national accelerator laboratory FERMILAB-NAL-039

MONTHLY REPORT OF ACTIVITIES

February 28, 1970

THE MAIN RING TAKES SHAPE

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Forthcoming Meetings at the Laboratory

March 6	Program Committee
March 13	Experimental-Facilities Workshop
March 12, 19, 26	S. Fubini and G. Veneziano
March 27-28	Conference on Duality
April 1, 2, 3	T. D. Lee
April 10-11	Annual NAL Users Meeting
April 16, 23, 30, May 7	S. L. Adler
June 22-July 24	Summer Study
Sept. 28-Oct. 2	Proton Linear Accelerator Conference

THE COVER: Precast main-ring tunnel sections in place. This photograph was taken February 25 from a point just beyond of the Transfer Hall, looking in the direction of the beam. The cut in the background trees is Road A, paralleling the external beam.

MONTHLY REPORT OF ACTIVITIES

F. T. Cole

February 28, 1970

Abstract: This report is a summary of the activities of the National Accelerator Laboratory during February, 1970.

General

1. Summer Study. The Laboratory will hold a summer-study program similar to those of 1968 and 1969. The single session will be from June 22 to July 24. The design work on experimental facilities has advanced considerably this year and the summer study will be held at the Laboratory to provide the close collaboration between the participants and the Laboratory staff working on the design. The invitation list for this program is being made up.

2. Experimental-Facilities Workshop. The third workshop will be held at the Laboratory on Friday, March 13, starting at 10:00 a.m. The topic will be Experimental Area 1. Physicists who wish to participate are invited to attend.

3. Users Meeting. The annual meeting of the NAL Users Organization will be held April 10 and 11 at the Laboratory. All interested physicists are invited to attend.

4. Program Committee. The Program Committee, whose membership was given in December's Monthly Report, will hold its first meeting at the

Laboratory on March 6. After this meeting, information concerning submission of proposals for experiments will be sent to all members of the NAL Users Organization. The Program Committee will meet again in August to begin consideration of proposals.

5. Professors of the Month. Profs. S. Fubini and G. Veneziano will lecture at the Laboratory on March 12, 19, and 26. Their topic will be "Duality in Strong-Interaction Physics." Prof. T. D. Lee will be at the Laboratory on April 1, 2, and 3. Prof. S. L. Adler will be at the Laboratory April 16, 23, 30 and May 7. There will be a conference on duality on March 27 and 28 at the Laboratory. Interested physicists are invited to attend.

6. Construction Progress.

a. Booster Enclosure. The booster tunnel was occupied by the Laboratory on Feb. 26, the scheduled date. (See also under "Booster" below.) Installation of piping and cable trays in the tunnel is approximately one-fourth complete. The west gallery above the tunnel is completely enclosed and work is proceeding rapidly on the east gallery. The booster contract is 69% complete. Figure 1 is a recent photograph of the injection area taken from the observation tower.

b. Cross Gallery. Work on roofing the upper level was delayed for a few hours in order to bring in the first booster magnet module. The entire contract is 73% complete and on schedule. The Cross Gallery can also be seen in Fig. 1.

c. Central Utility Plant. Figure 1 also shows the excavation and forming work for the foundation of the Central Utility Plant, as well as the utility tunnel across the booster. The contract is 9% complete.

Fig. 1. The Injection Area (taken February 25). The West Gallery of the Booster is to the left, the East Gallery to the right. The Central Utility Plant is in the foreground. The Cross Gallery and Linac Building are beyond the Booster.

d. Main Accelerator. The cover photograph shows tunnel sections in place in the excavation. Phase I, the first superperiod, is 29% complete. Work is beginning on Phase II, the remaining five-sixths of the structure.

It is indeed stirring for one in the Laboratory to see the main ring taking shape on the land. Even though I see the construction site almost every day, I am always struck with awe at the sheer size of the ring.

e. Industrial Buildings. The first building, the one we are moving forward in schedule, is almost closed in. (The end away from the photograph of Fig. 2 is still open to the breezes.) The contract as a whole is 38% complete.

In our other major construction contracts, the master substation is 24% complete and the ring road is 90% complete. In fact, the ring is being used for the move of a farmhouse from the southern edge of the site to near the village, where we will use it as working space for the summer study.

