

Coin-Operated Amusement

AN HISTORICAL AND TECHNOLOGICAL SURVEY



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Coin-Operated Amusement

COIN-OPERATED AMUSEMENT includes every type of machine which (a) is activated primarily¹ by a coin and (b) is patronized by the public as a mode of the non-productive but psychologically beneficial human activity known as play.

Coin-Operated Amusement, therefore, includes, not only the popular pinball game² and such arcade³ equipment as target-shooting games, but also the coin-operated game of chance commonly called the slot-machine⁴. For, although slot-machine players desire to win, their basic motive is to experience the pleasure of anticipation and the intensified pleasure of fulfillment by periodic wins, large or small.

Indeed, the history of modern Coin-Operated Amusement begins with the invention of the slot-machine in 1895⁵ by Charles Fey of San Francisco, California (USA).

Slot-Machine Mythology

Nearly a century after the appearance of the early Fey slot-machine, two persistent myths continue to prejudice appraisal of the machine as a form of amusement: first, that the percentage of intake which may be won by players is readily adjustable, up or down, by the owners of machines, merely by turning a concealed screw; second, that slot-machines are engineered to favor the owners of machines, as against the players.

Expert Refutes Myth

Commenting on the first myth, John Scarne, author of *Scarne's Complete Guide to Gambling* and a candid

critic of sharp gambling practices, states that instant adjustability of slot-machines "is simply not true; the mechanism of a slot-machine is quite complicated, and the pay-back odds cannot be changed unless the reel symbols are repositioned and the payoff slots adjusted to coincide with the changed combinations on the reels."

1. Certain machines, primarily activated by a coin, may be activated by the replay mechanism described on page 12, 25 and 33. Some slot machines may be activated by the distinctive metallic tokens with which the machines pay awards, as described on page 12.

2. See page 20.

3. See page 36.

4. The slot-machine is essentially a cabinet, housing 3 or more narrow cylindrical drums, commonly called reels, which are marked with symbols. Vertically disposed on a common axis, the reels are caused to revolve freely, when player activates machine and pulls a lever-like handle affixed in the side of the cabinet. Awards, which are paid automatically, are based on the horizontal alignment of symbols, when the spinning reels come to a position of inertial rest.

5. Coin-operated games of chance, based on dice or roulette, were used in the United States 10 years prior to Fey's slot-machine. However, the early machines never attained the popularity of the slot-machine, as defined in note 4.

Similarly, as early as 1889, Herbert S. Mills, pioneer promoter of the slot-machine, manufactured coin-operated arcade equipment, such as picture-viewing and fortune-telling machines. Operated exclusively in so-called penny arcades and out of the mainstream of Coin-Operated Amusement, Mills' early arcade equipment need not be considered in a survey of Coin-Operated Amusement and should not be confused with the arcade equipment described on page 36.

The history of modern Coin-Operated Amusement, therefore, properly begins in 1895.

The second slot-machine myth derives from the fact that early machines paid 50 percent of income to players, while some slot-machine owners tampered with their equipment to prevent occurrence of the highest paying alignment of reel symbols.

However, modern slot-machines are designed to be practically 100 percent tamper-proof, either by owners or players. And, as unauthorized operation of slot-machines declined to the present status in which machines are largely confined to licensing jurisdictions—and owned by prudent businessmen, catering to a sophisticated clientele—the payout percentages have steadily risen.

Today very few slot-machines are designed to pay out less than 78 percent of income. The average payout in leading licensed gaming areas is in the range of 85 percent. And numerous slot-machines

pay as high as 95 percent to the aggregate¹ players. As one successful casino owner declares, "You've got to send out winners to get players."

Slot-Machine Profits

Obviously, if a slot-machine player resolves to play 100 coins in a machine designed to return to players 90 percent of coins received, he may eventually play the entire 100 coins without his original fund being replenished from the machine. For 90 percent of 100 coins is 90 coins, 90 percent of 90 coins is 81 coins; and, as the player's available stake is diminished, the return in awards would diminish. However—sustained by periodic wins, large or small—a player would normally play during a considerable period of time before exhausting his original fund of 100 coins.

Slot-machine critics assert that the player has "lost" 100 coins. With less violence to language in the context of a free exchange, one may say that the player "spent" 100 coins for amusement. And in his predicament of having parted with the fund he resolved to play he is on equal terms with a person who resolves to spend a sum of money to hear a musical recital or witness a boxing contest: at the end of either performance, the patron is not refunded the price of admission. He knows that the impresario must pay rent and wages and realize a return on his investment. So must the impresario of slot-machine amusement.

Certainly, money expended for the purpose of slot-machine amusement is not lost to the economy of a community or nation. Coins deposited in slot-machines pass from one owner to another, as in all exchanges. And an axiom of economics is that no type of exchange which fails to yield mutual satisfaction can permanently endure.

Substantial as the earnings of slot-machines are—and they are massive²—one may be sure that the portion which is not immediately returned to the economy of a community or nation in wages and taxes is quite promptly returned to the economy in purchases and investments. A major portion of slot-machine profits may, indeed, enter into the capital formation which is the lifeblood of economic growth in every community and in all nations³.



First slot-machine in which mechanical play action was combined with electrical pay techniques was Bally **MONEY HONEY**, illustrated. Introduced in 1963, **MONEY HONEY** remains a world wide favorite.

MONEY HONEY is a representative standard slot-machine, which is a 3-reel, single coin machine, wins usually being based on horizontal alignment of symbols across a central win-line. Exceptions to the center-line rule are described in note 1, page 8.

Standard slot-machines are built in a wide range of styles, including **DEUCE WILD**, described on page 8, **FORTY-NINER**, **STAR SPECIAL**, **TIC-TAC-TOE**. Standard slot-machines may also be manufactured to specifications of casinos and clubs.

1. Each individual player is not assured of winning back 95 percent of the coins he deposits in a 95 percent machine. He may win more—as when, after playing a dozen coins, he walks away with a 200-coin jackpot—or he may win less. However, the total amount won by all the players patronizing the same machine, during a period of time, will be approximately 95 percent of the total amount deposited by players during the period. See *Mathematics of Slot-Machines*, page 14.

2. For example, \$180,510,866 in the State of Nevada (U.S.A.), during the fiscal year of 1969-1970.

3. See *Social and Economic Benefits of Slot-Machines*, page 17.

The Slot-Machine

CHARLES FEY WAS CONTENT to build only enough of his priceless invention, the slot-machine, to supply his personal enterprise—rental of machines to San Francisco establishments on a share-profit basis. The Fey slot-machine, therefore, was never exploited beyond the State of California.

However, a similar machine, produced in 1907 by Herbert S. Mills of Chicago, Illinois (USA), was vigorously promoted nationally and internationally.

Bankers Bought Slot-Machines.

Tradition tells that, when Mills sought a means to market his machine—a novelty unrelated to existing articles of commerce—he enlisted the cooperation of bankers, perhaps reasoning that bankers are trained

to handle cash with care. He shipped his early slot-machines on consignment to bankers in towns of medium size in every section of the United States. His only instruction was to place the machines in establishments frequented by the public, for he was confident that people would be attracted to a simple, convenient, low-priced form of amusement. He requested that a portion of the earnings be remitted to him until a stipulated price was paid. Thereafter, the machines were the property of the bankers.

The quick success of the slot-machine suggests, first, that bankers were prompt to heed Mills' advice and, second, that they faithfully paid for machines delivered in trust—and, evidently, continued to buy machines. By 1910 slot-machines—many built by competitors which Mills rapidly acquired—were in operation in most major cities of the United States, as well as in countless smaller towns, villages and rural areas¹.

Although bankers were probably the earliest professional owners of slot-machines, they were soon joined by aggressive competitors who, observing the action which surrounded a slot-machine located in a bar, billiard parlor, restaurant or hotel lobby, shrewdly perceived the financial opportunity offered by the new amusement device, hastened to Chicago—center of a booming slot-machine industry—to acquire all the slot-machines their capital or credit might manage.

A vast new class of energetic entrepreneurs suddenly appeared on the stage of commercial life—slot-machine operators². They were destined to play a role in the later popularization of other types of Coin-Operated Amusement.

Slot-Machine Improvements

Although Mills adopted the Fey principles of (a) 3 revolving, symbol-bedecked reels, (b) the manually operated handle to spin the reels and (c) automatic payment of awards in coins, he introduced two significant improvements in slot-machine design.

1. Owners and players of slot-machines, as well as all who scrutinized the colorful, ingenious device, probably recognized the slot-machine as a game of chance, subject to anti-gambling statutes. But in the early decades of the twentieth century the slot-machine was often considered a trivial toy beneath the notice of the guardians of public safety.

