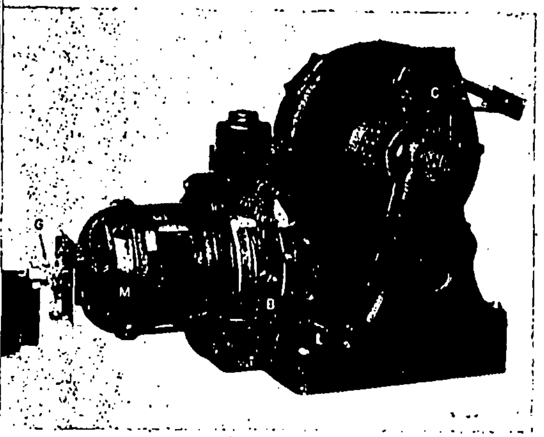
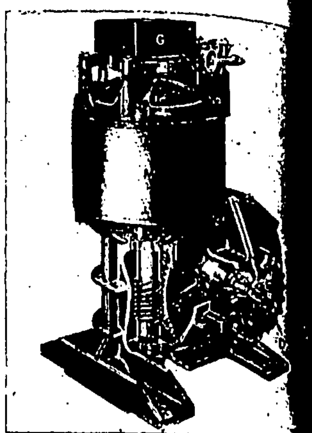
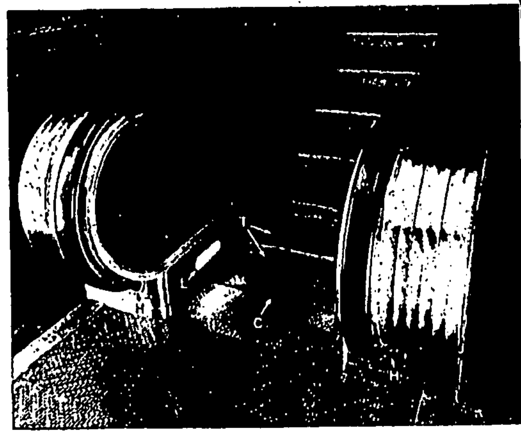


8 Stairway powers unit, has a squirrel-cage motor M and brake B supported from lower half of worm-and-gear housing, a rugged one-piece casting



9 Power unit similar to Fig. 8 but of vertical assembly for driving small moving stairways

10 Old-type smooth-tread-step moving stairways required a shunt S at the landings to guide the passengers on and off



11 On modern stairways, comb teeth fit closely between step cleats to form practically smooth surface at the landings

Moving-Stairway Story Continues With Brakes, Drives, Safety, Capacity and Speed

are shown in Fig. 6 for one type of power end. In this unit the power 2-strand roller chain runs on sprockets P and the handrail drive roller chains run on sprockets H, one for each rail. Sprocket G drives the speed governor. A magnetic brake between sprockets P and D stops the stairway when power is shut off.

In Fig. 6, sprockets are fixed on the axle and all revolve as a unit, whereas in Fig. 1 the axle is stationary and the step-chain sprockets revolve on it on roller bearings, Fig. 7. Chain-step sprockets D are rigidly connected together by a cast-steel spider or barrel housing BH, to which they are bolted to prevent misalignment. In Fig. 6, handrails are driven by sprockets H at each end of the main drive shaft, but in Fig. 7 these sprockets are on the barrel housing between the step-chain sprockets.

Stairway Brakes. On the driving machine, Fig. 7, two pawl-applied separately-operated brakes are side by side on the right-hand step-chain sprocket. These have two pawl rings, B and B_1, faced with friction material F and held between plates O by tension springs S. As long as stairway operates normally, two magnets hold the pawls released from rings B and B_1, so the whole brake rotates with the drive-chain sprockets.

When power is cut off by opening a stop or safety switch, one magnet releases its pawl into one of the pawl rings. This stops the ring which slows down the stairway because of the braking action, but the other ring continues to rotate with the drive shaft. A few seconds later the second magnet releases its pawl, which applies the second brake to bring the stairway to a smooth stop. In this system both brakes operate each time the stairway stops, generally at least once a day.

Drives. Moving stairways are driven at constant speed by a power unit that consists of a constant-speed motor and some form of speed reducer. In Fig. 1, the power unit has a single-speed squirrel-cage motor M, a service brake B, a speed governor G and a worm gear, similar to a worm-gear elevator machine. This machine is also built without a service brake. On it the brake on the step-chain sprocket acts for both service and emergency stops.

