American Meteorological Society
University Corporation for Atmospheric Research

TAPE RECORDED INTERVIEW PROJECT

Interview of Walter Orr Roberts
Month Day, 1966

Interviewer: Interviewer Name

WALTER ORR ROBERTS: -- we did that once a week. We went to [Leadville], and did big shopping. And the families would all get together because gas rationing was on. They'd make a once a week, big shopping tour. Then in towards the end of the war, the Navy assigned Lou [Larimore], a Naval Air Officer Lieutenant to [Climax?] to assist. That was the first beginnings of really professional assistance up there. And by then, I also had a guy who lived in Leadville, who helped out with Machine work for the Observatory. And Larimore worked full-time. He said that he had to get flight pay because he'd been in the Naval Air Force for two or three years and never been as high as he was at the Observatory Climax. (laughter) How's our tape? How much time have we got? (pause)

INTERVIEWER NAME: It's still going around. No. It's the (inaudible) keep turning off in here. (inaudible).

WALTER ORR ROBERTS: Oh, yeah. Turn the light on. I guess we don't need a light on there, do we?

INTERVIEWER NAME: No. Much more pleasant without one. (pause)

WALTER ORR ROBERTS: See the Climax was under guard because it was a very crucial war industry, so you had the badges come through the gate. The Chief of the Guard Force became a good friend, and he was interested in photography. And the head of the recreation had a gymnasium, a bowling alley, so I'd do it with another one of our good friends. And that's where we met (inaudible). Hello? John's outside somewhere. He was the Company Doctor, and of course he became one of our very best friends. He used to come up every Wednesday, even when he had to skew right into the kitchen. I went 18 months once without being away a single night from Climax because I didn't know how to let a single day go by without getting the [Corona], if it was clear. And I think that's right. I could be wrong, but I'm almost sure of that. And I got so that I got a sort of a psychological lift on cloudy days because that meant we could go out on a picnic or take a day off. (laughter)

INTERVIEWER NAME: It's one of the things that people always ask about people who are in isolated places. Of course, I guess you had a radio up there. Where, you know, what they were doing and how they found out about all the events that went on. I should think that you would have felt pretty far removed from the war and things that were going on. How did you hear about Pearl Harbor for instance?

WALTER ORR ROBERTS: Well, we had a radio.

INTERVIEWER NAME: (Overlapping dialogue; inaudible) people always remember, you know.

WALTER ORR ROBERTS: Yeah. We had a radio, had a good, short wave radio. And I remember I was listening to the radio and just heard about that, that Sunday afternoon, Pearl Harbor. But we were not really as isolated as you'd think. See, it was a pretty vigorous mining community. There were about 500 people living in the mining community. So (pause) we weren't really in isolation. And we had a lot of very, very good friends that worked in the mine. I mentioned the (inaudible) Superintendent was one of our best friends, and the doctor, and a couple of the engineers, the [Walmsly] Brothers. And Doc King is now the geological [survey] in Denver. And [Eisenack] later, who's now one of the big shots. Oh, and Frank [Kuba], who's now president of Climax Company, back in New York was up there.

INTERVIEWER NAME: How about the--.

WALTER ORR ROBERTS: And [Jillian Feist] was the Chief Geologist, and Van der Wilt, who is the President of Colorado Mines for years. He used to be up there a lot.

INTERVIEWER NAME: How about the events that were going on in the world, like things like (inaudible) Canal, Roosevelt's Re-election, and Roosevelt's death, and VE day, and things like this.

WALTER ORR ROBERTS: Well, of course my brother was in the war, and he was killed in it. And that brought the war close to home. And his wife came out and spent some time with during the war at Climax. And with a short wave radio and one wave, we were in pretty close touch with the news everyday. I didn't really feel at all isolated. And then, of course, you had meat rationing and so on. And

then I was in charge of air rescue work up there. I headed a group of people who were supposed to be able to go out if a plane went down. Go anywhere between [Levelin] Pass and Independence Pass on the north and south, and Tennessee Pass on the west. Anywhere in that region to try and rescue somebody if a plane went down. And we used to go on practice missions. We fortunately, never had a plane go down during the period of our responsibility, but we had about 12 people trained, and we had all kinds of first aid gear that we could carry way back on. And in the remote regions with skis and snowshoes, and then we went on training missions. Sometimes go out for most of the night. And go out with some pretty foul weather. And also, I taught Red Cross First Aid in the mine, and things like that. So we felt pretty involved.