2. The term "operator" designates a businessman who buys coin-operated equipment and, while retaining title, installs the equipment in various establishments on a share-the-profit basis mutually agreeable to him and the proprietors of the establishments, which are called "locations."

The function of an operator is to exercise experienced judgment in the selection of equipment, to maintain equipment in presentable and good working condition and to circulate equipment among the locations he serves to insure continuous novelty.



DOUBLE UP provides the play appeal and earning power of two machines in the space of a single slot-machine. Player may deposit one or two coins before pulling the handle. All payouts, including jackpots, are doubled when 2 coins are played.

DOUBLE UP is built in a wide variety of styles, including TRIPLE BAR, illustrated.

Each reel on the first Fey machines bore only 10 symbols. Thus, the possible combinations of symbols in horizontal alignment across the win-line was limited to 1,000 (10 x 10 x 10). Mills vastly increased the number by printing 20 symbols on each reel, producing 8,000 possible combinations (20 x 20 x 20). The 20-symbol, 20-stop system is in general use today¹.

The obvious advantage of a greater number of possible combinations of symbols on the win-line is that, by extending the mathematics of probability² to the widest feasible range, (a) an enriched array of wins may be advertised on a slot-machine to attract and hold the attention of players, (b) the frequency of wins may be considerably accelerated and (c) the value of wins, particularly jackpots, may be notably increased.

Mills further improved the old Fey design by enlarging the window in the front of the cabinet through which the reels are viewed. Only 3 symbols in horizontal alignment were visible in the first Fey machines. Mills permitted players to see, not only the horizontal row of symbols across a central win-line, but also the rows directly above and below the center-line, a total of 9 symbols being constantly visible in the window.



MULTIPLIER may be played with a single coin. Or a player may deposit up to 5 coins before pulling the handle. Wins are multiplied by coins played.

MULTIPLIER model illustrated is based on the popular MONEY HONEY, shown on page 2. However, MULTIPLIER models are built in a variety of styles.

The original purpose of the expanded symbol visibility was to allow players to visualize the rich win potential. A non-winning alignment of symbols on the central win-line might often be bracketed between winning alignments above and below the central win-line, teasing players to continued play. In the course of time, the visibility of triple rows of symbols prompted development of interesting departures from the basic style of a single central win-line.

Invention of the Jackpot

The first outstanding advance in slot-machine design, after the Mills contributions already described, was the jackpot³ with which Mills—hastily followed by his competitors—embellished his machines in 1925.

The original jackpot—now referred to as the drop jackpot, as distinguished from the guaranteed jackpots of today—was a metal container attached to a slot-machine, the front of the container being transparent to display the coins contained.

The owner of a jackpot slot-machine partially loaded the container with coins, then set the coin-handling mechanism of the machine to divert into the jackpot a percentage of all coins played into the machine. Thus, the jackpot was gradually filled to capacity.

The traditional jackpot alignment of symbols was 3 Bars⁴, which also paid 20 coins. When 3 Bars appeared on the win-line at the end of a spin, the jackpot container automatically opened, dropping the contents into the payout-cup.

Weakness of Early Jackpots

Although the drop jackpot tremendously stimulated play, while the container sparkled with coins, the device was capable of stopping play on a machine. Players tended to avoid any machine which had recently delivered the jackpot.

A superstition of players is that, after a big win, a slot machine “slows down” and yields only small wins for a period of time⁵. An empty jackpot container or a container showing only a dribble of

1. Some casinos use a limited quantity of machines with 22 symbols on each reel (22 stops or positions at which each spinning reel can stop) and a lesser quantity of 25-symbol, 25-stop machines.

2. See *Mathematics of Slot-Machines*, page 14.

3. The term “Jackpot” is derived from the card game, Draw Poker, in which the jackpot is the pool into which players enter their bets.

4. Various other symbols are now favored as jackpot symbols, but the Bar continues in the jackpot class.

5. The superstition continues among some players. But the modern method of paying jackpots, as described on page 7, does not plainly inform newly arriving players that a machine recently delivered a jackpot. The superstition is, of course, without basis. No slot-machine is built to “remember” previous payouts.

coins was vivid evidence that the largest possible win had recently been paid. And players who did not subscribe to the slow-down theory recognized that 3 Bars would yield only 20 coins, plus the few coins, if any, in the jackpot container. The boycott of an obviously "hit" machine usually continued until the manager of the establishment could call the owner of the machine to refill the jackpot.

End of the Drop Jackpot

The problem of the empty jackpot container was solved by the addition to slot-machines of a second jackpot container, either on the face of machines or concealed within machines.

However, when the State of Nevada (USA) in 1931 legalized all modes of gambling other than lottery, state regulations prohibited the variable and indeterminable jackpots delivered by the drop jackpot device. A jackpot in the State of Nevada—as in other jurisdictions around the world which license slot-machines—must be of a specific value¹. The value of each jackpot must be conspicuously advertised on machines, and the advertised values must be guaranteed, i.e., must be paid in full, when won.

New Problems Arise

Although introducing a businesslike certainty to jackpot technique, the guaranteed jackpot resulted in problems which plagued licensed slot-machine owners for many years.

The coin-tubes from which slot-machines, prior to 1963, paid wins lacked capacity to deliver the increasingly big jackpots which technical ingenuity developed. When a player won a jackpot of 50, 100 or 200 coins, he was obliged to call an attendant, who, after verification of the jackpot, gave the player a ticket, certifying the amount won and redeemable in cash by a central cashier.

Aside from the lack of showmanship inherent in attendant-paid jackpots, as compared to the sight and sound of a cascade of coins, the ticket method of paying jackpots led to abuses estimated to cost slot-machine operators huge sums of money. The problem was not solved until the invention in 1963 of the Bottomless Payout Reserve.

1. Jackpot values may be expressed in the number of coins involved or in the currency value of the coins—or in tokens or replay credits, as described on page 12.



3-LINE-PAY may be played with a single coin, which qualifies only the basic central row of symbols as the win-line. Or, at his option, a player may deposit up to 3 coins before pulling the handle. When the second coin is deposited, both the central row and the visible row above the central row are qualified as win-lines. When 3 coins are deposited, all 3 visible rows—the central row and the rows above and below the central row—qualify as win-lines. Wins are not multiplied by the number of coins played, but the player can win on any lines qualified as win-lines. A strong inducement to 3-coin play is provided by the fact that the third line, qualified by the third coin, is the major jackpot line.

Another multiple-line slot-machine, **5-LINE-PAY**, appears on page 6.

The Bottomless Payout Reserve

THE FIRST TRULY NEW slot-machine since 1895 was introduced in 1963 and immediately won world wide fame and popularity among operators and players.

The new machine—the Bally Slot-Machine¹—not only preserves the slot-machine characteristics described in note 4, page 1, but also retains features of design which research indicates are indispensable to slot-machine success.

(A) The power which causes the reels to spin is 100 percent mechanical—essentially the mechanical

impact of spring-loaded reel-impellers, commonly called kickers, the springs being tensioned, then quickly and forcibly released, through a train of ratchets and gears activated by the player's forward and downward pull on a manually operated handle².

(B) The presence of ratchets is apparent to players through the "ratchet feel" familiar to players since the earliest days of slot-machines.

(C) The free, uncontrolled spin and random, positive stop of the reels are entirely mechanical.

(D) General dimensions and styling³—often called "slot-look" styling—immediately identify the machine as a slot-machine.

New Slot-Machine Concept

Beyond observance of slot-machine traditions, the Bally Slot-Machine is revolutionary in concept, design, engineering and construction, particularly in the use of electricity for invaluable purposes which do not alter the essentially mechanical action.

The introduction of electrical energy⁴ into slot-machine technology resulted in advantages which slot-machine operators were quick to recognize.

(A) Reels and the various display signs of the Bally Slot Machines are illuminated, enhancing, not only the eye-appeal of the machine, but also the visibility of win schedules and other directions to players; and concealed lamps cast a warm, wealthy glow on the deep, wide payout-bowl which in the Bally Slot-Machine replaces the small payout-cup of earlier machines.

(B) Illumination is extremely useful as a means to "personalize" a slot-machine by display of the name, trademark, slogan or other identification of a casino or club. Bally artists have produced several hundred individualized slot-machine display signs, ranging from simply a distinctive name-style to an elaborate picture in colors of an entire hotel.

1. Originated and manufactured by Bally Manufacturing Corporation, Chicago, Illinois (USA), established in 1931 and now the world's largest producer of all types of Coin-Operated Amusement.