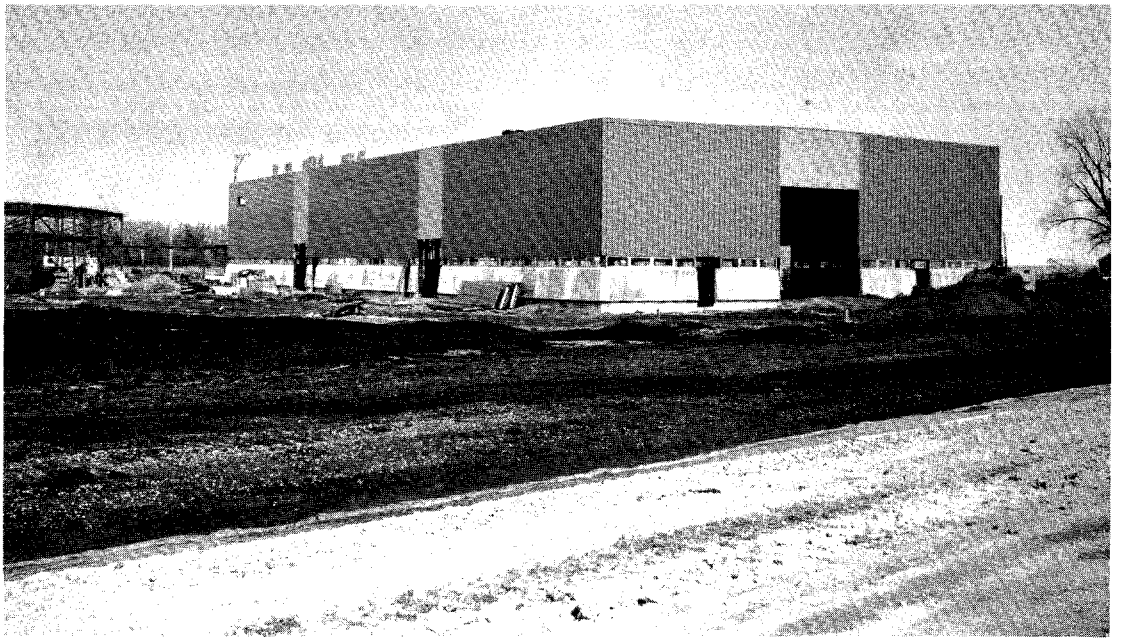

Fig. 2. The Industrial Buildings. To the left is the completed steel frame of the second building.

Linac

Installation of the high-voltage power supply of the preaccelerator and of the rf system for the first tank has been completed and these systems are now being tested.

Realignment of the drift tubes in the first tank, following the move to the permanent building, is almost complete. One can see from Fig. 3 how laborious this work is. Other installation work in the permanent building is proceeding apace; the linac equipment gallery is beginning to look full. Some rescheduling is being made necessary by delays in the delivery of the filament power supplies.

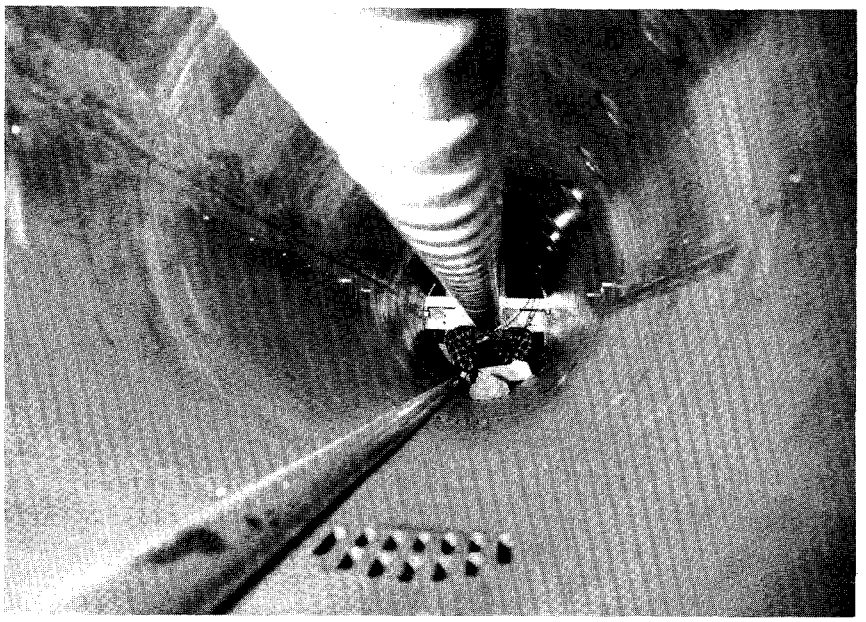

Fig. 3. Drift-tube alignment work in progress. Don Tokarz of the Linac Section is working inside the tank.

