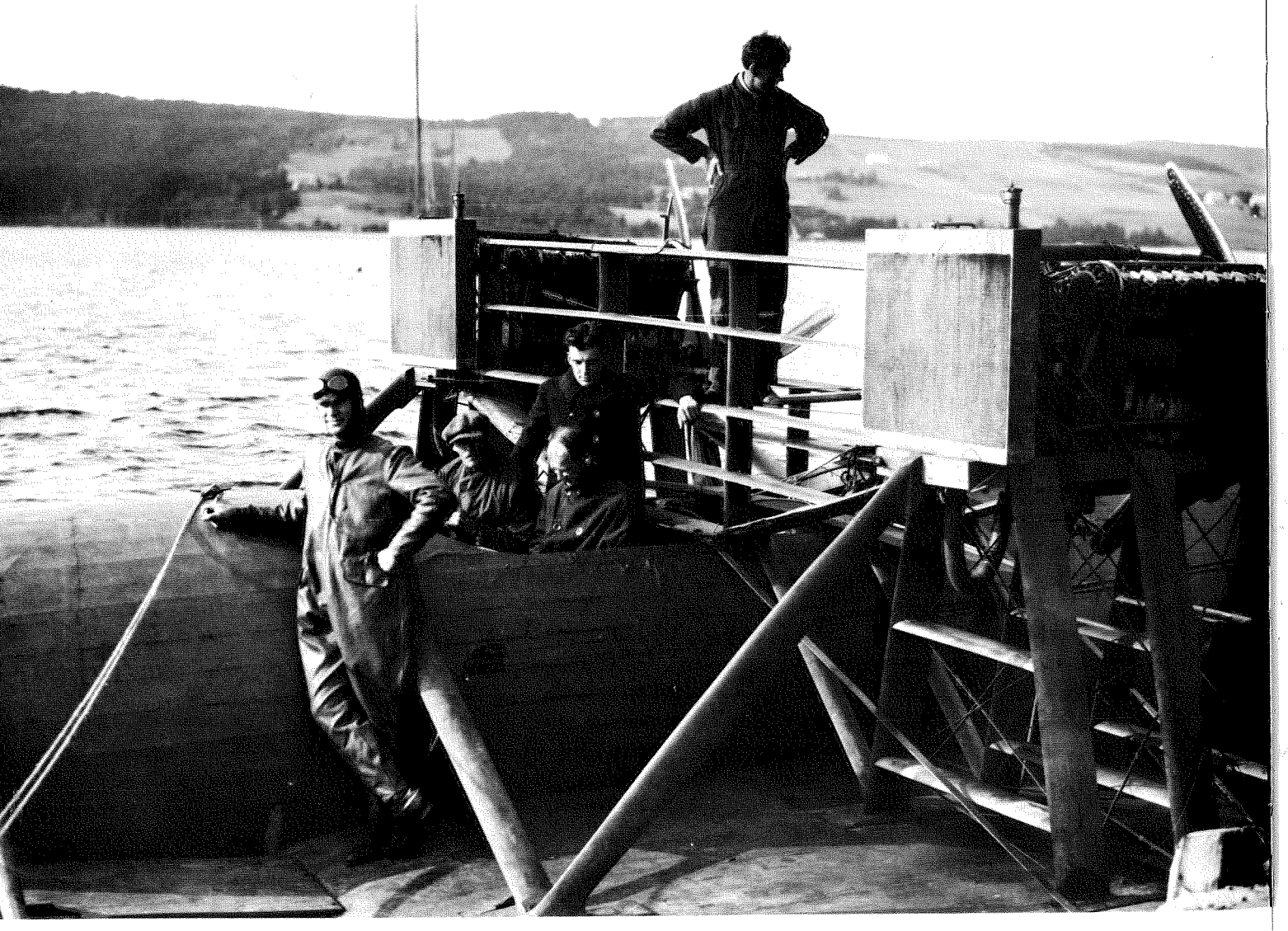
"There are just three fellows alive now who worked on the HD-4: myself; Douglas Fraser, who took over the grinding after I left (he told me the other day he can still taste the dust from the emery); and Murdoch Stewart."