2. Some specialized Bally Slot-Machines are not equipped with a handle and are activated simply by deposit of a coin. Reel action of such machines, however, is entirely mechanical, a motor merely supplying the spring-loading energy normally supplied by a player pulling a handle.

3. Although as obviously a slot-machine in appearance as the historic earlier machines, the Bally Slot-Machine is styled with extravagant elegance new to Coin-Operated Amusement and artfully illuminated for maximum eye-appeal.

4. Electricity was not entirely new to coin-operated gaming equipment in 1963. As early as 1937, slot-machine manufacturers introduced a type of electrically operated machine called a "console," probably from a dictionary definition of the word: "a cabinet (as for a radio or television set) designed to rest directly on the floor."

Although consoles continue in limited use, the machines do not rank with the typical slot-machine in popularity and need not be discussed in detail in a general survey of Coin-Operated Amusement.



5-LINE-PAY may be played with a single coin or player may deposit up to 5 coins before pulling the handle. First coin qualifies the basic center-line as the win-line; and each additional coin qualifies an additional line as an added win line. If 5 coins are played, 5 lines—3 horizontal and 2 diagonal—are win-lines. Wins are not multiplied by number of coins played, but player can win on any lines qualified as win-lines. An inducement to multiple-coin play is provided by the fact that the fifth line—qualified by fifth coin—is the giant jackpot line with a win-value of 3000.

(C) The use of electrical circuitry to detect instantaneously the alignment of symbols at the end of a spin—and, when a winning alignment occurs, to “telegraph” the appropriate award to the payout mechanism—insures precision, reliability and speed never attained by the non-electrical mechanisms, which were subject to wear and maladjustment.

(D) Of greater importance, perhaps, than dependability is the fact that electrical circuitry in slot-machines permits development of an endless variety of new and fascinating win-systems, some of which are illustrated on other pages.

Jackpots Paid Automatically

Surmounting all other advantages of introducing electrical energy into the equation of slot-machine design is the fact that the payout mechanism may be motor-operated—and, thus, vastly enlarged in coin-capacity.

The pay mechanism of the Bally Slot-Machine includes a container with a capacity of 3,000 U.S. dime coins¹, which may be delivered in awards at a rate in excess of 6 coins per second. The container is often called “the Bottomless Payout Reserve” for the reason that the supply of coins available for payouts is never exhausted in normal play. Indeed, jackpots up to 200 coins are paid automatically² in coins, significantly reducing the problems of jackpot payments previously described.

The operator of the Bally Slot-Machines, when placing a machine in operation, loads the payout reserve to capacity. Thereafter, an ingenious sensor device constantly “feels” the level of coins in the payout reserve. When, through continued payouts, coins in the reserve fall below a predetermined level, all coins played into the machine are automatically fed into the reserve. When the reserve again attains the desired level, coins played go directly to the coin-box from which the operator takes his income.

Although the level-sensing is mechanical—the sensor floating across the coins in the reserve—the signals to direct the flow of coins to the reserve or to the coin-box are through electrical circuitry, again illustrating impact of electricity³ on slot-machine technology.

1. Capacity in terms of other coins depends on size of each coin.

2. Jackpots in excess of 200 coins are necessarily attendant-paid to avoid excessive depletion of coins in the payout reserve; and all jackpots in machines operated with the U.S. half dollar and dollar—and coins of similar size—are usually paid by attendant. But the Standard Bally Slot-Machines pay all jackpots automatically in the most popular machines, i.e., machines played with U.S. 5 cents, dime and quarter dollar—as well as coins of similar size in other nations.

3. Bally Slot-Machines are available for operation with all types of magnetically induced electrical current in use throughout the world.



The **PROGRESSIVE** slot-machine is a machine in which the top jackpot—called the Super Jackpot—continuously increases in a predetermined ratio to the number of coins played into the machine, play being feverishly stimulated, as the Super Jackpot steadily climbs to an incredible peak—as high as \$9,999 in some U.S. dollar and half dollar machines or \$999 in comparable U.S. 5 cents, dime and quarter dollar models. Outside of the United States, Super Jackpots are expressed in either a quantity of coins or replay credits.

Super Jackpots are displayed on two separate Super Jackpot counters, which advance alternately, while red arrows light alternately to indicate which of the two Super Jackpots may be won at each moment of play. Thus, when one counter is reduced to the minimum amount—approximately 2 percent of the maximum—the other counter remains a strong inducement to continued play.

PROGRESSIVE slot-machines are available in single win-line models and multiple-line models, as illustrated. In the model shown the Super Jackpot can be won only by alignment of triple 7 across the third or bottom line, which qualifies as a win-line when the third coin is deposited before pulling handle.

Types of Slot-Machines

THE ENDLESS VARIETY of slot-machines permitted by the use of electrical circuitry cannot possibly be described in detail in a general survey of Coin-Operated Amusement. The vast panoply of available slot-machines may be suggested only by a brief summary of current major models, some of which are illustrated on other pages.

(A) The standard slot-machine uses 3 reels and is played with only one coin per pull of the handle with wins based on the alignment of symbols across a central¹ win-line.

The standard slot-machine is built in numerous different styles, representative of which—in addition to the styles described in note 1—is DEUCE WILD in which the Deuce symbol (numeral 2) is “wild”, i.e., acts as any symbol in the configuration of a scheduled win combination. Thus, while 3 Deuce symbols pay

200 coins and 3 Melons pay 100 coins, one Deuce may be combined with 2 Melons or 2 Deuces with one Melon to produce a fictitious but valid winning triple Melon jackpot.

(B) A multiple-coin slot-machine can be played with a single coin. Or a player may deposit several coins before pulling the handle, every win being multiplied by the number of coins played. The obvious advantage of a multiple-coin machine is that hourly² income per square foot³ of floor space is notably increased.

(C) A special class of multiple-coin machine is the multiple-line machine. A typical multiple-line machine, illustrated on another page, is the Bally 5-LINER, which permits a player to play 1 to 5 coins, at his discretion, to qualify 1 to 5 lines (3 horizontal, 2 diagonal) as win-lines. Wins are not multiplied by coins played, but a player can win on any lines played⁴. One pull of the handle can produce wins on more than one line. An inducement to multiple-coin play is the fact that the fifth line, qualified by fifth coin, is the big jackpot line, often called the giant jackpot line.

(D) Another special class of multiple-coin slot-machine is Bally CONTINENTAL and other models in the CONTINENTAL series, all of which are 4-reel⁵ machines, offering players the option to play 1 to 6 coins—all wins being multiplied by the number of coins played—and an exceptionally brilliant array of wins. CONTINENTAL type machines are illustrated and described in detail on other pages.

(E) A PROGRESSIVE slot-machine is a machine in which the top jackpot—called the Super Jackpot



REEL DEAL is leader in the popular Hold & Draw style. Symbols are all facsimiles of playing cards. Payouts are awarded when 3 cards of the same rank appear on the center-line, 3 Aces being the top win.

The term Hold & Draw refers to a style of slot-machine which gives players a second chance to win.

After a no-win spin, a Hold signal is lit. Player may then press Hold button or buttons to hold any desired reel or reels in a locked position, play a second coin and spin reel or reels not held to try again for a complete winning alignment of symbols.

Other Hold & Draw machines appear on pages 9, 10.

1. Within the category of the standard slot-machine are models which utilize for payment of minor jackpots, not only the central horizontal row of symbols, but also the rows above and below the center-line.

For example, in the popular MONEY HONEY model, shown on page 2, 3 Money Honey Faces pay 18, whether the Faces appear across the central win-line or in any of 9 visible positions.

Similarly, in the TIC TAC TOE model, while the symbols TIC, TAC and TOE on the center-line pay a jackpot of 200, the same symbols scattered in any of the visible positions pay 18.

2. A player can deposit up to 5 coins before pulling the handle nearly as rapidly as he can deposit a single coin and pull. Of course, sound operating policy dictates a mix of models, including single-coin models, to attract all types of players.

3. A multiple-coin does not occupy significantly greater space than a single-coin machine.

4. In some jurisdictions, notably in Australia, players can win on only one of the several lines played. In the event of a winning alignment on two or more lines played, only the highest paying win is paid. The possibility of multiple-line wins is foreclosed, but the probability of winning is increased, as additional lines are qualified as win-lines.

5. EXTRA LINE, a popular model in the CONTINENTAL class, utilizes 5 reels, but symbols are confined to 4 reels, the fifth reel serving an auxiliary purpose.

—continuously increases in a predetermined ratio to coins played into the machine, the play being feverishly stimulated, as the Super Jackpot steadily climbs to an incredible peak of \$9,999¹.