INTERVIEWER NAME: Real seven day work?

WALTER ORR ROBERTS: And, of course, the Climax mine was a key war industry. And we had black outs, and I used to be part of the security force of the Climax mine that would go up in the top of [Tough Bluff], and when we'd have a blackout, take photographs to spot the lights that didn't go out. And things like that. (laughter) So you didn't have much chance to forget there was a war on.

INTERVIEWER NAME: The real seven day a week job. Did it ever get to the place where you'd get a little tired of it?

WALTER ORR ROBERTS: Well, the hard part was when the kids started to come, and after Dr. [Ratalick] left, then there wasn't any good medical care up there. And then it was pretty hard. You could tell who'd come down sick, and of course our first three kids we had to drive to Denver over Levelin Pass to have the babies.

And that part was fairly hard. There was no decent medical care available in Leadville then. There was only one doctor, and he wasn't very good. And that part of it got hard, but I liked the work. And I was the Jack of all trades. I ran plays, and I developed the film, and I just did everything. And consequently, I enjoyed it. I was not very much of a manager, I'm afraid. It took me many years to get over my impatience, the dissatisfaction with another people. I'd just take the credit. (laughter) I used to get furious if anybody'd spill hypo on the floor of the dark room. Then towards the end of our stay up there, there were quite a few people. You see, Jack Evans came in the spring ' 46 if I remember correctly. Yeah, in fact Jack came about February-March of '46. And I taught him how to run the [chronograph]. And I think I told you the famous story about how the Fourth of June prominence. He'd finally got the place where he could run the chronograph by himself, and he was out there, and he came in and said what do you do if (inaudible) a civilian goes right out of the picture frame? (laughter) I said forget it, it never happened. And then he said wait for it to come out and look at this one. It was the biggest prominence I had ever seen and we got a movie of it.

INTERVIEWER NAME: That must have been exciting.

WALTER ORR ROBERTS: God, that was fantastic. I couldn't believe it. The chronograph was exciting because you never knew what you were going to see. It's sort of like fishing. You always think the next one is going to be a whale. (laughter) Every now and then you do get something fantastic. And I remember the first day I got a photograph of the Corona itself, or the green-lined chrono

filter. See, Jack Evans had made the filters himself long before he had become associated with the Climax budget. He'd made the filters in the basement of his house I believe while he was at [Mills] College. None of them was designed to pick up the green chrono line. But it wasn't until about '43 that I got around to really making-- maybe it was even '44-- to making a serious try. And on the 19th of June, I think it was '43, I got a photograph of the chrono that was just a fantastic thrill. A pretty crummy picture by present standards. Never had the prominence pictures that we got as good as the best that are taken now. Well, not as good as the best. They're not as good as Dick Dunn's 16 inch chronograph. But still, some of the most exciting prominence movies that we have are taken back in the early days. Nowadays, we have so many standards, and intermittent frames and so on that frames of wedges, calibrations, and so on if they don't make a pretty movie.

INTERVIEWER NAME: In terms of isolation, how about keeping up with what the rest of the scientific community was doing? Was this kind of tough? I suppose during the war, of course, this activity was cut down anyhow.

WALTER ORR ROBERTS: Yeah, it was cut down, although I did a lot of correspondence. I corresponded even to the French underground with Leo. I got a lot of help and instructions.

INTERVIEWER NAME: Where was Leo during the war?

WALTER ORR ROBERTS: Well, first he was in Paris, and then he got into an occupied France, got onto the (inaudible) and was there for a while. And he corresponded with me from there. I think somebody carried the letters across to Spain where

they were mailed to me. See, they're right on the Spanish border. And he told me all kinds of tricks about running the chronograph. And as soon as the war was over, one of the first things that Leo did was to come to this country, and go up to Climax and see the observatory.

INTERVIEWER NAME: Had you met him before?