Meanwhile, back at the village, tank 2A, the first of three sections that will be welded together to form tank 2, has been delivered. It is shown in Fig. 4. Mechanical preparation is now under way. Tank sections will now be arriving at approximately two-week intervals.

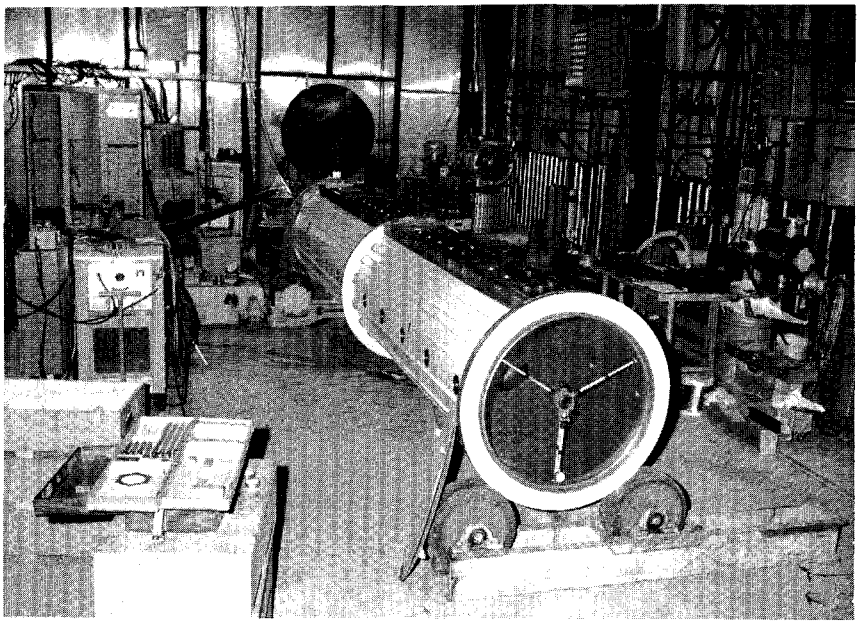

Fig. 4. Tank 2A in the linac building in the village.

Booster

The first booster module was installed in the booster tunnel on February 26. A module consists of an F and a D magnet and associated energy-storage and vacuum equipment mounted on a girder. The assembly is approximately 20 feet long and weighs 16 tons. Figure 5 shows this work in progress. The module was rigged down through the Cross Gallery hatch because the permanent lifting equipment is not yet ready.