Super Jackpots are displayed on two separate Super Jackpot counters, which advance alternately, while red arrows light alternately to indicate the Super Jackpot which may be won at each moment of play. Thus, when one counter is reduced to the minimum figure² by a Super Jackpot win, the other counter remains an inducement to continued play.

PROGRESSIVE slot-machines are available in single win-line models and multiple-line models. A multiple-line PROGRESSIVE machine is illustrated on another page.

(F) "Hold & Draw" refers to a popular style of slot-machine which offers a player a "second chance" to win.

After a non-win spin, a Hold signal is lit. A player may then press Hold buttons to hold any desired reel or reels in a locked position, deposit a second coin and spin reel or reels not held to try again for a win. For example, if an Orange appears on the first and third reels and another symbol on the middle reel, a player may hold the Oranges and spin the middle reel in hope of "drawing" another Orange to fill out a triple Orange win.

Needless to say, the preceding survey of major models of slot-machines will be incomplete on the date of publication. The state of the art in the slot-machine industry is never static. New styles are continuously developed by imaginative designers.

1. In some U.S. half dollar and dollar models. In comparable U.S. 5 cents, dime and quarter dollar models the maximum Super Jackpot is \$999. Outside of the United States, the Super Jackpot is expressed in a quantity of coins or in replay credits.

2. \$200, for example, in some U.S. dollar machines, \$20 in comparable U.S. dime models.



QUICK DRAW is a favorite in the Hold & Draw class of slot-machine—the principle of which is described at (F) in opposite column.

Animated display glass of **QUICK DRAW**—in which a "sheriff" pulls a "quick draw" of his pistol and two "bandits" throw up their hands in surrender—attracts immediate attention in the busiest club or casino. A rich array of awards, including a 200-coin top jackpot, and the extra play appeal and extra coin potential of the Hold & Draw feature insure prolonged repeat play and extraordinary earnings.

Another great Hold & Draw machine appears on page 10.

Methods of Slot-Machine Operation

A WIDE VARIETY of systems are employed throughout the world for the operation of slot-machines.

The Independent Operator

The independent operator, as defined in note 2, page 3, continues to occupy an important position in the United States (confined to the State of Nevada in respect to slot-machines), the United Kingdom, Belgium, the Scandinavian nations and Finland, as well as other scattered areas of the world. Such operations range from the limited activity of one man, operating a small number of machines, often in time spared from his primary occupation, to extensive enterprises with numerous employees and hundreds

of machines. Frequently, an independent operator owns and operates all forms of Coin-Operated Amusement.

The Casino

The casino, either as a department of a resort hotel or as an establishment devoted solely to gaming—and auxiliary services of food and beverage—is an increasingly important factor in presentation of slot-machines to the public, particularly in some Caribbean islands, Monte Carlo, Greece, some republics of Africa, as well as in other jurisdictions catering to tourists and confining slot-machines to casinos.

The Club

Some jurisdictions, notably in Australia², license slot-machines only for use in private clubs, established by social groups with a common interest in athletic teams, occupations or simply the mutual congeniality of members. Slot-machine income, after expenses and taxes, are used to subsidize the food, beverage and other attractions of a club.

The Mixed Economy

Two or more methods of slot-machine operation may be found in some jurisdictions. For example, in the State of Nevada slot-machines are operated both in casinos and by independent operators, who serve the various retail establishments in which slot-machines are auxiliary to the basic business. In the United Kingdom the independent operator, the club and the casino are all involved in slot-machine operation.

The Public Association

A unique operation is the Slot Machine Association of Finland, founded to collect funds for civic organizations engaged in social work³, the funds being derived from slot-machines and coin-operated phonographs owned and operated by the Association.

The Association is governed by a Board consisting of a chairman appointed by the government and eleven members, six of whom are appointed by beneficiary organizations, five by the government.



MUSTANG, an international favorite in the Hold & Draw class—the principle of which is described on page 9—features solo symbol awards. 3 Horseshoes pay 20 and light Mustang for next 10 plays. While Mustang is lit, a single Mustang **anywhere on the center line** pays 20. Animation is a galloping mustang horse.

1. The history of Coin-Operated Amusement is replete with accounts of one-man operations which, through the years, developed into large business concerns.

2. Some slot-machines in the United Kingdom are restricted to clubs and casinos, as discussed in note 3, page 12.

3. Work of the Association is described on page 17.

The Governmental Agency

Some observers of trends in Coin-Operated Amusement believe that governments at national, regional or local levels may in the course of time be directly involved with Coin-Operated Amusement.

Indeed, the Union of Soviet Socialist Republics has already purchased a substantial quantity of coin-operated equipment of western manufacture and, under the auspices of the Ministry of Culture, operates amusement centers in Leningrad and Moscow, which are reported to be extremely successful both recreationally and financially. Although the equipment is entirely in the arcade class, described on other pages, the logic of success may ultimately encourage use of other types of equipment, perhaps including slot-machines, particularly in the Crimean Peninsula and similar resort areas. And other eastern European nations may be expected to follow the example of the U.S.S.R.¹

Similarly, the legislature of the State of New Mexico (U.S.A.) recently considered an elaborate proposal, not only to legalize slot-machines, but also to institute a State agency to operate the machines. Although the bill was not enacted into law, the fact that the suggestion was seriously debated, pro and con, is indicative of new trends in "establishment" attitudes toward slot-machines. One should not be surprised in the future if some governments undertake the direct operation of slot-machines, as some governments now operate lottery.

From the independent operator, through the casino and club, to the governmental agency, governments disposed to consider the slot-machine as an effective means of replenishing the public treasury are offered a variety of operational methods.



Exclusive features of **CONTINENTAL** are:

Players' option to play 1 to 6 COINS with wins multiplied by number of coins played.

4 REELS to provide maximum suspense and extra rich win schedule.

Dazzling display of wins.

Wins at both ends of reels. For example, Bells on first 3 reels—with anything at the end—pay. So do Bells on the last 3 reels—with anything in front.

Plenty of upper bracket Jackpots to 1500 top when 6 coins are played.

Impressive vertical styling towers above standard machines but requires a space only 23½ in. wide by 17½ in. deep.

Other slot-machines in the **CONTINENTAL** class appear on pages 12 and 13.

1. Yugo-Slavia presently licenses gaming casinos in Adriatic resorts.

Styles of Slot-Machine Awards

AUTOMATIC PAYMENT OF AWARDS is a basic characteristic of the slot-machine. But the media in which awards are automatically paid may vary considerably. Indeed, the manner in which the 3 major



SUPER CONTINENTAL includes all the popular attractions of **CONTINENTAL**, illustrated on page 11, plus new Super Symbols, 2 or 3 of which, scattered anywhere on the center-line, add up to wins.

MODEL 891, illustrated, is a non-payout model with all wins registered on a visible Credit Counter for quick, easy replays.

MODEL 891-1 is convertible to operate as Model 891 or with wins paid automatically in coins. (Very high wins are paid by attendant.)

media—currency, tokens and replay credits—are used and regulations pertaining to such use vary so widely throughout the world that detailed discussion with complete references to specific jurisdictions is not practical in a general survey of Coin-Operated Amusement. A summary of the 3 media—and variants—must necessarily suffice.

(A) Like the original slot-machine, the most popular and presently¹ most widely used machines automatically deliver awards in coins directly to players—or by the imperative of symbol alignment oblige the owner of a machine or his agent to pay large² awards in currency³.

(B) One type of token-pay slot-machine may be activated either by coins or by the distinctive tokens with which the machines automatically pay awards; but awards are paid only in tokens⁴, coins played into a token-pay machine never entering the payout mechanism.

(C) A second type of token-pay machine may be activated only by tokens, which players purchase from the location management, and, of course, all payouts are in tokens⁴.

(D) One type of replay-credit slot-machine may be activated either by coins or by pressing a credit button to play off the replay credits⁵ in which awards are paid and which are registered on a visible credit counter.

(E) Another type of replay slot-machine is activated only by a credit button. A player who desires to play buys a stated number of credits from the location attendant, who then registers the purchased credits on a visible credit counter by means of a key. All awards are in replay credits⁵.

1. As the use of token-pay and replay-credit slot-machines increases in Europe, such machines increasingly approach numerical equality with currency-pay machines.

2. The word "large" may apply either to the quantity of coins or to the physical size of a coin.

3. Only currency-pay machines are used in the United States (presently restricted to the State of Nevada) and in Australia (presently confined to clubs). In the United Kingdom slot-machines which pay a range of awards, including major jackpots, are licensed only for clubs and casinos. Slot-machines available to the general public in the United Kingdom either pay coin awards of minor value or pay all wins in tokens. Regulations related to currency payouts vary in various other jurisdictions of the world.