WALTER ORR ROBERTS: No, I've never met him. But we've corresponded all these years.

INTERVIEWER NAME: That must have been quite a thrill.

WALTER ORR ROBERTS: Oh, that was a thrill. He spent three or four days at Climax, and he had all kinds of ideas, and he looked through the chronograph. He made me look at the disc. That's another fantastic story. He made me look at the disc. And I didn't want to because it meant readjusting my careful adjustments to take out the (inaudible) disc and so on, and look at the disc of the sun. But he insisted that I do it, and he was--.

INTERVIEWER NAME: This was the first time you've done that?

WALTER ORR ROBERTS: Yeah, first time I'd really done it. I'd tried it, but never seen anything. He said oh no, you ought to see something. And then this is in July of '46, it was the 25th, sometime right around there. And I looked and I didn't see anything. And he said well, I'll watch a while. So he watched the eyepiece and said see now? There's something happening. Come and look. I went and took a look, and by golly, there was. It was the largest flare that's ever been recorded.

INTERVIEWER NAME: (laughter)

WALTER ORR ROBERTS: And it was occupied something like five or eight percent of the whole disc of the sun. And it's a famous one, and it's photographed at near dawn and various other places. We got some pictures of it, but they weren't good. But nonetheless, you could see them. And that really got us interested in making routine flare observations. And later, I made something like 30 or 40 flare observations with the Climax chronograph. And then very soon there after, we built the flare patrol in order to routinely observe the flares. But he was a great mountain climber, and he climbed up at the top of the (inaudible). That was a very wonderful visit.

INTERVIEWER NAME: You might talk a little more about that. It sort of sounded as though it should have been a very kind of dramatic moment in your life being the guy who---.

WALTER ORR ROBERTS: Well, it really was.

INTERVIEWER NAME: -- had developed this instrument that you had spend so many years on by that time.

WALTER ORR ROBERTS: You see to maintain communication, I had done an enormous amount of correspondence. I'd corresponded with him, and you see in those days, there weren't very many solar physicists. And Robert McMath had also been extremely helpful.

INTERVIEWER NAME: How many solar physicists that you knew of?

WALTER ORR ROBERTS: Well, I suppose--.

INTERVIEWER NAME: A dozen?

WALTER ORR ROBERTS: Yeah, a dozen (inaudible) in France, and Leo. I don't think there were any in the Soviet Union yet, and there was McMath, and the [Nat Wilson] people had pretty much followed up their tent. [Pedent] was still slightly active, so that was really-- oh yes, there had a guy who had been active earlier in Virginia. And then there was [Emond] in Sweden, and [Woltmeyer] in Switzerland. See, Woltmeyer built the second chronograph. [Will] all built the first, Woltmeyer built the second, and we built the third. And then there was a man named [Von Kleeber] in Potsdam. And when the Russian occupation of Germany occurred, he stayed there for a while, but then got out and went over to Switzerland. Oh yes, and there was a buddy in Italy, and there were a couple of priests: Father [Kardus] in Spain. But I went to the meeting of the International Astronomical Union, the first post-war meeting in Switzerland in 1948, and that was really the thrill of my life because there I met face to face all of the people who had just been names up until then. And, oh yes, [Lyman Spitzer] in the U.S. had been-- you see, Harvard really had quite a corner on it. At Harvard, there was Goldberg, Jim Baker, Jack Evans had come, I had come from there. And then there was [Menzel], and did I mention [Laurence Aller], and Lyman Spitzer. And that was-- except for McMath and Pedent-- that was essentially all of the active solar physics in the U.S. It was right there in that very small group. So we knew each other, and we corresponded, and we communicated. Then when I went to Europe, I met through Menzel, and through these other people, Spitzer who were a little bit older than I. I met these other people, and they were famous names. [Father Lumatra], who was the author of the Cosmic Egg, the Big Bang-- I mean

the Cosmic Explosion theory of the expanding universe. And sat until the wee hours of the night listening to him and [Schaffley] debate this. They drank beer in that little (inaudible).

INTERVIEWER NAME: Too bad they didn't have a tape recorder.