Sixteen-year-old Norman Bethune acting up for the camera.

* According to J. H. Parkin in *Bell and Baldwin,* with the aid of the telephone detector, most of the metal fittings were eventually recovered.

"There are few things in the life of a child," David Fairchild wrote beside this picture, "that can compare with a small bridge from which you can look down into the stream below and with some kind of a net catch the water animals there." Daisy Bell Fairchild with Barbara and Graham Fairchild. (David Fairchild, about 1911)

Casey Baldwin leans on the cockpit of the Bell-Baldwin hydrofoil HD-4. (Gilbert Grosvenor)



Riding the HD-4

One night in about 1925 Murdoch Stewart, then a young apprentice accountant, was seated in a movie house in Sydney, Nova Scotia, watching some sports shorts. Suddenly he turned to his friend in the next seat and said, "That's me you're looking at!"

"A lot of sports events were shown," he remembers, "and then suddenly there was a picture of the HD-4 the day we set the record. Just a picture of the machine and me." The date was September 9, 1919, and for many years the HD-4, the craft Bell and Baldwin timed that day, was the fastest ship in the world.

Now a retired accountant, Murdoch Stewart lives on a Sydney side street with his wife, Helen. In 1918, just out of school, to earn some money he went to work for the summer at Beinn Bhreagh, where his father, William Stewart, was chief carpenter. Dan Stewart, Murdoch's brother, says, "They were looking for someone young and active to go out on the HD-4. Murdoch was ideal for it."

"At Dr. Bell's I did work around motors," explains Murdoch Stewart. "They used to come kind of natural to me. I read in a magazine not long ago that some people have the power to make machines operate more efficiently just by some inner force. There was a motor there in the machine shop that they always had trouble with and I got the machine working just as good as it could. The strange thing was sometimes I'd get it going like lightning without going near it; just by looking at it. The foreman came along one day and the motor seemed to be going extraordinarily fast and he said, 'I don't know what the heck's the matter with that Stewart!'

"Dr. Bell sent for me and he said something about needing somebody active to go out on the boat and I believe he said something about there being some risk."

"It was one of the world's inventions," comments Murdoch's wife, Helen, "and Murdoch is the only living human being who was on it."*

Murdoch Stewart at twenty-two.

* The only crew member still alive.

The HD-4 leaving the boatshed. The craft was launched from a cradle fitted on a track running into the water. (Gilbert Grosvenor)

Murdoch himself told me: "At first we didn't know what the machine was capable of doing. Nobody knew. You know what the design was like? She had those wings. The HD-4 was sixty feet long with this big platform on both sides shaped up in the front and lower behind like the wings of an airplane. There was a lot of airlift to those things and there was airlift from the hydros. So the chap who was with me, an older man called Bill MacDonald from Baddeck Bay, mentioned one day that he was kind of concerned that if the thing got going too fast, it might lift off. I didn't think there was much danger of that. I wasn't worrying about it. In fact, all I was thinking about was the thrill of getting out on her, hoping she'd go fast.

"But after the first couple of flights, when we got back, I couldn't hear the other fellow talking. There were two Liberty airplane motors on the HD-4 and it took five hundred horsepower to drive her. When you were in between those two engines it was pretty noisy, so we got something to plug our ears and we were all right after that.

"The only thing I really minded was getting the hail in my face. That didn't happen too often because we only got the spray at seventy miles an hour. Then it was like being out in a hailstorm and sometimes we'd have to put our hands up.

"The first run I was on didn't amount to anything . . . we went about thirty miles an hour. Every time they made tests they'd come back and reset the hydrofoils.

"The adjustment of the hydros was the important thing. There were hydros made of welded steel under the ship but a few feet above these were big long wooden hydros, probably about eight or nine inches wide, that went from one side of the ship to the other so that when she started picking up speed they kind of raised her up off the water until the metal hydros took over.