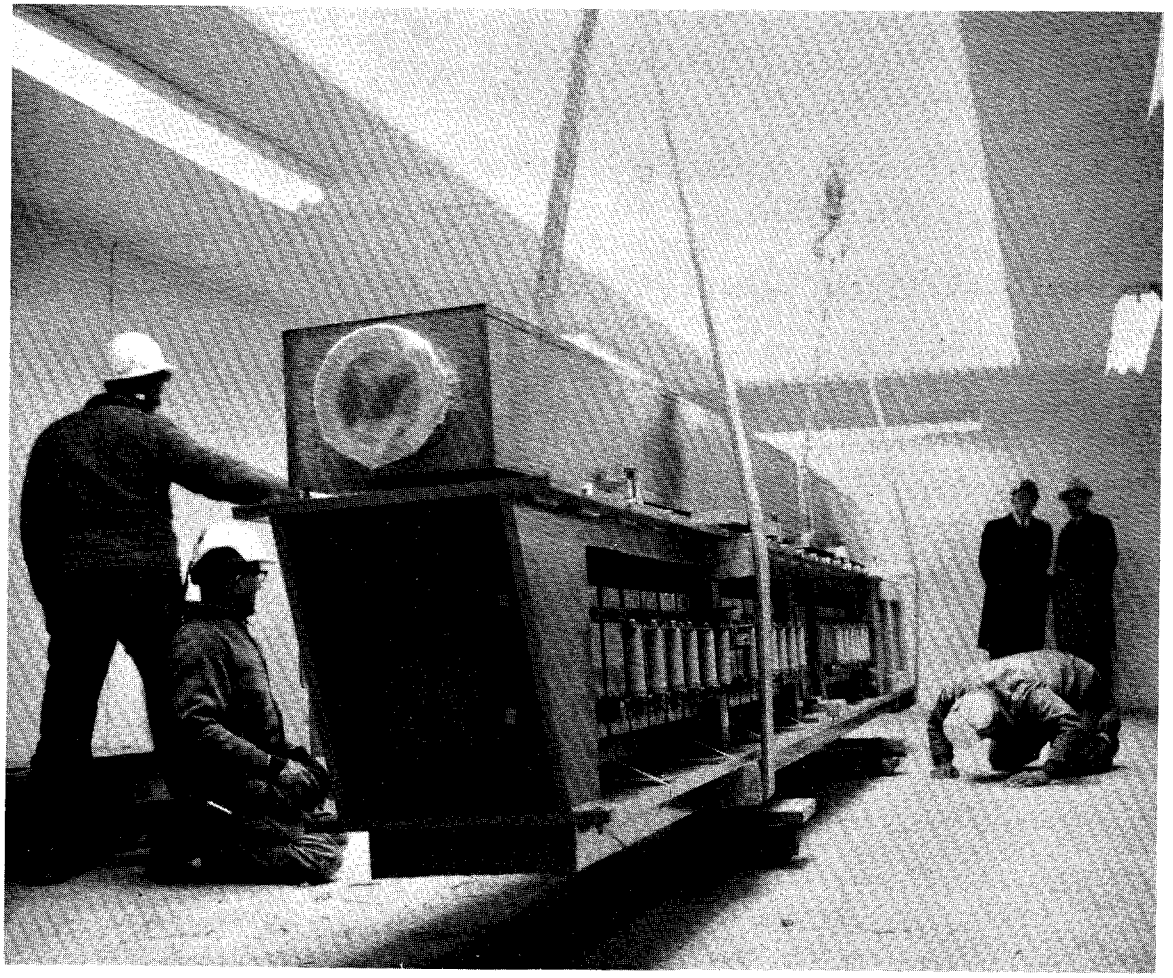

Fig. 5. Riggers setting down the first booster module at the major booster entrance. The hatch from the upper level of the Cross Gallery is above. In the background are Andrew Mravca of AEC and Bradley Bennett of URA.

Altogether, six booster magnets have been completed. The energy-storage chokes and capacitors and magnet power supplies are being delivered on schedule.

Main Accelerator

Four B2 magnets have been installed in the main-ring prototype tunnel in the village. Figure 6 is a photograph from one end of the prototype tunnel.