WALTER ORR ROBERTS: Yeah. (laughter) And then I went over to Salzburg. That's right. [Keipenhoyer] was working in Germany, he was the fair-haired foil of Mussolini and Hitler. He was the solar--.

INTERVIEWER NAME: And this was the same Keipenhoyer that (Overlapping dialogue; inaudible)?

WALTER ORR ROBERTS: The same Keipenhoyer there. And I had had a famous photograph of him on Brenner Pass being congratulated by Mussolini and Hitler on the establishment of solar physics and the great, glorious God. And he was flown around in a German Air Force airplane. And the [zeist] works had started to build 20 chronographs during the war. And two of them had gotten into operation: one on [vendelstein] and one on [sumspitza]. And these were tempting to get chrono observations that didn't actually get them fully operative until after the war. And in '48, I went and visited these. The sumspitza one had been destroyed by the U.S. soldiers, and the lens for the chronograph finally turned up in a New Jersey punch out. A (inaudible) tried to sell it to us. But the sumspitza-- I mean the [kenzlehoya]-- no, excuse me, vendelstein won. They were three in Germany that actually got going. One was in vendelstein, and I visited that one. And one was in Kenzlehoya, and that was in the Eastern zone, and we didn't have time to go there. And Sumspitza had been destroyed by the U.S. soldiers. And

[Georges Dmitrov], who was a professor at Harvard had been with the U.S. Army people who went into the zeist works, gathered up all of the chronograph drawings. Shipped them back ask classified documents, shipped them back to the U.S. for us to examine. We were a little bit amazed that the Germans would be building 20 chronographs. We thought maybe they'd discovered something that we hadn't, but nothing ever showed up. I think they thought that we were-- I don't know why they built 20 of them. But oh yeah, and then of course one of the things that really never forget is that I had been clued in and asked to do a little bit of advisory work at [Eastman] Kodak. See, I still was on leave from Kodak throughout the war. I'd gone back there and had learned about the work on the A Bombs because all of my friends at Kodak were working at what we called dog patches, which was the [ridge]. And (laughter) I'd forgotten now why exactly I had suppressed it so. But I learned about the fact that we were well on our way towards building an A Bomb. And I remember worrying about whether the chain reaction would stop. I guess that was what I would have been asked about. I'd forgotten cause this is relative to solar physics, and a group of people came up from Los Alamos and visited, and we talked solar physics. We didn't talk explicitly about the A Bomb, but I knew that they were working on the A Bomb.

INTERVIEWER NAME: That's interesting, and I wonder how widely shared a secret that was.

WALTER ORR ROBERTS: Well, it's hard to say. Secret began to break about June, but I still had not even talked to Janet about it.

INTERVIEWER NAME: In June of '44?

WALTER ORR ROBERTS: Yeah. And then when I finally was out on the observatory dome taking pictures when somebody burst in and said a new kind of bomb has been shot and I almost fainted. And I said it's gone off, and then I told him about it. And then suddenly, I realize that maybe this wasn't the A Bomb. (laughter) And so I got scared to death that I had broken a secret. And so I went in and we listened on the radio, and it was indeed the A Bomb. They were talking about it as an atomic bomb. And that actually had a fantastic impact on me. And the fact that it hadn't continued the chain reaction. I was pretty sure it wouldn't, but I wasn't clued in to the details and the calculations that had been made. I knew [Theramy] very well, you see, in those days.

INTERVIEWER NAME: Oh, really?

WALTER ORR ROBERTS: Yeah.

INTERVIEWER NAME: How was that?

WALTER ORR ROBERTS: Through his being at Los Alamos and coming up to visit quite frequently [Hans Beta] and Edward Teller were regular visitors at Climax. They came up two or three times during the course of the early years. And Theramy came up three or four times. Kenneth Price and so on, and Bruno [Rassy] was up there doing cosmic ray work. We had quite a cosmic ray group towards the end of the war. And then one time, as a matter of fact, we built a shed right up near the observatory, where the couple of tons of gold from Fort Knox there, which I had to get in without letting anybody know in the community know that it was gold or anything.

INTERVIEWER NAME: I should think so. A couple of tons of it.