"The metal hydros could be adjusted forward or backward so the pitch was changed. Even one inch or two inches on the tilt of the hydros made a tremendous difference to the pitch. Getting the right angle before launching took a lot of experience. It took a good many trial runs to actually get the most efficient angle.

"The hydrofoil principle is quite simple . . . a stone will skim over the water; it gets on angle and it lifts up. You often see a stone jumping up. It's the same thing.

"The whole purpose was to build a ship for the navy. Casey Baldwin thought the ship could be a submarine chaser. Because of its speed and because on the surface of the water it wouldn't be so susceptible to torpedoes. They'd go under it.

"The HD-4 wasn't something that happened suddenly. Dr. Bell experimented with the principle for years. Probably he experi-

mented with hydrofoils for takeoff when he was working with kites. It would have been a practical use for them. Then he used to build little boats, maybe thirty feet long, and put hydros under them and measure the resistance to the water.

"Casey Baldwin was the principal designer. You see, Dr. Bell knew a lot about angles and that sort of thing, but Dr. Bell wasn't an engineer; Casey was. It was a good team. All the experience Dr. Bell gained through his models he passed on to Casey and Casey Baldwin was a very clever man.

"Casey was always on the HD-4; he steered the ship. Dr. Bell had his picture taken aboard, but we were tied up at the wharf. I'm there with a cap on. They had some photographers down from New York and were taking pictures of Dr. Bell and the ship. I had this cap on and of course our clothes were covered with grease, and I felt a little self-conscious and began to take it off. Dr. Bell said, 'Lad, don't change; leave it on.'

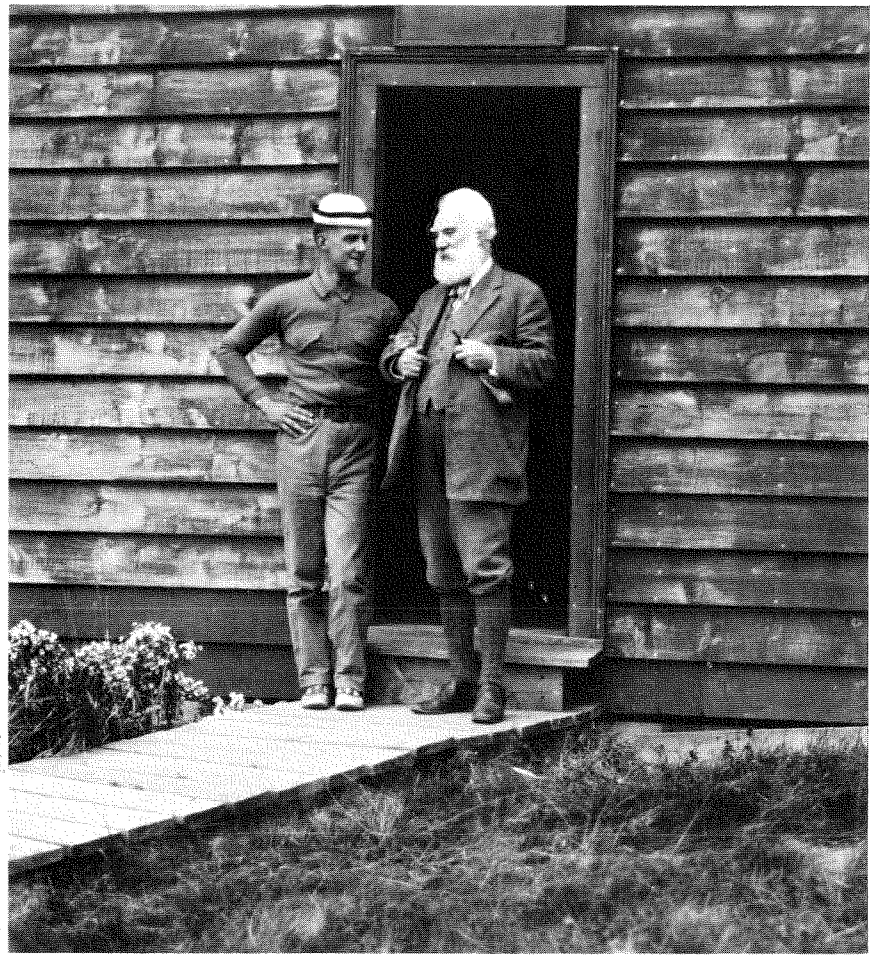
"He was rather eccentric like all of those fellows. Grumpy? Could be. But he was never cross at any of the men. When he looked at you, he looked right through you, trying to figure out what made you work. Quite often he'd entertain the staff. There'd be general discussion . . . very informal. Dinner was the main event, and quite elaborate, with about twenty or thirty there. I remember one time after most had gone home there were a few who stayed around. There were some drinks and Dr. Bell had a few drinks and played the piano. We started to sing 'Auld Lang Syne.' But he played it so often! He was feeling good. He didn't want to go home. Finally someone came down looking for him. His people were getting worried about him.