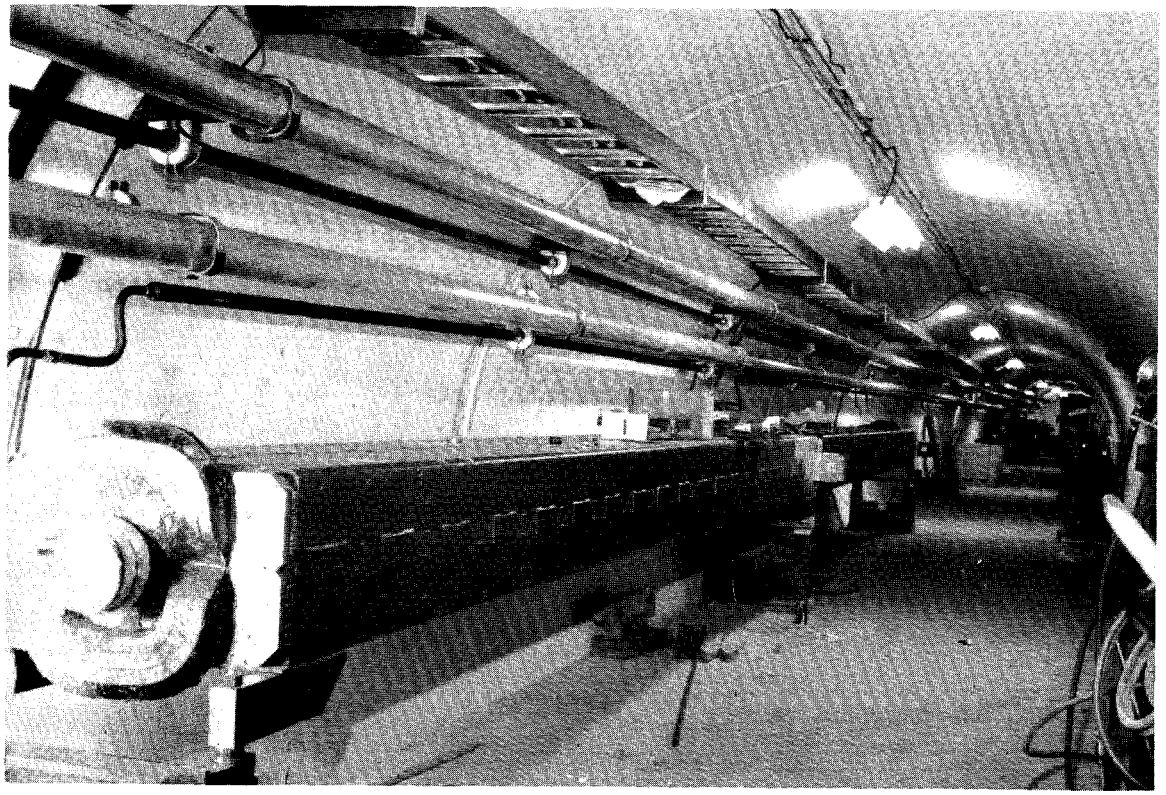

Fig. 6. The prototype tunnel with two B2 magnets in the foreground.

Figure 7 shows the magnet-handling vehicle now completed and used in the installation. Components are also being installed in the prototype service building next to the tunnel and Fig. 8 shows the equipment layout.

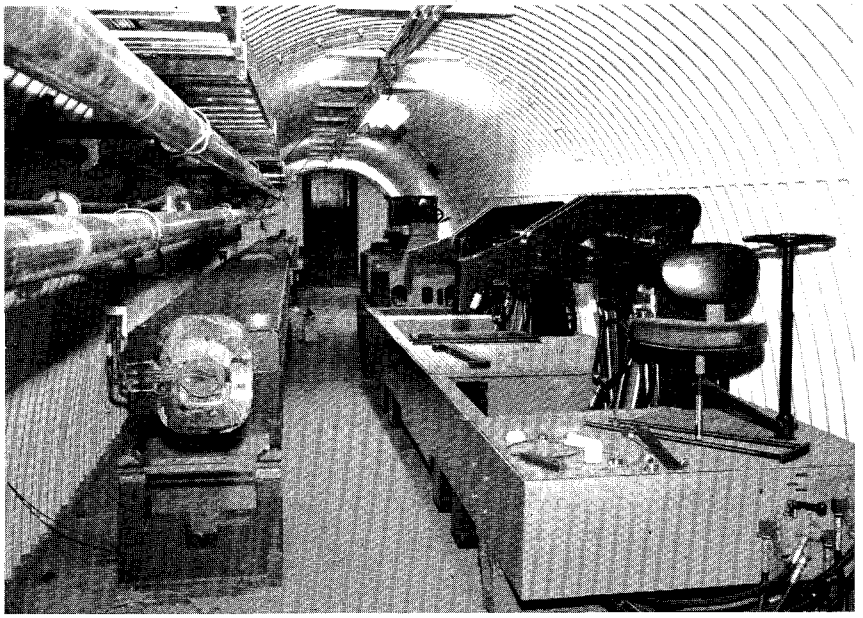

Fig. 7. The magnet-handling vehicle. Its prime mover is beyond it in the photograph. This part of the prototype tunnel was built of corrugated steel as a test of that material.