WALTER ORR ROBERTS: Yeah. (laughter)

INTERVIEWER NAME: That would have been several million dollars.

WALTER ORR ROBERTS: Well, I can't remember. Maybe it wasn't that much. It was a tremendous amount. And we decided not even to put any special locks on the building for fear that putting such special locks and posting such special guards would get somebody suspicious. And we did special cosmic ray work with the gold as a moderator because lead was too valuable a war material to use, and gold was just as good a moderator. (laughter)

INTERVIEWER NAME: (laughter)

WALTER ORR ROBERTS: Maybe it wasn't a couple of tons, but it was a tremendous amount. Now that the (inaudible) Express people were desperately disturbed, because they knew that it was gold and they were responsible for delivering it. Came up from the railroad, which I think by then had been converted to a full gauge. That was another early war measure.

INTERVIEWER NAME: Were (inaudible), and Beta, and Theramy were all interested in cosmic rays?

WALTER ORR ROBERTS: No, Teller and Beta were interested in solar physics, and Theramy too.

INTERVIEWER NAME: So it was just sort of as a sideline to what they were doing?

WALTER ORR ROBERTS: Well, science wasn't as specialized then as it is now. People like Theramy, so they were interested in everything. Teller, Vigner, and I didn't know Vigner. And Theramy gave at my invitation, after I'd moved back here to Boulder, Theramy gave one of the first presentations of the theory of the

generation of cosmic rays and colliding galaxies at [Macky] Auditorium, and had forgot to provide a (inaudible) slide to show us slides, so he just waved his arms. He gave a brilliant public lecture with about a thousand people in there on the origin of the comic rays. (laughter) But the decision to create the (inaudible) Observatory was interesting too. In 1946, right after--.

INTERVIEWER NAME: This is the transition from the observing station of Harvard University?

WALTER ORR ROBERTS: Yeah, Freemont Pass Station of Harvard Observatory it was called.

INTERVIEWER NAME: Right.

WALTER ORR ROBERTS: And I remember [Menzel] had the idea of incorporating it as a Colorado Corporation, and we were going to have a joint with University of Denver, the University of Colorado, and Harvard. And then we ran into some difficulties. Denver couldn't, I'd forgotten just what. We were going to combine it with the Mt. [Evan] station, but that part of it didn't go. But Bob [Stearns] of Colorado was very enthusiastic about incorporating it, and affiliating it with the University of Colorado. And I was given the job of getting the Climax Company's permission to name it the Climax Solar Observatory. And we decided we'd have to get permission with the board of trustees from the Climax (inaudible) Company to use their Climax sort of trademark. And we didn't get in, in time to get it before the board of trustees at the particular meeting, and yet we wanted to incorporate it. And so Menzel told me well, just pick some name, any name that we can incorporate under, and we'll change it later. And so Jack Evans

and I picked the name High Altitude Observatory. We figured we'd keep that for a few months.

INTERVIEWER NAME: When was it decided to make this an observatory to incorporate it in order to bring in these Colorado Institutions?

WALTER ORR ROBERTS: No. It was because Harvard had become worried about its tax exempt status in Massachusetts if it had out of state enterprises. And it was a [dodge] to get Harvard University out of out of state operations.

INTERVIEWER NAME: Gee, that's fascinating.

WALTER ORR ROBERTS: Yeah.

INTERVIEWER NAME: You would think as an education owner, research activity anywhere would be--.

WALTER ORR ROBERTS: Well, it was a great deal of fuss about universities running businesses and having out of state operations. And at the same time, Harvard got rid of its South African station, it's Climax station, and a Florida station in primate biology, which became the [Yorky's] Center. And all three of these enterprises prospered later, and they were prospering then. But Harvard was worried, and the President appointed three trustees for the corporation. Dean Buck, who was Provost of Harvard University, and two members: Ted Jackson I believe, and Peter H. Holme were the three Harvard trustees. Oh no, there were three plus an officer of Harvard and an officer of Colorado. Yeah. So there were eight in all. And you get a mosquito bite?

INTERVIEWER NAME: A little bit.

WALTER ORR ROBERTS: Should we go in?