4. Tokens won from a token-pay machine may be used for continued play of the machine or, as authorized in many jurisdictions, may, subject to limitations, be redeemed for beverages, tobacco, souvenirs or other merchandise.

5. Replay-credits are usually utilized for the amusement of continued play, but some jurisdictions permit redemption of credits in a manner similar to redemption of tokens, as described in note 4, above.

(F) An interesting type of slot-machine combines certain advantages of replay credits with the special satisfaction of currency-pay. Although wins are ultimately paid in currency—either automatically or in the case of large wins by attendant—all wins are first registered on a visible credit counter. A player in a mood for fast action can play off replays as rapidly as he can press the credit button and pull the handle. However, he can collect accumulated credits in currency whenever he desires by pressing a collect button.

(G) Another type of machine is readily convertible by the owner to either (a) currency-pay or

(b) replay credit operation. The machine is, thus, adaptable to use, within one jurisdiction, to currency-pay operation in clubs and casinos or to replay operation in establishments frequented by the general public. Convertibility also facilitates resale from a jurisdiction, for example, which permits only replay operation into a jurisdiction which licenses currency-pay machines.

The broad range of award systems available in modern slot-machine technology is a primary reason for the increasing world wide use of the slot-machine as a popular and profitable form of Coin-Operated Amusement.



EXTRA LINE features 1 to 6 coins play with all wins multiplied by coins played; and 4-reel play action. But a fifth **red** reel is added to arrow-indicate **extra win-lines** above and below the basic center win-line. Illustration shows a triple Bar win on the basic line and a single Cherry win on the arrow-indicated **extra line**.

Mathematics of Slot-Machines

SLOT-MACHINE PERFORMANCE is regarded as darkly mysterious in the folklore of the general public, including numerous players, as well as critics who profess to be extremely knowledgeable on the subject of gaming equipment. However, the performance of a slot-machine is based on relatively simple¹ mathematics, as a brief examination of the pay-schedule on page 15 reveals.

The schedule is the actual "paperwork" by which engineers of Bally Manufacturing Corporation² designed a specific machine to return to the aggregate³ players 86.3 percent of coins played into the machine.

The upper section of the schedule states the quantity of the various symbols on each of the 3 reels, producing the 8,000 possible combinations on which the payout percentage is based. As related to awards—expressed in coins in the lower section of the schedule—the factor of 8,000 is also regarded as signifying 8,000 coins, the mathematical probability⁴ being that, during a period in which 8,000 coins are played into the machine portrayed by the schedule on page 15, the machine will pay out 6,908 coins.

Under the title of SUPERIMPOSED in the pay-schedule on page 15 are data which illustrate an interesting technique by which the quantity of symbols on a reel are increased above the traditional 20, thus increasing the variety of winning alignments.

The Seven over Bell arrangement consists of the numeral 7 printed over a Bell with a sufficient portion of the Bell visible to permit immediate recognition of the familiar Bell symbol. Seven over Bell in conjunction with other symbols in horizontal alignment on the win-line acts as either a 7 or a Bell. Thus, if Seven over Bell appears on one reel with Bells on the remaining 2 reels, the machine "reads" the horizontal alignment as 3 Bells and pays 18 coins. However, if Seven over Bell appears across the win-line on all 3 reels, a triple 7 jackpot is paid⁵, the superimposed 7 being the only 7 symbols on the reels.

The use of superimposed symbols does not alter the basic 8,000 combinations previously described. Although symbols are pictorially added to reels, the number of stops (positions at which each reel can stop) remains limited to 20.

Attention is directed to numbers enclosed in parentheses in the section of the pay-schedule which analyzes awards, e.g., (20-5) opposite "1 Cherry" and under 2ND REEL. The notation is a shorthand expression signifying the following two factors: (1) the 20 stops of the second reel must be considered in calculating the number of possible combinations which include a Cherry on the first reel; (2) all 5 Cherry symbols on the second reel are allocated to double Cherry wins, for, if a Cherry on the first reel is followed by a Cherry on the second reel, the alignment produces a double Cherry win. Similarly, the

notation (20-3) opposite "2 Cherries" and under 3RD REEL indicates that, although the 20 stops of third reel cannot be ignored in calculation, all 3 Cherry symbols on the third reel are involved in triple Cherry wins.

Presentation of detailed pay-schedules for the multitude of different types of slot-machines available would require a volume of considerable magnitude. The pay-schedule on page 15 should suffice to suggest that slot-machine performance, far from being an occult phenomenon, is as mathematically organized as a musical symphony. But in both the symphony and the slot-machine the basic mathematical structure is gracefully concealed to enhance the pleasure of patrons.

1. Equations which express the mathematical performance of multiple-line machines, described on page 8, and hold-and-draw machines, described on page 9, involve a greater degree of complexity than the schedule on page 15. However, such comparatively complex equations remain in the realm of elementary mathematics.

2. Cited in note 1, page 6.

3. See note 1, page 2, and note 4, below.

4. An important caveat must be attached to a statement of mathematical probability. During an indeterminable and unpredictable period of time, a slot-machine performs in accordance with the mathematical formula. But in a brief period a machine may not adhere to the formula.

Inherent but not explicitly stated in the schedule on page 15 is the factor of 1,358—the number of separate payouts mathematically anticipated during 8,000 plays. When 8,000 is divided by 1,358, the quotient is 5.8173, expressing the win frequency of the machine: the mathematical anticipation of a payout, small or big on approximately every sixth pull of the handle.

However, during a relatively brief period, the machine may be played considerably in excess of 6 times without yielding a payout; and conversely, the machine may deliver several payouts, including big wins, in rapid succession.

The reason for such apparently erratic behavior is twofold. First, a slot-machine is not equipped with a "memory" system to compute wins and control payouts. Second, the reels whirl freely and stop randomly; and no force, either in the physics of the universe or intrinsic to the mechanism, can compel a slot-machine neatly and invariably to abide by the mathematical probability. In actual operation, however—particularly during a prolonged period and usually during a brief period—slot-machines follow the mathematical script with remarkable fidelity. Exact obedience to mathematical prediction would, of course, diminish, if not completely nullify, the pleasure of play.

5. Technically, the machine expressed in the pay-schedule can, when 7 over Bell appears in triple alignment on the win-line, pay both the 100-coin jackpot for triple 7 and the 18-coin win for triple Bell. Usually, however, through electrical circuitry, the payout mechanism responds only to the higher winning alignment.

Star Special

86.3% payout

	1ST REEL		2ND REEL		3RD REEL		
Cherry.....	3	×	5	×	3		
Orange.....	6	×	1	×	10		
Plum.....	7	×	1	×	4		
Bell.....	1	×	10	×	1		
Star.....	1	×	1	×	1		
Bar.....	2	×	2	×	1		
	<u>20</u>	×	<u>20</u>	×	<u>20</u>	=	8000

SUPERIMPOSED

Seven over Bell.....	1	×	2	×	1		
Eleven over Plum.....	2	×	1	×	1		
Target over Orange.....	1	×	1	×	2		

AWARD AMOUNT

1 Cherry.....	2	×	3	×	(20-5)	×	20	=	1800
2 Cherries.....	6	×	3	×	5	×	(20-3)	=	1530
3 Cherries.....	10	×	3	×	5	×	3	=	450
3 Oranges.....	10	×	6	×	1	×	10	=	600
2 Oranges, Bar.....	10	×	6	×	1	×	1	=	60
3 Plums.....	14	×	7	×	1	×	4	=	392
2 Plums, Bar.....	14	×	7	×	1	×	1	=	98
3 Bells.....	18	×	1	×	10	×	1	=	180
2 Bells, Bar.....	18	×	1	×	10	×	1	=	180
3 Stars, Showing in Any Position.....	18	×	3	×	3	×	3	=	468
(Minus Center Line Position)									<u>5758</u>

PAYOUTS 5758
2242

JACKPOTS

3 Sevens.....	100	×	1	×	2	×	1	=	200
3 Elevens.....	100	×	2	×	1	×	1	=	200
3 Targets.....	100	×	1	×	1	×	2	=	200
3 Bars.....	100	×	2	×	2	×	1	=	400
3 Stars (On Center Line).....	150	×	1	×	1	×	1	=	150
									<u>1150</u>

JACKPOTS 1150
NET INCOME 1092

SUMMARY

Total Play		8000	100.0%
Payouts	5758		72.0%
Jackpots	<u>1150</u>		14.3%
		6908	86.3%

TOTAL NET INCOME 13.7%



The young lady is not concerned with mathematics or the social and economic benefits of slot-machines as she enjoys playing the world famous CONTINENTAL. Photograph illustrates the distinctive style of the machine—a towering display in compact space.