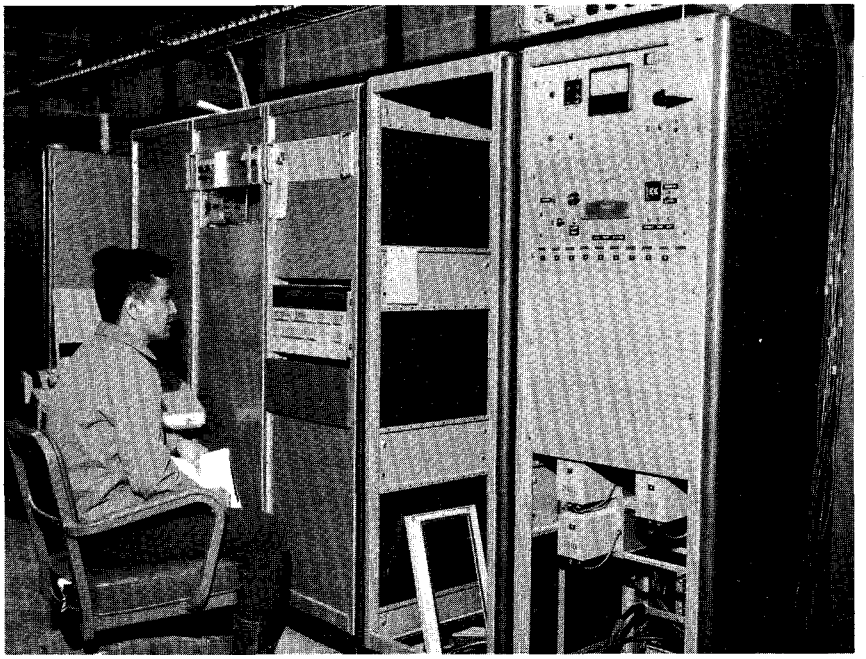

Fig. 8. Hsi Feng of the Main-Ring Section in contemplation of the control computer installed in the prototype service building. The rack to the right contains local controls for the magnet power supply.

In addition, a B1 magnet and a quadrupole have been assembled and are being tested. More quadrupole cores have been completed and are awaiting coils from the fabricators. Figure 9 shows a coil being wound at the coil factory in West Chicago.

Fig. 9. Joel Misek and Erich Laukant of the Main-Ring Section working at the coil-winding table at the West Chicago facility.

It appears that the Main-Accelerator section will meet their milestone date, that is, they will bring the prototype into operation on March 20.

Radio Frequency

The rf system installed in the prototype booster operated for a total of 260 hours, providing a great amount of useful data. It has now been taken back to the rf laboratory for further testing.

Fabrication has begun on the booster cavities; the first four copper castings have been produced. There have been some schedule difficulties with production of the ceramic insulators for the cavities, but it is hoped that these have now been solved through discussions with the fabricator.

Beam Transfer

A prototype of the four fast-kicker magnets for the 8-GeV transfer has been fabricated and vacuum-encapsulated. Figure 10 is a photograph of this kicker, with the end ferrite ring visible.