INTERVIEWER NAME: Whatever you like.

WALTER ORR ROBERTS: We can just move the tape recorder in.

INTERVIEWER NAME: OK.

(Break in Audio)

INTERVIEWER NAME: I thought it might be interesting to get on here some specific events that happened or reminiscences of specific people on specific occasions. Of course, quite often, these tend to be the most enjoyable parts of this sort of thing. I guess they divided them into two parts. The first half had to do with living in terms of your family growing up or other things that happened. Or maybe there are three things. The second kind of event is an event such as the June 4th, 1946 when you and Jack photographed the great prominence. And the third has to do with the visits or encounters with really interesting people.

WALTER ORR ROBERTS: Yeah. One of the really interesting visits was the visit of [Severeni Onabakov] from the Soviet Union to Climax right after the war.

INTERVIEWER NAME: Oh, I didn't know they'd come.

WALTER ORR ROBERTS: Yeah, they came out and they came up to Climax.

INTERVIEWER NAME: That must have been among the first Russians to have this country after the war.

WALTER ORR ROBERTS: Yeah, I think so.

INTERVIEWER NAME: The war couldn't incorporate (Overlapping dialogue; inaudible).

WALTER ORR ROBERTS: I can't remember what year it was, but I was still at Climax, and I made arrangements for him to stay down at the miner's boarding house, the

Climax Mining Boarding House. I took him in to visit Jack Abram's, the miner's (inaudible) and so on. And the Russians were quite the celebrities because they still had very vividly in our minds Stalingrad, all of that. And they spent two or three days up there, and that's when Severeni decided that the would build a chronograph in the Soviet Union. And he went very carefully over with me all of the principles of design and operation, and showed me the preliminary plans that they had. And we talked about whether they would be better off to get one of those [zeist chronographs] that had been manufactured by the zeist people, but were not completed. Or whether they'd be better off to run their own, and they wanted to buy one first. And this is something to be worth talking about a little bit, but getting started here in Boulder, and how we developed the designs for the big chronograph and so on. Because Jack and I had already started thinking about the sort of what would be the post-war type of chronograph, what would be the next big step in chronograph development. And I talked quite a bit, and I guess Jack was there at Climax at the same time when Severeni Onabakov was there. We talked about what you do to make a really good, new chronograph. What size it would be and so on. And I urged them to go for a five or six inch rather than to go for a big one because the chronograph was better to get experience was a modest sized one. It was such a difficult thing to make work. And they did decide to build a modest one. But they wanted to buy one, and I'd forgotten already there were restrictions against their buying stuff. I don't remember whether it was political or whether it was dollars or what. But we gave them all that we could in the way of experience and so on. And the French were already

talking about making birefringent filters for sale. It's the [Cotsi] Company was informed. Well, in any event, Severeni went back with a whole bunch of ideas and we corresponded for a while as they developed their plans to develop a chronograph. And I think one of the French groups that came and visited us with Leo, there were three that came with Leo. I can't remember their names. One was an optical and mechanical designer, and I think he did some work for the Russians on their chronograph, taking advantage of our experience, plus the French experience and so on. But Jack and Betty have come up to Climax in '46, but Betty was not able to cope with the altitude. She got physical troubles from it. And so in '47, I was planning to leave. I was having physical troubles then too. I started to get too high a (inaudible) pain, and cause me to have fainting spells and dizziness. And so I decided to go back to Harvard for a semester and teach, and then come back out to Boulder where we would create a Boulder branch, with the corporation just having been formed in '46, this was '47. And by the spring of '48 I'd be settled in Boulder. And I came down to buy a house here in Colorado, and bought Joseph [Hannick's] place on 842 [Vant] Place, I think it was.

INTERVIEWER NAME: Really?