Social and Economic Benefits of the Slot-Machine

FROM THE EARLIEST YEARS of the slot-machine, the spinning reels paid out generous contributions to charitable and civic endeavors. Volunteer fire departments, for example, in numerous towns and villages of the United States often depended significantly on two or three slot-machines, owned and operated by the firemen, to generate funds for the purchase of fire-fighting equipment. Slot-machines were formerly¹ common in clubrooms maintained by associations of military veterans, ethnic groups, fraternal and social organizations. The machines in private clubs served a threefold purpose: (1) to provide relaxation and amusement for members and guests, (2) to subsidize maintenance of clubrooms, (3) to produce revenue for the favored charity which nearly every social society adopts. Indeed, an elderly pastor—reminiscing about the bygone era in which his left hand was not expected to be acutely aware of the pragmatic good works of his right hand—might recall borrowing slot-machines from a local operator or neighborly slot-machine manufacturer to enliven the church bazaar or carnival—and to raise money, not only for the church, but also for church-supported charity.

Slot-Machines and the Economy

As the technological advance commonly called automation decreases the need for a vast corps of labor in the extractive, productive and distributive industries, the services industries—among which are the operation and maintenance of slot-machines—assume a position of increasing importance to the economy of nations—an importance enhanced by the gradual enlargement of leisure time and disposable income. Within the service industries, the slot-machine has already demonstrated ability to contribute to economic growth in specific areas of the world.

The small desert town of Las Vegas, Nevada, rapidly grew to a city with a population of 270,000, including environs, when hotels with casinos² and specialized casinos² were erected to compete with the earlier—and still thriving—resort and gaming center of Reno, Nevada.

Similarly, when the Commonwealth of the Bahamas determined aggressively to promote tourism as a major national industry, an early official action was to authorize builders of resort hotels to include gaming casinos—with slot-machines—in their plans. The example of the Bahamas was quickly followed in the Netherlands Antilles and other Caribbean island resort areas. Economic indicators clearly suggest that the introduction of slot-machines has notably stimulated Caribbean tourism and, thus, economic growth.

Economic growth in an area opened to slot-machines is not limited to expansion of population

in terms of mechanics and attendants in the service of slot-machines and other employees of hotels and casinos. Personnel directly associated with the resort and gaming aspects of an area require food, shelter and clothing. They require entertainment and recreation, schools, religious institutions, municipal services, banks, barber shops, beauty parlors and all the establishments of a community. Such establishments rapidly enter the area or, if already in existence, expand. Like the wave caused by a pebble cast in a pond, economic growth initiated by pleasure resort enterprises—including the slot-machine—spreads in an ever widening circle.

Slot-Machine Benevolence

The structure of a slot-machine operation established to support charitable and other civic purposes—the Slot Machine Association in Finland—is described on page 10. The sphere of activity of the Association includes³:

- "1. Promotion of general public health;
- "2. Support of child welfare;
- "3. Care of the blind, deaf and dumb;
- "4. Support of the welfare of the disabled;
- "5. Support of the welfare of the aged;
- "6. Development of youth education;
- "7. Preparation for the protection and rescue of human lives in major emergencies; or
- "8. Procurement or maintenance of holiday sites open to all or promotion of comparable holiday facilities."

As the slot-machine is increasingly accepted by society as a legitimate form of Coin-Operated Amusement, the slot-machine may be expected to contribute increasingly to charitable and public welfare purposes. Although such contribution may in some nations involve governmental operation of slot-machines or, as in Finland, operation by quasi-public associations, the beneficence of the slot-machine in most jurisdictions of the world will probably be effected through public taxation of privately owned slot-machines.

1. Slot-machines largely vanished from private clubs in the United States with the rise of the neo-puritanical spirit which presently appears to be diminishing in intensity.

2. Earnings of table gaming in Nevada are approximately twice the earnings of slot-machines. However, the simple play of slot-machines attracts countless visitors to whom the complex table games do not appeal. The slot-machine, therefore, must be acknowledged as a major factor in the growth of Las Vegas—and, indeed, all of Nevada.

3. The list of social areas in which the Association is involved is quoted from a booklet published by the Association.

Tax Benefits of Slot-Machines

SLOT-MACHINES ARE LICENSED in the United States, at present, only in the small State of Nevada¹. However, the national government of the United States annually collects approximately \$8,750,000 in slot-machine taxes—\$250 annual tax on each of the approximately 35,000 slot-machines operated in Nevada. And the national tax is not the sole tax imposed on slot-machines in Nevada.

State of the Nevada

The State of Nevada wisely channels the major flow of direct slot-machine tax revenue to the county, which in the United States is the political subdivision closest to the daily affairs of citizens. The State, however, collects an annual tax of \$40 per machine or a current total of \$1,400,000. And in addition to the direct tax the State collects from 3 percent to 5.5 percent of the gross win of a gaming establishment, depending on the volume of each establishment. The gross win in the case of slot-machines is equivalent to the gross earnings of \$180,510,866 in the fiscal year 1969-1970².

The share of the county—and of the two largest cities—in slot-machine taxes in Nevada is suggested by the table below, which states the annual tax levy per machine in each of the political subdivisions

SLOT-MACHINE TAXATION IN NEVADA					
	Douglas County (Lake Tahoe)	City of Reno	Washoe County (Reno)	City of Las Vegas	Clark County (Las Vegas)
Federal	\$250.00	\$250.00	\$250.00	\$250.00	\$250.00
State	40.00	40.00	40.00	40.00	40.00
County	124.00	120.00	160.00	120.00	250.00
City		100.00		120.00	
Annual Total	\$414.00	\$510.00	\$450.00	\$530.00	\$540.00

listed. The table is based on data of only the 3 major pleasure resort counties. Slot-machines are operated in all except two of the 17 counties of Nevada; and other counties are allocated proportional slot-machine-taxes.

Australia

Although approximately 36,000 slot-machines³ are operated in the Commonwealth of Australia, all are concentrated in the State of New South Wales⁴, the only State of Australia which presently⁵ licenses slot-machines.

Slot-machines in New South Wales are licensed only for use in private non-profit clubs, 1,500 of which flourish in New South Wales⁶. The machines are taxed in two ways. An annual license fee of \$100 is levied on machines designed for 5 cents play and

\$200 for 10 cents machines. The fee for 20 cents⁷ machines increases from \$1,100 annually on each of the first two machines in a club to a maximum of \$5,000 annually per machine, depending on the number of machines in a club. The machines are also assessed a graduated annual tax on gross income, ranging from 12.5 percent to 24 percent, depending on the coin denomination of each machine.

A reliable estimate⁸ is that the government of New South Wales derived \$35,000,000 (Australian)⁹ from slot-machine taxes during the fiscal years of 1970-1971.

Belgium

During 1970, in excess of 7,300 slot-machines were in operation in Belgium, a nation with a population of 9 million¹⁰; and the number of machines continues to increase. Each slot-machine in Belgium is taxed 50,000 francs (U.S. \$1,000) annually, providing the government in 1970 with the equivalent of U.S. \$7,363,000.

1. State legislatures in all sections of the United States are devoting serious attention to proposals to legalize, license, regulate and tax slot-machines, as a means to obtain urgently needed revenue without adding to already onerous general tax burdens.

2. Nevada Gaming Commission Annual Report for the fiscal period of July 1, 1969 through June 30, 1970.

3. Slot-machines are called "poker machines" in Australia for the reason that facsimiles of playing cards were formerly favored as symbols. The name continues, although the universal symbols of Bar, 7, Bell, Plum, etc. are increasingly adopted in Australia.

4. The population of New South Wales is 4,000,000, one-third of the total population of Australia.

5. Sir Henry Bolte, Prime Minister of the State of Victoria (Australia)—who formerly opposed introduction of slot-machines into Victoria—recently told his Parliament that the State might collect as much as \$20,000,000 annually in slot-machine taxes.

6. Membership in individual clubs range from 50 persons to 52,000, which is the active membership in the South Sydney Junior League Club, said to be the biggest workingmen's club in the world.

7. 20 cents is the maximum denomination permitted for slot-machine play in New South Wales.

8. Quoted from The Daily Telegraph, a Sydney (Australia) newspaper, dated October 28, 1970.

9. The Australian dollar is currently valued at (U.S.) \$1.20.

10. An interesting sidelight on slot-machine use is that the annual per capita stake played in slot-machines in Belgium is equivalent to (U.S.) \$5.90, less than the annual per capita expenditure for either alcoholic beverages or tobacco.