Other stairways are driven by a closely assembled motor, worm gear and brake of either horizontal or vertical construction, Fig. 8 and 9. Unit in Fig. 8 has a squirrel-cage motor M, and a brake B supported from the lower half of the worm-gear housing, a rugged one-piece casting to give rigid support to the whole machine. An overspeed and underspeed governor G is driven directly from the motor-shaft end. A broken drive-chain switch is at C.

Vertical Drives. Power unit in Fig. 9 is like Fig. 8, but is a vertical assembly for driving smaller stairways. It is designed for installation in top end of truss to save space and reduce building framing. A heavy single-strand roller chain connects the drive sprockets D on the machine to that on the step-chain drive shaft. A recent development has a vertical squirrel-cage motor on a worm gear, whose gear shaft connects by helical gears to stairway drive shaft.

Safety. These stairways are the safest means of transportation even though they are subjected to all the pranks that human ingenuity, curiosity and carelessness can devise. They are made safe for even the most careless riders. This is because safety has been designed into every part of the equipment. Beginning with the steps, they have narrow groove treads of wear-resistant aluminum alloy that form a stable platform, comfortable to stand on. Space between the cleats on the steps is so narrow that soft soles or narrow high heels cannot sink between them. Close clearances prevent dragging of galoshes or boots between the treads and skirt risers. Solid step risers and close clearances prevent accidents as step formation changes.

On old type flat-step moving stairways with smooth tread steps, a shunt S, Fig. 10, was required at the landing to guide passengers on and off the steps. At the landing end of modern stairways the steps come out from under a comb plate, as at C, Fig. 11. The comb teeth fit with close clearance between the step-cleat treads to form practically a smooth surface.

Distinct safety features are the ample level spaces formed at the landings by the 2-step tread T, nearest the comb plate. When in this level position the two adjacent treads fit so closely together that there is no space or groove in which to snag a heel or catch the point of an umbrella.

Extended Newels. Getting passengers on and off a stairway is one of the most important problems in its safe operation. Semi-circular newels, Fig. 11, at both landings contribute much to solving this problem. In Fig. 11 the newels and balustrade extend for some distance before the steps start to rise. For part of this distance the steps are under the floor and comb plates, then come out and run flat for two tread widths before they start to rise. In this distance, passengers can grasp the moving handrails before reaching the steps, and retain their grip until after they leave them. This assists them to enter and leave the stairs smoothly and without hesitating, which practically eliminates the stumbling hazard on the steps.

Just above the comb plate at each terminal, a light L in the sides of the balustrades, Fig. 11, illuminates the landing plate and comb for added safety when getting on and off. Besides, the stairway is well illuminated for its full length. In addition to the features that make it safe to ride on a moving stairway, other safety devices stop it if it is not in good operating condition.

Capacity. For handling large crowds, stairways have many advantages, the first being their large capacity. A single stairway 4-ft wide, operating at 90-ft per min handles up to 8000 passengers per hour, whereas a large low-rise elevator serves only about 500. A stairway handles as many passengers on a 70-ft rise as on 12 ft. Height of rise is a limiting factor in the number of passengers that an elevator can handle.

Moving stairways are not limited to handling large crowds. Frequently they are installed for inter-office service, where one company occupies more than one floor. Moreover, when they connect the ground and second floors of an office building, the second is almost as desirable for renting as the first floor. In department stores they increase sales volume on all off-street floors by making them easily accessible and reducing customer fatigue by eliminating waiting and crowding. These and many other factors have made moving stairways as popular as elevators for low- and medium-rise service in many types of buildings.

Stairways in Series. Even though moving stairways are limited, in the height of a single rise for which they can be built, to about 80 ft, they can be operated in series so that they will serve several floors.

This practice is often used in large department stores. This type of operation requires a transfer at each floor. This is not a serious objection in a store, because a large part of the traffic is from floor to floor.

Stairways can be operated (1) ascending (2) descending (3) or in both directions. To accommodate traffic peaks they may ascend for part of the day, and descend for the rest of the time.

Higher Rises. To adapt moving stairways to higher buildings a system combining express and local stairways was proposed by G B Gusrae in April 1952, *Architectural Record*. In a 10-story building the express units would serve 1st, 4th, 7th and 10th floors.

Thus a passenger could go from the 1st floor to the 10th floor and transfer only twice, compared to eight times on the locals. Travel time on the express is 2 minutes, 31 seconds, on the local 3 minutes, 19 seconds. To go from the 1st to the 6th floor, a passenger would express to 4th, take local to 6th, requiring two transfers and 2 minutes, 47 seconds to make the trip.

Mr. Gusrae arrived at the conclusion in his article that besides lower daily operating cost with moving stairways, they do not require penthouses, pits, complicated controls. They also need less floor space than elevators of comparable capacity, and they cost less.