WALTER ORR ROBERTS: (Overlapping dialogue; inaudible) except that at the last minute, Jack signed and bought it instead of I because Jack decided to move down in September of '47. And I figured well, he can take that house and I'll find another one. So Jack Mr. Hannick's house and set up in the study of that house, set up the first Office of the High Altitude Observatory. And I came out around Christmas, and started hunting for a house and getting prepared to come out in the

spring. And Jack and I spent a lot of time talking about what would be the next chronograph design. And I'll never forget the evening or the day when suddenly, we got the idea of the-- well, Jack had the idea of a roller drive instead of a clock, a gear and so on. Jack had that idea, but we couldn't think of a way to make it [kinematic]. I had been interested in instrument design, and was very much wrapped up with the principles of whitehead. And instrument design called kinematic design, which you had no [backlack]. For example, any device that has backlash is not kinematical. It has what you call a false element. We kept trying to think of a way to make it kinematical cause that kinematical principles appealed to Jack too. And all of a sudden, I don't remember whether Jack saw it or whether I saw it, but I remember it came into my consciousness as I was looking at his chronograph turntable, which we were fixing. We suddenly realized the central turntable of the turntable motor is on a fixed axis, and the motor driving it on a fixed axis. And there's an idly spinning orbit that goes between them, which translates the power from the one to the other, and provides the gear (inaudible) the roller reductions. The intermediate roller has a big axis and a small axis. And the smaller axis rests on the big wheel, and then the small of that rests on the central. And that gives you the gear roller ratio reduction. And we suddenly saw that as the principle for the big chronograph drive. It was a great, big decide to push this steel roller into the space. And then you see that there were not exact alignments or anything like that. That wheel would roll in and out a little bit on its spring, but it would never decouple. And this is a principle in which all of our chronographs, all of the (inaudible) drives, all of the

climax drives invented today had been built on this principle. And then we had a great sort of a disagreement, or dispute, or question between Menzel and me, with Jack sort of in the middle as to whether we should build a 12 inch chronograph or a 16 inch chronograph. I thought going with the 16 inch was to go too far. It carried us too far beyond the present state of engineering ability and so on. And so I wanted to build a 12 inch, and Menzel thought this was our one and only chance to build the biggest and the best. Let's go for 16. And the Navy was supporting Climax, and we tried to get the Navy to add some money to build an observatory at the new site. Meanwhile, I'd already started looking at the new site of the Climax. I had two sites: one the site where we were now located, and the other was about three miles farther to the west on the top of the ridge that was again on the continental divide between (inaudible) Leadville and (inaudible) on the one side, and we're just on the (inaudible) River on the other side. There's a beautiful site back there, but it's about three miles farther, and we faced the problem of how actively would the Climax (inaudible) grow versus how many year are we prepared to operate at this site for the greater ease of getting in and out of the road cause the other site being two or three miles further in and we had to plow all of this road ourselves, and so on and so on. And so we got estimates of the future build up of the Climax Mine, and the future height of the [Taling's Dump] and so on. And the Taling's Dump has already been, for four or five years, above the projected level for the year 2000. Now that's how much the Climax people underestimated the rate of growth of their mine. And we therefore

underestimated the rate of growth of the contamination of the environment by the Climax company.

INTERVIEWER NAME: It's working out pretty well though.

WALTER ORR ROBERTS: It's working out pretty well. It really is.

INTERVIEWER NAME: As a matter of fact, when I was writing up this thing about the new (inaudible) and the new site. I said that we were looking for a site that would be useful for a comparable period of time. (inaudible) works for 25 years that's pretty good.

WALTER ORR ROBERTS: Yeah. (laughter) Well, you see, so we moved to the site about '50 or '51. But we were so broke, we didn't really have enough money to operate, and we were terribly embarrassed because of the Air Force-- Menzel winded up getting money from the Air Force, and he went originally to get them to pump money into Climax, but they wouldn't. They were willing only to put it into a site near the (inaudible) ground where they had a big operation in Holland. And then we started to think well, that's another observatory with a little more number of clear hours. Even though it might be much more inaccessible. But in the long run, perhaps the better debt. So we picked the [site] peak observatory, and I did all of the weather studies for the relative observing qualities of the sites and change of number of hours of clouds with altitude and contamination levels, et cetera et cetera. And then I forgot to say that when I was in Zurich in 1948, I spent a lot of time with [Ingvee Irman] of Sweden. Got very much interested in him as a scientist, and I've got him for a year to the High Altitude Observatory. He came in '49 and spent a year, and he developed the first sky [plutometers] for

