5/sec. Technically, the lower limit depended on velocity.

For 10 groups of three animals each, high initial activity lasted 15-20 min (decreasing from 500 to 300 counts per 10 min), following which it stabilized at a lower level for at least 20 min. Activity pattern was not significantly altered by a previous injection of saline, 0.9% 10 ml/kg, or by illumination during the first 20 min. Diurnal activity rhythm was not reflected in measured activity. D-amphetamine bitartrate (5 mg/kg) was injected I.P. to 15 mice in groups of 3. Motor activity registered at about 1,000 counts per 10 min for the first 10 min, declined to 700 counts at 80 min, then stayed fairly stable at 650-700 counts per 10-min period for the next 80 min. Control animals injected with saline registered a fairly steady 550-600 counts per 10 min over the 160-min session.

The initial effect of reserpine (2 mg/kg) was to drop activity from 450 counts per 10 min to zero over 160 min; blespharospasm developed 10-15 min after injection. After 20-30 h, activity increased and, at 40-50 h, moved up to near normal. Saline-injected mice registered approximately 550-600 counts per 10 min throughout.

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unusual durability. Part of the system they describe includes a commercially available solenoid valve. Commercial valves are commonly quite expensive owing to their design specifications, which cover wide ranges of inlet pressures, fluid viscosities, and outlet port controls. In short, these valves often exceed the requirements of a low-pressure liquid-reward presentation system.

Figure 1 illustrates a valve that combines economy with both ease of construction and maintenance. The small amount of brass roundstock needed machines easily and provides ample durability. The materials and dimensions were chosen for a minimum of machining (the model illustrated required about 3 h work). Simplicity of the valve ports enables the use of the whole range of commonly used liquid rewards. Furthermore, since the low inlet pressure is opposed by the piston spring, positive sealing is ensured. The only conceivable maintenance required would involve cleaning the piston. This is easily accomplished by removing two nuts on the solenoid mounting bars (upper portion of figure). The valve in Fig. 1 is activated by an IMC SD770-2 24-V dc solenoid; however, any solenoid having a linear travel of between 1/16 and 1/4 in. will suffice.

The piston itself is 3/8-in. brass roundstock, lightly machined to slide fit the 5/16-in. center hole. The port end is turned down to 3/16 in. and tapered to a 90-deg cone. After the 1/8-in. inlet and

outlet ports have been drilled, the barrel is held in the headstock of the lathe and the piston is pushed gently against the inlet port with the tailstock. The rotation of the inlet port against the motionless 90-deg cone of the piston produces a small lip providing a good seal for the valve port. The other end of the piston is drilled and tapped to receive a headless 6-32 screw that connects the valve piston to the armature of the solenoid.

Into the inlet and outlet ports are soldered flared pieces of thin-walled brass tubing onto which are fitted lengths of polyethylene hose. An optional outlet port adjustment is provided by a 6-32 screw shown at the bottom of the figure.

Connecting the valve to the solenoid may be accomplished in a variety of ways. In the authors' model, two pieces of 1/8-in. bronze welding rod provided the mounting bars. These were threaded on one end to receive 6-32 nuts. The other ends were bent to 90-deg angles and soldered into holes drilled in the barrel of the valve. 8-32 spacer nuts were soldered to the rods and barrel near the top of the valve.

Prior to assembly, the valve piston is lightly lubricated with an inert stop-cock grease.

REFERENCE

POLIDORA, V. J., & MEYER, P. M. Simple devices for liquid reward delivery. *Journal of the Experimental Analysis of Behavior*, 1961, 4, 382.

Notes

A simple valve for liquid reward systems

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Gravity-fed liquid delivery fountains such as described by Polidora and Meyer (1961) have several advantages in liquid reward presentation. Among these are control over a wide range of possible amounts presented, simplicity, and

Fig. 1. A cross-sectional drawing of the valves' major construction details. The centrally located piston is shown connected to the solenoid piston in the upper part of the figure. Liquid enters the inlet port at the bottom and emerges from the outlet port at the left-hand side. The outlet port adjustment screw is shown in the lower left-hand corner of the figure.