"On the HD-4 I had various duties. We had to keep the motors in check, and that meant that when we came in from a run we had to drain the oil off. And every time we went out, the motors had to be refilled with fresh oil. They had to be heated in order to start the machine up. Sometimes it took half or three-quarters of an hour to do that. Originally we had to start them with our hands and that was kind of dangerous, but then they got compressed air tanks. They had a compressed air motor on the machine. You let the air into the motor and when the pilots were on, they'd start. So that was quite simple.

"Launching the ship was kind of tricky and so especially was getting her in after a run. The first time I ever saw the HD-4 she was in the shed. She was on a cradle which fitted under the ship and the cradle was on a railway running into the water. The railway was on an incline so the ship went into the water by its own momentum—with a little push sometimes! But getting her back in was the problem! It was difficult to get her in exactly the right po-

sition on the cradle so she would balance. That was my responsibility. I used to stand on the forward deck and there was a big post . . . a two-by-four or something like that was attached to the cradle and sticking out of the water. This post was coming towards you, and when it was close enough you grabbed ahold of it and kind of tried to force the boat into position. Then they'd pull her in with an engine. Oh, she was heavy at times . . . she weighed ten thousand pounds . . . but she was easy to maneuver. It was a little tricky at times, but I never had too much trouble.

"Local people got quite familiar with watching this machine in the water. One day Casey Baldwin decided to take the HD-4 to Sydney. I went over in the morning not knowing that we were going. But Casey was all ready with two or three cases of port aboard. We started out and everything was going fine. If nothing had happened, at sixty miles an hour I'd say we'd have been at Sydney in an hour easy. We came around Beinn Bhreagh and Dr. Bell's home. You could see everybody running down towards the



Bell with grandson Melville about 1920.

The HD-4 at the Beinn Bhreagh wharf. (Gilbert Grosvenor)

shore. There was a tremendous noise. Everybody heard it and wondered what was happening.

"We made good headway to the entrance to Big Bras d'Or. There the sea was on the roar from the ocean. We saw a big roar coming and Casey slowed up; he was afraid to keep his speed. As he slowed, a big breaker came and smashed the wooden lift they used to start her up out of the water. She settled down in the water and you couldn't start her up again; the wooden hydro was broken. So we had to be towed back to Baddeck; we never got to Sydney. Even if I wasn't equipped for the visit . . . I'd my old cap on with all the grease . . . I was disappointed.

"The day she made the record was September 9, 1919. Quite early in the summer we began with the runs and she was out twelve or fifteen times. Of course, you couldn't take this machine out in any kind of water. She wasn't built to go in rough seas, and you don't find too many summer days when it's perfectly calm. That's probably why it took so long to get her to maximum speed.

"Personally I was a little dubious about her efficiency as a submarine chaser . . . because she wanted calm waters. For instance, in the ocean you get thirty- to forty-foot waves, and when you're traveling 60 or 70 miles an hour you have to have a very, very strong structure underneath to withstand the pressure of those waves at that speed.