us to measure sites to find out what good, quantitative. And that's the thing that was the prototype of the Gordon [Newkirk] Balloon chronograph. And again, Jack Evans and I sort of worked from the preliminary design of it. Irman worked out the detail design and built the first one during his visit here. And he also got somewhat interested and did a lot of work himself on measuring [polarization] phenomena. In fact, he wrote a book on polarization (inaudible). Well, then the Air Force decided they wouldn't put money into Climax, and the Navy was a little bit out of joint over the fact that we grounded the Air Force, and we're building this observatory that would eclipse the Climax Observatory rather completely, and they had put up the money for building one of the big chronographs, the 16 inch chronographs. And now all of a sudden the Air Force is going to build another one. And it was a little bit of difficulty between the two, with the Navy and Climax on the one side, and the Air Force and Site Peak on the other side. And during all of this time came the extremely difficult period of the McArthur period. And all of the troubles that migrate, political activity in Colorado talking about atomic control, and so on, and so on. And Schaffley's involvement in the [Walford] Conference, and the charges of being communist dominated and so on, and so on. And in the mist of all of this, we were starting to develop the Sacramento Peak Observatory. And I applied for a security clearance in order to be able to go through the gate at [Holloman], in order to save the government money as I went down to help set up the Sacramento Peak Observatory. And then the declassified area that I had to walk through but I forgot about it, never withdrew my security request, and it was denied. (laughter) After I didn't need

it, so I had to go through security clearance. Well, that strained a lot of tempers and caused a lot of difficulties. And that, plus my disagreement about you see, Climax is in real trouble financially. We didn't have money to build a dome for the big chronograph, and the Navy wouldn't build a dome. And Harvard didn't have money to build a dome, and raising private money isn't easy. And so Menzel's solution was to turn Climax over to the National Bureau of Standards. See, the Bureau Standards had then decided to move to Boulder because of the high altitude observatory. Then being in Boulder, they moved the CRPL, and the DS here, and it was Menzel's idea that it would be good to have CRPL fund and operate Climax. See, they were already operating a contract. And it's interesting that from that day to this, it's been the same dollar amount year, after year, after year. Still, I think, $35 thousand or $50 thousand. And at one time, that was most of the High Altitude Observatory's income. Well, at any event, the High Altitude Observatory got the first contract from the Air Force to explore Site Peak, and we sent Rudy Cook down and various people to study the weather there and set up the first pilot chronograph as a High Altitude Observatory Contract. But around '50 or thereabouts, we decided to separate High Altitude Observatory and Site Peak. Partly over this question of Federal operation. I just didn't want Federal operation, and Menzel didn't see anybody to raise the money. And it was on this issue to (inaudible) because Harvard dropped out of the Harvard Colorado Corporation. And I was given a year to raise the money to house the Climax Chronograph, or else we would go into the MDS. And of course, during all of this time came the security investigation, and a number of other people at the

Harvard Observatory went through security investigations, some of them much worse and much longer than mine. And this really raised and made things difficult for everybody. But in the course of a year, I raised almost enough money to build the dome. So we went ahead, I got a half year extension, and then got enough money to build the dome we went ahead and built the dome.

INTERVIEWER NAME: The money you got from private sources?

WALTER ORR ROBERTS: Private sources. There's a great, big list of donors on the building up at Climax of the private donors that made that possible. And that's when I met all of these people in New York, like Tom Watson, Erin [Sears], and Max [Shott.] Max Shott was the first contributor that former president of Climax (inaudible) Company. He gave me $5000. The first $5000 towards building the dome. (laughter)

INTERVIEWER NAME: How much did it cost?

WALTER ORR ROBERTS: Oh, I'd forgotten. It was about a quarter of a million. Now that was a tremendous amount of money to me. (laughter) It still is. I don't know, maybe it was only $130 thousand, I can't really remember. But we went ahead, but we still didn't have enough money to finish the chronograph. And but we had built the big [spot], we had enough money to build the big spot given to us by the Navy, but not one penny more. We had the big spot up, but we didn't have enough money to put in any after--.

[End around 45:51]

END OF INTERVIEW