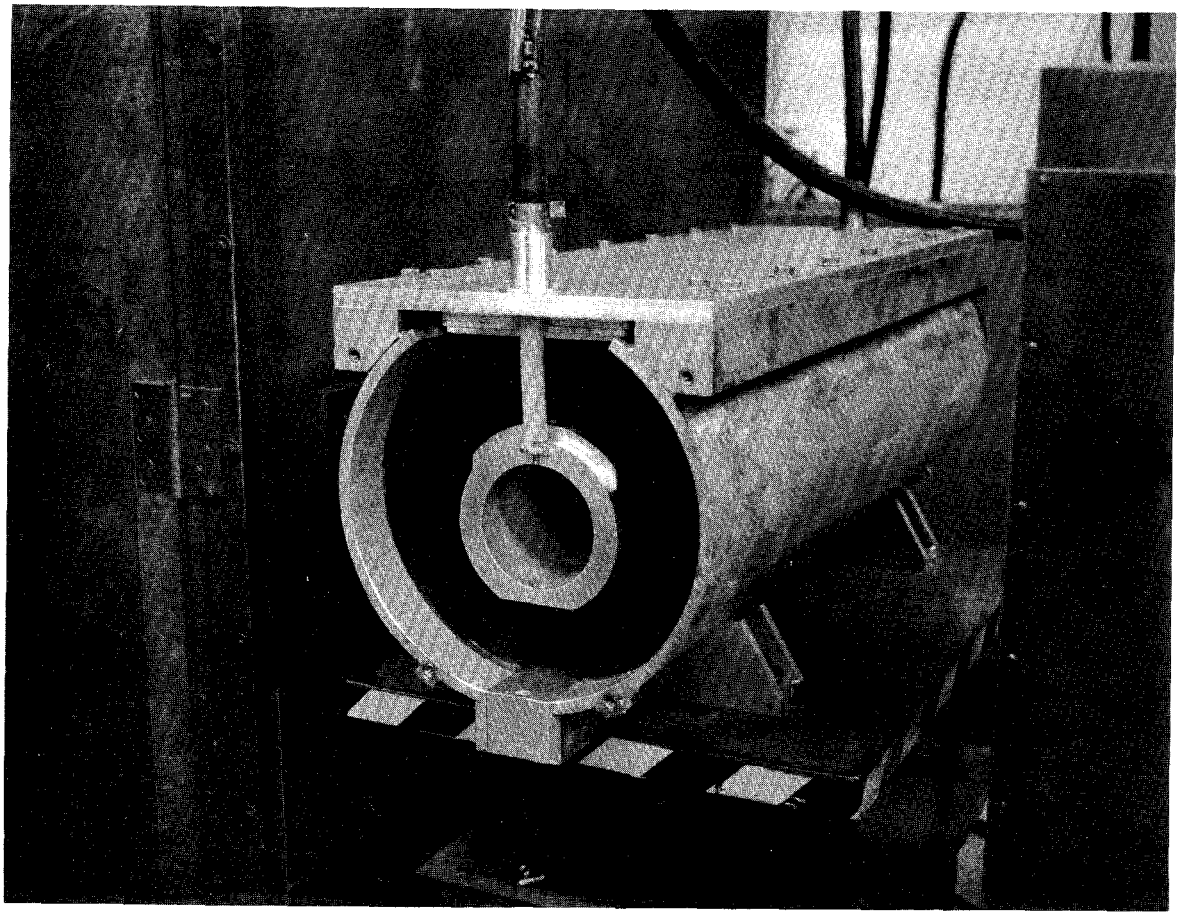

Fig. 10. A fast-kicker magnet for the 8-GeV transfer. The beam aperture is the square opening below the inner conductor.

Two servo-manipulators have been loaned to us by the Argonne National Laboratory to be used in studies of remote-handling assembly and disassembly of target equipment. Figure 11 shows one of them. Two manipulators are being fabricated for us and will be delivered in about a year.

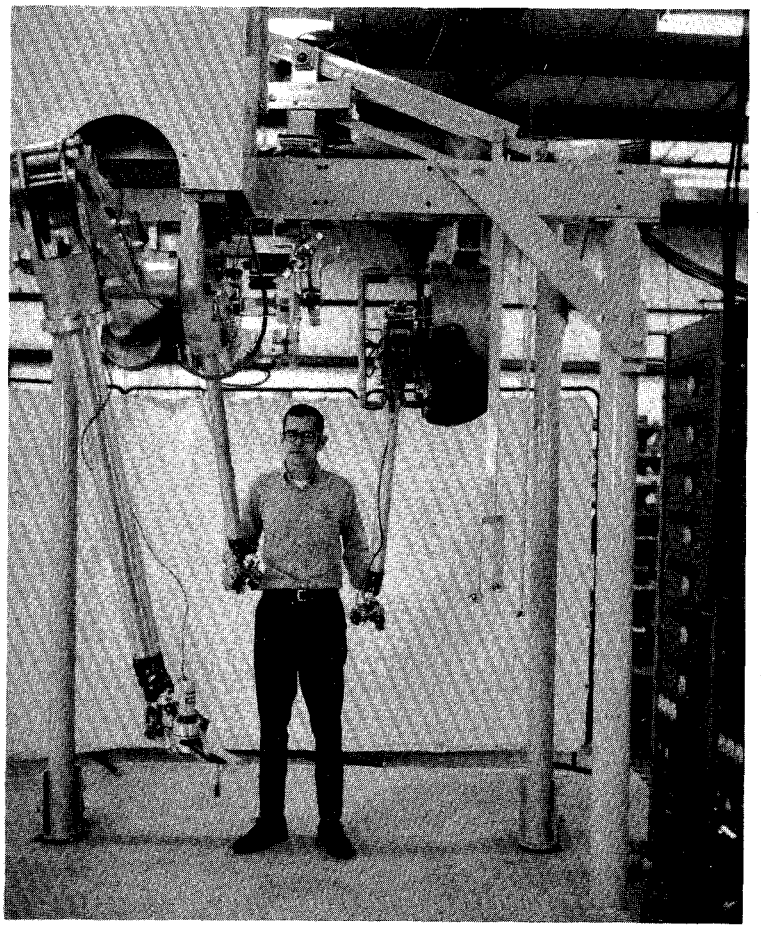

Fig. 11. Ken Bourkland of the Beam-Transfer Section with a servo-manipulator.