"To clock her they measured off the distance of a mile along the shore. At the start point they had a flag on a pole and another buoy out in the water. When she came in line with those two, the boat was supposed to be going at its highest speed. Then when it reached the mile point there was another set of flags. That's how they timed her. The record showed 70.86 m.p.h., but she went faster than that. *We* clocked her at 72.7. For twelve years she was the fastest boat in the world.

"It was quite a thrill for a boy of seventeen. I loved to go out on the flights. Oh, I was paid about fifteen dollars a week. But I would have gone if they'd paid me nothing at all."

Bell himself never rode on the HD-4. "Casey tried to persuade him to take a ride and experience the pleasure," Murdoch Stewart remembers. But although Bell had enjoyed his trip on the Forlanini hydrofoil in Italy, he always declined.

At the opening of a new hydrofoil hall at the Alexander Graham Bell National Historic Park in August 1978, Bell's grandson Melville Grosvenor, who had hitched rides whenever he could, told how he had viewed this hesitation on the part of Grampy with distress. "We thought he was an awful sissy," he recalled. Not so Grammy. "She was always trying to get Casey to take her out and one day Casey did and turned over the controls to her.

There's a photograph taken that day which shows Grampy peering intently out at the HD-4. That was his wife he was watching. When she returned he kissed her and hugged her." Melville added, "Being the same age now as Grampy—more or less—I well understand. I forgive him—now!"

An entry made by Mabel Bell in her husband's notebook for November 11, 1919, describes the experience. "From Spectacle Island I steered the boat almost to the wharf. It was a most wonderful trip, she rose so slowly that I had no sensation of rising, she went just as steadily as a rock. She felt like a rock, so steady, and kept on an even keel. She feels so tight there is no feeling of loose jointedness. She is so stiff and solid. Impossible to feel the least sensation of fear. Occasionally she sort of bubbled as might a smooth going train going over a joint in the rails. I don't call it a bump because a bump means something hard. It seemed to me that it was more on the starboard side than on the other. But it was very slight and rather agreeable to vary the monotony of the perfectly smooth passage over the water. Really the remarkable thing to me was the feeling of perfect confidence she inspired."

By 1920 the Bells were hoping that the HD-4 would also inspire confidence in prospective buyers. Looking for customers, they prepared for visitors from the British Admiralty and the U.S. Department of the Navy.

The famous hydrofoil passing at speed. Two 350-horsepower Liberty airplane motors were used to drive the craft.

Courting the Admiralty

The trials of the HD-4 and the hopes, disappointments, drama, and romance that surrounded the visit of the British Admiralty Commission were made very real for me by the words of Polly MacMechan Dobson. "In the spring of 1920 I decided it was time I left, and I said to Mrs. Bell, 'This year I don't think I'll . . . you know . . .' and she said, 'Well, if the Admiralty Commission comes out, won't you come back and help entertain?' I said, 'Yes, I will.' I thought it was as remote as Mars because you know what governments are . . . they hum and haw. I was actually in Kingston, Ontario, when I got the wire from Mrs. Bell saying the Admiralty Commission was arriving and when could I possibly be at Beinn Bhreagh?

"They were hopeful one of the navies would take the HD-4. Mr. Bell thought as an American he should offer it first to the United States Navy Department, which he did, but the British Admiralty Commission was the first to arrive.

"I got there early to help make arrangements. Mrs. Bell wanted them to have fun besides doing their work. And they did. There were three: G. H. Child, the naval architect and a civilian; Engineer Commander W. S. Mann, who was much older and whom I remembered at once because in the days before we had any Canadian Navy . . . perhaps 1906 . . . he had been in Halifax with Prince Louis of Battenberg's squadron, which used to spend a good deal of the summers there and had been entertained by my mother. I was a little girl and I suppose a frightful nuisance, always in with the grownups, and he had sent me postcards from China and the different ports he visited; like any child, I was thrilled to get something through the mail. And Tommy . . . Commander Claude Congreve Dobson. He was thirty. He got his V.C. [Victoria Cross] in CMBs (coastal motor boats)—small boats that were the forerunners of the motor torpedo boats. They were high-powered motorboats that dashed into harbors. One of the ways the HD-4 was supposed to be useful was as a submarine chaser. With her hydrofoils she could skim over the water.