If all tax benefits of all types of Coin-Operated Amusement in Belgium are considered¹—(U.S.) \$13,618,990 in license fees; (U.S.) \$3,018,860 in custom duties; (U.S.) \$16,306,787 in income tax of persons associated with Coin-Operated Amusement—the impressive total is (U.S.) \$32,944,787 or .5 percent of the national budget. Slot-machines account for a significant major portion of the revenues cited².

United Kingdom

Probably the first great nation to license³ slot-machines is the United Kingdom. During 1970, slot-machine license fees amounted to 7.7 million pounds (U.S. \$20,000,000), despite restrictions on currency-pay machines, as described in note 3, page 12.

Although the foregoing survey embraces only typical areas of slot-machine taxation, figures cited should suffice to suggest a public revenue potential which is frequently ignored for “moralistic” reasons.

1. Figures cited are for 1970, compiled by H. A. Koevoets, a prominent Antwerp (Belgium) accountant.

2. 54 percent of license fees; 49 percent of custom duties, 66 percent of income tax.

3. By the Betting and Gaming Act of 1960, pursuant to recommendations of a Royal Commission concerned with the necessity of new sources of governmental revenue.



Political cartoon, published in 1863, depicts Abraham Lincoln, the sixteenth President of the United States, playing a bagatelle game, generally considered the basic inspiration for pinball.

The Pinball Game

THE ORIGIN OF PINBALL is lost in antiquity. The earliest known reference to a similar amusement device is found in Chapter XIV of *Pickwick Papers*, published by Charles Dickens in 1836. The narrator describes the Peacock Tavern at which members of the Pickwick Club stopped and “beguiled their time chiefly with such amusements as the Peacock afforded, which were limited to a bagatelle-board on the first floor.” The game probably resembled the board illustrated at the top of the page, which is generally regarded as the ancestor of pinball¹.

Early in 1929, John J. Sloan, an advertising solicitor for *Billboard*—a magazine then catering to the carnival and circus trade, street vendors and operators of slot-machines, and other early coin-operated equipment—observed an adaptation of bagatelle in the basement of his apartment building. The device had been built by the janitor for the amusement of his friends.

Although the unknown, unsung inventor of modern pinball utilized the traditional scoring objective of bagatelle—holes or cups in a plane surface with the score-value of each hole prominently displayed—he introduced three historic innovations: (1) the plane surface was slightly slanted, balls² being propelled upward to the rear of the surface, then rolling toward the front of the surface; (2) the scoring holes were partially surrounded by hedges of brass nails or pins, increasing the degree of skill required to shoot balls into holes; (3) the balls were shot, not by means of a cue, but by a spring-loaded plunger,

identical in basic principle to the ball-shooter used in pinball games today. The basement bagatelle was not coin-operated.

Intent on developing a new source of advertising revenue, Sloan described his subterranean discovery to several of his carnival equipment accounts; and one company—In and Outdoors Games, Inc.—built and marketed several coin-operated bagatelle or pinball games.

Probably because the games were too large for the average location and too expensive—approximately (U.S.) \$100—for an economy already drifting into economic depression, the In and Outdoors Games contribution to Coin-Operated Amusement was not successful and soon vanished from the amusement scene—but not before other entrepreneurs shrewdly appraised the enormous potential of coin-operated bagatelle.

First Pinball Boom

“On a gloomy day in October of depression-clouded 1931,” writes a veteran coin-machine historian, “a young businessman, Raymond T. Moloney, after

1. Municipal ordinances governing pinball in the United States often refer to the game as “bagatelle.”

2. The ball in the basement bagatelle, as in early commercial pinball, was the spherical glass toy usually called a “marble” in the United States. Indeed, for several years, pinball was variously identified as “marble game”—in reference to the projectile used in play—or as “pin game”—in reference to the hole-guarding pins.

hours of stubborn argument, persuaded his senior partners in a small Chicago printing shop to join him in a bold venture.

"As a result of their decision, a simple but fascinating, color-splashed pinball game was introduced to America late in 1931. By the time 1932 dawned, under darker depression clouds than ever, the rainbow-bright game, BALLYHOO¹, was a national sensation. 50,000 BALLYHOO games were sold in a period of 7 months."

New Locations Develop

"The lexicon of locations," the historian continues, "did not include taverns in 1932². But in barber shops, tobacco stores, restaurants, drug stores, coffee shops, gasoline stations, railroad depots, bus terminals, roadside stands and—in the words of BALLYHOO advertisements—"wherever people congregate," BALLYHOO brightened the somber scene, giving Americans a penny's worth of escape from worry, a nickel's worth³ of cheer in a grim world."

New Operators Appear

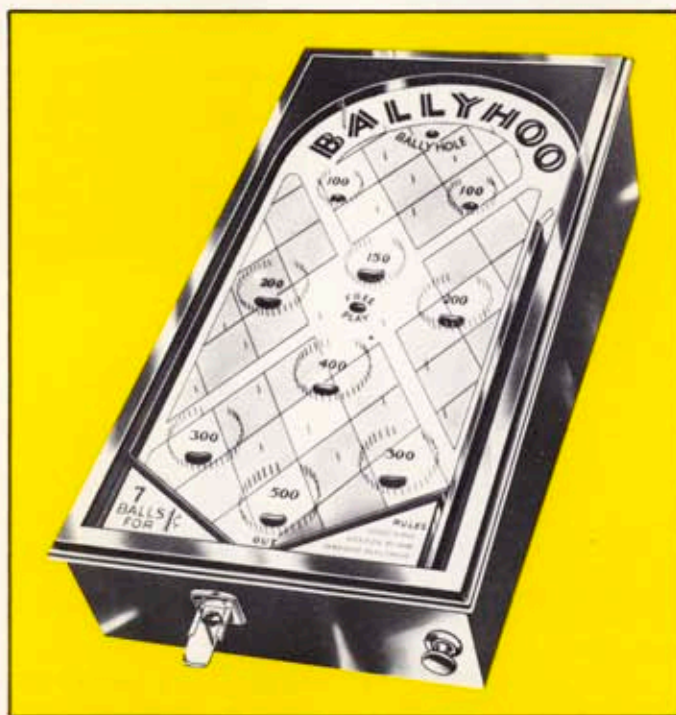
Slot-machine operators, whose advent is chronicled on page 3, constituted the first immediate market for BALLYHOO. But they were soon joined by throngs of

other men and women: unemployed workmen, who risked their small savings to buy BALLYHOO and embark on new careers of self-employment; bankrupt businessmen; doctors and dentists without regularly paying patients; lawyers without clients; anyone who could scrape together (U.S.) \$16.00—the list price of BALLYHOO—or (U.S.) \$160.00 to be a 10-game tycoon. Indeed, the slot-machine boom of 1907 was a mild and minor economic event compared to the pinball boom of a quarter of a century later.

1. The name, BALLYHOO, was adopted because of the popularity of "Ballyhoo," an American satirical journal of the era. And, for the purpose of manufacturing and marketing BALLYHOO, Moloney and his partners incorporated Bally Manufacturing Company, predecessor of Bally Manufacturing Corporation, cited in note 1, page 6.

2. A tavern in the United States is a retail establishment licensed to serve alcoholic beverages. The Amendment to the Constitution of The United States which prohibited "intoxicating liquors"—in effect from January, 1920—was not repealed until December, 1933.

3. BALLYHOO was offered in two models, the sole differences being in the coin mechanisms and the number of balls available for play. One model provided 7 balls for (U.S.) 1 cent—commonly called a penny. The second model permitted a player to shoot 10 balls for (U.S.) 5 cents—commonly called a nickel.



BALLYHOO, pioneer pinball game of 1931, was only 18 in. wide, 24 in. long, 8 in. deep.

Evolution of Pinball

THREE ECONOMIC FACTORS largely account for the immediate and amazing success of BALLYHOO in 1932: (1) the presence in the United States¹ of thousands of men and women who, struck down by economic depression, were attracted to the novel amusement device as a means to earn a livelihood; (2) the extremely low price of BALLYHOO, which permitted the new influx of operators to engage in the business of Coin-Operated Amusement with a modest investment; (3) a populace which, unable to afford expensive entertainment, welcomed the incredible amusement bargain afforded by BALLYHOO.

Equally vital to the meteoric rise of BALLYHOO were three characteristics of the game: (1) the toy-like simplicity of BALLYHOO play appealed to a generation disenchanted with the gaudy sophistication of the preceding decade, which ended in economic disaster; (2) the elementary mechanics involved in the design and structure of BALLYHOO demanded no specialized skill on the part of operators, and in the expanded fraternity of Coin-Operated Amusement a kindergarten teacher, whose salary had been suspended by a school board in financial distress, was on equal terms with a watchmaker, who had lost his job; (3) the small size of BALLYHOO, not only opened innumerable doors of small but busy locations² to the game, but also dispensed with the necessity of transport equipment, for an operator could easily carry two BALLYHOO games—one under each arm.

