Preface

During the continuing program of beam-foil research at the Berkeley Hilac, the need arose for a device to allow rapid insertion of the targets into the beam line. A target, being extremely fragile ($10 \mu\text{g}/\text{cm}^2$), requires protection not only from mechanical damage but also from potential damage due to gas dynamics. A fully mechanical insertion device was desired that would, with high precision and smooth action, mate the target to a turntable mounted on a precision-driven rider in a vacuum exceeding 10^{-6} Torr.

The device and its application, shown in the accompanying photographs, has been developed and tested, and satisfies all these requirements. An especially valuable feature is the protective cover that slips over the target during manipulation. The entire device appears to be reliable and convenient, and usable for many years.

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NOTICE

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TARGET HANDLING DEVICE FOR
TIME-OF-FLIGHT APPARATUS*

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ABSTRACT

A mechanical device is described for holding and inserting a target foil and its protective cover into the beam line of a linear accelerator. The method of operation is graphically demonstrated.

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Fig. 1. Target-foil holder is a rectangular tantalum plate $22.23 \times 28.65 \times 1.55$ mm ($0.875 \times 1.128 \times 0.061$ inches) with a central hole over which a target foil is placed. The holder is clamped into a slot of a special aluminum block.

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Fig. 2. The target holder is inserted between two $1/4$ -in. diameter rods, which are part of the piston assembly. The target cover is in a raised position to show insertion of the target holder.

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Fig. 3. The slots in the target-holder block are lined up with the two pins in the shafts.

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Fig. 4. Rotation of the shaft engages the pins in the slots.

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Fig. 5. The pins are engaged.

Fig. 6. A schematic drawing of the complete assembly.

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Fig. 7. Target is now firmly held in piston-rod assembly.

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Fig. 8. The aluminum shroud is lowered over the target to protect it against air currents.

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Fig. 9. Complete piston assembly is now ready for insertion in outer vacuum chamber open to the atmosphere, which is attached to a vacuum tank (simulated in plastic). The piston assembly must be properly aligned with the key in the outer vacuum chamber, as shown in the next photo. The valve to the inner chamber is closed.

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Fig. 10. The inside of the outer chamber with valve closed.

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Fig. 11. The piston is lowered into the chamber.

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Fig. 12. The target is lowered to the closed vacuum valve and the top cap is lowered onto the top of the outer chamber.

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Fig. 13. O-ring-equipped flanges are now bolted together and the outer chamber is ready to be evacuated.

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Fig. 14. After evacuation, the valve is opened.

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Fig. 15. A view through the open valve showing the piston key and alignment with target seat. The key continues below the valve to control piston shaft rotation.

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Fig. 16. The target can now be lowered into the main vacuum chamber,

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Fig. 17. --and inserted into target seat in small turntable.

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Fig. 18. The target is in position and ready for release.

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Fig. 19. Manual 180° rotation of outside handle disengages pins from the target block.

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Fig. 20. The shroud and shafts can now be withdrawn into outer chamber.

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Fig. 21. Valve can be closed isolating main vacuum chamber, and leaving target in position for exposure to the beam.

To withdraw the target, this entire procedure is followed in reverse sequence.