"Tommy was in command of the attack on Kronstadt in the

Opposite page:
For twelve years after its record-setting trial on September 9, 1919, the HD-4 was the fastest ship in the world. (Gilbert Grosvenor)

Russian northern waters in 1919. The war with Germany was over, but the war with the Bolsheviks continued. It was a rather romantic sort of thing. Huge Russian warships were in there and it was supposed to be a completely fortified harbor. The admiral in charge of the whole operation said it was so dangerous he wouldn't give a direct order. But they were all young and thrilled with the chance. They went in at night—with the air force bombing and distracting the Russians' attention. They torpedoed three or four of the Russian warships which were a great potential danger to the Allies.

"Every day while the commission was at Beinn Bhreagh they took the HD-4 out for trials . . . probably every day weather permitted. I suppose people were out to watch in Baddeck and everybody who could was out at Beinn Bhreagh. Of course, the HD-4 went at almost unbelievable speed, to us. As she got up speed, she got up on the water and was practically airborne. She had just a little hydrofoil . . . like a ladder with steps of varying width and the last one the smallest . . . skimming along the top of the water. You've seen a dragonfly running across a pond, haven't you? Well, that's exactly what the HD-4 was like. It was very thrilling. Casey always said that the only exciting parts of flying were taking off and landing. So the HD-4 was always exciting because she seemed always just about to take off. Oh, I couldn't believe the speed at which she was going up the bay!

"So that summer they did the trials and it was also the summer that Casey Baldwin and Bill Nutting, an American who was editor of *Motor Boat,* sailed to England in the *Typhoon,* a boat they had built in Mr. Bell's boatyard. They were trying to prove that sailing was not just a rich man's hobby . . . that a well-designed boat could be built on a budget, and they did, in a way, prove their point. They had a following wind and they made England in record time. One of the things Mr. Bell worked on while they were getting the *Typhoon* ready to go over was distilling . . . getting fresh water from salt. It was something he'd thought of and, as he often did, let lie dormant. The fact that Casey and Bill were going on this trip made it a good time to go on with it. I think they did take what he had designed . . . something like a steam kettle with a lot of pipes . . . but I don't think they had to use it.

"The *Typhoon* sailed on July 19, while the Admiralty Commission was still with us. The Admiralty Commission stayed three weeks. Each day after the trial runs, they would go into conference and assess what they had seen. Of course, the members of the Admiralty Commission weren't allowed to show too much how they felt."

Bell was hopeful. On July 10, 1920, he wrote, "The British of-

Opposite page:
Polly MacMechan with her fiancé, Commander C. C. (Tommy) Dobson; V.C., D.S.O.; her parents, Professor and Mrs. Archibald MacMechan; and the Bells at Beinn Bhreagh at the time of her engagement in 1920.

ficers are observing everything and saying nothing, but I can't help thinking that they must have been impressed with what they saw. . . ." When the officers visited him in his office, there was no doubt about their enthusiasm and interest in his sea-water experiments. "I gave them some distilled water to drink," he noted. And certain other aspects of the Admiralty Commission's visit had clearly been marked with success. "A good deal has happened in the twenty-four days they have been here," Bell wrote on August 2 after the commission's departure. "On Tuesday Commander Dobson paid me a little visit in my study and instead of talking about the trials of the HD-4, he startled me with the announcement of his engagement to Miss MacMechan."

Bell went to England and gave the bride away, but in the end neither the British Admiralty nor the U.S. Department of the Navy took on the HD-4. In due course the U.S. Navy sent a delegation to Beinn Bhreagh and another period of trials interlaced with welcoming entertainment took place. But after the delegation returned to Washington no further word was heard from its members. Only recently, after considerable digging and prodding, was a report unearthed from a dusty dead file in storage. The report was favorable, strongly so, according to Melville Grosvenor, but a top admiral had written across it, "This is an old man's toy: a boat that will not fly."