Work is also being done on a prototype target vacuum box shown in Fig. 12; it is constructed of 2-inch steel plate and is approximately 20 feet long. It will be used to test remotely adjustable equipment supports and to study remote operations with the manipulators.

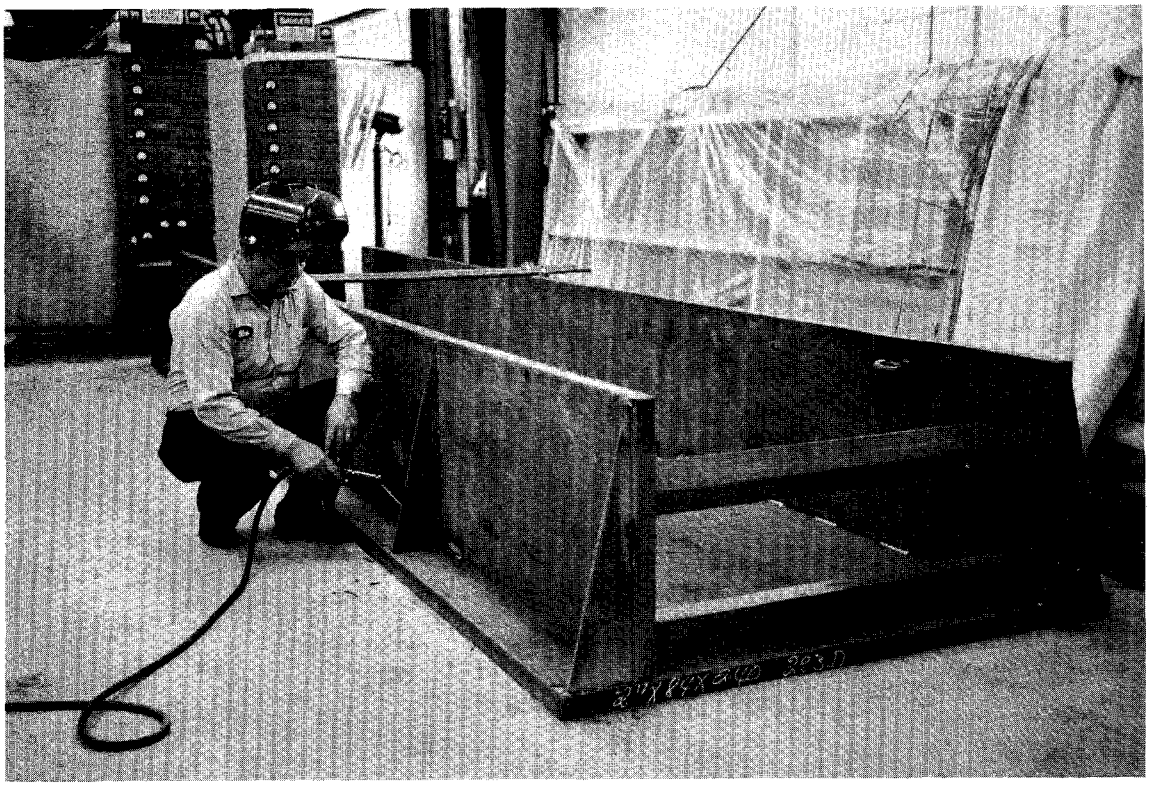

Fig. 12. Glenn Smith of the Machine Shop welding the prototype target vacuum box.

Experimental Facilities

Detailed design has been started on the upstream half of Experimental Area 2. This half includes the proton beam, target area, target laboratory, and the first 200 feet of the secondary-beam enclosures. This work will be pushed to get construction started as soon as possible, hopefully early in fiscal-year 1971.

Experimental Area 1 will be the subject of the March 13 workshop announced earlier in this report. The principal feature of this area will be a high-energy neutrino beam. In addition, plans are being developed for a

high-energy muon beam and for an rf-separated beam for both bubble-chamber and counter experiments.