Today the U.S. Department of the Navy does use hydrofoils. In 1919 the HD-4 was the fastest ship in the world and for many years remained the most advanced craft of its type. Marine engineers benefited greatly from the knowledge acquired by Bell and Baldwin. However, the rough open sea remained a challenge. In 1957 the Canadian Defense Research Board launched a hydrofoil appropriately named the *Bras d'Or.* Sea voyages proved the *Bras d'Or* was not efficient over undulating water; her hydrofoils rapidly succumbed to metal fatigue. Then, in the 1960s, the decade in which the computer came of age, it became possible to change foil positions with great rapidity, and the U.S. Navy is now able to operate the hydrofoil successfully on open seas.

"Yes, Mr. Bell was disappointed they didn't take the HD-4," Polly MacMechan Dobson continued. "Of course, the Canadians eventually built the *Bras d'Or,* the hydrofoil sub-chaser. As they say in Cape Breton—don't be talking! All that that's cost the taxpayers! Of course, it's no more like the HD-4 than I'm like Greta Garbo.

"My husband thought the HD-4 could be successful, and he was very disappointed that the Admiralty didn't take it on. But if you read history, it's always the same. As soon as the war is over, what do they do? They get rid of the armed forces . . . all the

weapons they've spent thousands on. No country wants to spend any more money on anything to do with the services. It's swords into plowshares.

"Mr. Bell was indeed surprised by my engagement. The romance proceeded quite quickly . . . the Admiralty Commission was only there three weeks! But I think he was pleased it took place under his roof. I think he was a romantic and in a way a sentimentalist in spite of being such a scientist. That usually doesn't go with sentiment, does it?

"There was one funny thing. When the *Typhoon* arrived in Cowes . . . Casey and Bill had planned to be there for Cowes Week to demonstrate the boat . . . it was early in the morning. They had dropped anchor, and Casey was on deck in a sweater and pyjama trousers and Bill about the same. Facing them was a yacht with two very pretty girls on deck. Casey certainly had an eye and he hailed the yacht and when the girls heard they had just come from Canada, they said, 'Come on over for breakfast.' So they went over and when the girls found out they had come from Baddeck, one said, 'I've just heard from a cousin of mine that he's got engaged to a girl in Baddeck! Can you tell me anything about her?' That was the first Casey and Bill heard of it because of course they had had no communication from the family.

"My mother and I went over to Britain in October, and Tommy and I were married from his mother's house in Bristol. My father couldn't come; he was still professing at the university. Mr. Bell gave me away, and Mabel Grosvenor and Catherine MacKenzie were my bridesmaids.

"One of the things Mr. Bell did while he was in Britain was receive the Freedom of the City of Edinburgh. I really think that honor pleased him more than anything. You know he was a true American. Like any convert, he was more zealous than people born to the faith. He didn't care for the honorary title of 'doctor.' He became more democratic than the most democratic American when he embraced American citizenship, and everybody was more than equal. But receiving the Freedom of the City pleased him terrifically.

"When I was leaving the Point, Mrs. Bell gave a big fancy-dress ball . . . a farewell for me. I remember one thing that I was very proud about: Mrs. Bell's mail was always collected and brought around, and I opened any business things and put the personal things aside for her. There was a letter I could see was business so I opened it, and it was from a girl employed as a secretary in an office in Halifax, saying she had noticed the announcement of my engagement and would like to apply for my place. I took this in to Mrs. Bell, and she read it through and said, 'Polly,

write her and say I have no intention of replacing you at the moment. I can think of no one who could take your place.'

"And I don't think she ever did have anyone else, because, you see, Mr. Bell died in 1922. I don't think if you had any medical knowledge you would say his death was sudden because he had anemia and also he was diabetic. His diet had to be watched and he was very naughty about that; he used to like to slip away and eat the things he shouldn't. But his death was so simple and pleasant. He'd had a marvelous life; his family were all there. Mrs. Bell died just five months later. It seems so awful after a death to say, 'Well, it was a blessed release.' But Mrs. Bell was losing her sight; blindness would have cut her off completely. And probably she had no wish to live after he died; it was such a long marriage and time together."