As economic conditions improved throughout the world, some coin-machine operators of the class of 1932 returned to their former occupations. Most, however, remained in Coin-Operated Amusement, their newly established careers strengthened by the fact that pinball quickly attained the position of one of America's—later the world's—favorite and perennial modes of entertainment.

Manufacturers responded to the large immediate market—the operators—and the larger ultimate market—the players—by rapid and ingenious improvement of pinball—a development so vast and varied, through the years, that only the salient advances may be traced in a general survey of Coin-Operated Amusement.

1. The economic depression which commenced in 1929 affected, not only the United States, but the entire world—with a world wide influence on the popularization of pinball. Although BALLYHOO was sold only in the United States and Canada, by the end of 1932 pinball games were exported from Chicago—center of the industry—to Europe, Africa and near east areas of Asia.

2. The majority of BALLYHOO games were placed directly on tobacco counters, pharmacy counters, restaurant counters and similar crowded but convenient spaces in retail establishments. However, a metal stand was available for use with BALLYHOO at (U.S.) \$2.50 extra.

The evolution of pinball proceeded along two major lines: (1) technology of construction; (2) principles of play. The two forward trends in pinball design must, for convenience, be separately considered.



Although a typical single-player flipper-type pinball game, illustrated, is designed for play by one player, two or more players may play competitively, each player shooting a complete game before yielding to the next player.

Introduction of Electricity

The first notable progress in pinball was the graduation from the status of counter-top¹ accessory to the position of an independent item of furniture with legs integral to the machine, permitting the gradual enlargement in size to the present dimensions of 23 in. wide, 53 in. long.

Of greater importance than size was the adaptation of electricity to pinball purposes, which occurred in 1933². The first source of electrical energy for powered pinball was the dry cell voltaic battery, but within two years the games were connected to the electrical outlets of locations, a transformer being installed in each machine to reduce the high "house" voltage to the lower voltages used in the operation and illumination of pinball.

As in the case of slot-machines, since 1963, electrical circuitry in pinball, since 1933, encouraged a profusion of epochal improvements in pinball technology.

The simplest electrical device in pinball is the switch, which—in response to the pressure of the ball in play—closes or opens, thus closing or opening portions of the total electrical circuitry for various purpose related to play action and scoring. Although widely used in the typical pinball game, the ordinary switch is the least important circuit link employed in pinball. By 1936 three elaborations of the switch appeared in pinball games: (1) the relay³, (2) the stepping switch⁴, (3) the cam-controlled switch⁵.

Probably the most significant electrical apparatus in pinball is the solenoid⁶, first used on the playfield of FLEET—a popular game of 1934—and destined to be a major motive force in pinball.

1. Coin-operated counter-top amusement devices, not related to pinball, preceded pinball and continued in use after pinball moved from the counter-top. However, counter-top machines largely vanished from the amusement scene by the middle of the current century.

2. Electrical energy was first used in pinball to operate the payout mechanism of ROCKET, which delivered awards automatically in coins.

Automatic payout pinball games continued in limited use from 1933 to 1950.

3. A relay consists of 4 essential components: (1) a switch or a series of switches in a stack, all secured by a common fastener (or several such switch stacks); (2) a switch-actuator, fabricated of electrically non-conductive material with slots which engage the movable blade of each switch; (3) an electromagnet; (4) an armature, which is a hinged, spring-loaded, movable iron flap, attached to the electromagnet but normally not touching the central iron core of the electromagnet.

When an electrical current is caused to flow through the copper wire coil of the electromagnet, the core is magnetized, i.e., acquires the magnetic property of attracting iron. The iron armature is magnetically pulled to the magnetized core, the force of magnetism overcoming the restraining force of the spring attached to the armature. Being engaged with the switch-actuator, the magnetically moved armature moves the actuator; and the movement of the actuator causes the engaged movable switch blades to flex, thus closing or opening the switches in accordance with the predetermined function of the relay.

The displacement of the switch blades continues until the electrical current ceases to flow through the coil, demagnetizing the core, permitting the spring load to pull the armature up from the core, reversing the movement of the switch-actuator and, thus, returning the movable switch blades to normal position.

The purpose of a relay is twofold: (1) to maintain the relay switches in the desired closed or open position for a predetermined period of time; (2) to permit a single electrical impulse—through the coil of the electromagnet—to operate a multiplicity of switches. Thus, in a typical pinball game the out-hole relay—energized by a ball entering the out-hole and closing a single switch—includes 6 different relay switches, which close or open several sub-circuits, effecting the various phenomena desired by the entrance of a ball into the out-hole.

Several specialized types of relays are used in pinball, e.g., the interlocking relay and the trip relay. However, description of the basic relay should suffice to suggest the vital role of the relay, three dozen of which may be employed in a pinball game.

4. A stepping switch consists of two basic components, the first of which, the contact plate, is fabricated of electrically non-conductive material. The conductive element of the contact plate is either a series of brass rivets, affixed in the perimeter of the plate, or a "printed" circuit, which is a copper pattern adhering to the contact plate, after the undesired portions of an overall copper coat—applied to the plate by electrolysis—has been acid etched off of the plate.

Soldered to the rivets—or to the outer termini of the "printed" circuit—are electrically conductive wires, forming potential partial circuits to various apparatus of the game.

The second basic component of a stepping switch is the wiper assembly, comprised of several copper blades, affixed to a common rotatable axis, separated by discs of electrically non-conductive material, and extending outwardly from the axis in a "spider" pattern.

Soldered to the inner termini of the blades are wires which form the second section of the potential circuits described in respect to the contact plate.

When the wiper assembly rotates, the wiper blades glide across the rivets—or the surface of the "printed" circuit—causing the several potential circuits to be complete and effective circuits, momentarily and successively or in steps, as the term "stepping switch" implies.

The motive force which causes the wiper assembly to rotate is the solenoid, described in note 6, below.

5. A cam-controlled switch is a switch which closes briefly, then opens again—or opens briefly, then closes again—in response to the pressure of a generally circular but irregularly contoured cam, rotating tangentially to the lower blade of the switch.

Cam-controlled switches are mounted in a parallel bank of switches—or, usually, stacks of several switches—each switch or switch stack being controlled by a separate cam, all of which are affixed to a common motor-rotated axis. As many as a dozen differently contoured cams may be employed in a bank of cam-controlled switches.

6. The solenoid is based on the same fundamental principle of physics which is the basis of the electromagnet, described in note 3, at left, i.e., the establishment of a magnetic field of force within a coil of wire, when an electrical current is caused to flow through the coil.

The modern solenoid consists of two essential components: (1) a coil of wire wound to produce the hollow cylinder for which the solenoid is named, i.e., from the Greek word—"solen"—for pipe; (2) a plunger, a spring-loaded iron rod, which is inserted in the coil with only sufficient clearance to permit the plunger freely to move, as a piston, within the coil.

When an electrical current is caused to flow through the coil, a magnetic field is produced within the cylindrical cavity of the coil, i.e., the coil acts as a magnet. The iron plunger is magnetically—almost violently—pulled into the cavity. When the current ceases, demagnetizing the coil, the spring load on the plunger immediately returns the plunger to normal position.

Depending on the design of a particular solenoid, the magnetic movement of the plunger may pull any apparatus to which the outer end of the plunger is linked, push any object which the plunger contacts or merely strike a surface, as a bell or a chime.

The tremendous importance of the solenoid to pinball design is demonstrated in the chapter on Principles of Pinball Play.

Development of Coin Mechanism

The coin mechanism used in BALLYHOO and other early pinball games was an extremely primitive device—simply a narrow, horizontally disposed, sliding metal plate with which the player pushed a coin into the cabinet, the coin depressing a latch to release balls for play. Although frequently modified to reduce the muscular effort required to deposit a coin—and to minimize the hazard of “counterfeit” coins called slugs—the old coin-slide continued to protrude from the front of pinball games until production of pinball was suspended in 1942, as a wartime measure. When pinball manufacture was resumed in 1946, the first convenient drop-type coin chute appeared.

Continuously improved through the years, the present drop chute is a sophisticated and sensitive apparatus, quickly accepting the proper coin, while rejecting improper coins. Bally Manufacturing Corporation, cited in note 1, page 6, presently ships pinball game with coin chutes designed, respectively, to accept 50 different coins of 25 different nations, from the 5 and 10 cents coins of Australia to the 5, 10 and 20 ngwee coins of Zambia—and to reject slugs and coins foreign to each nation.

During the past decade, pinball games have usually been manufactured with 3 separate coin chutes, each accepting a different denomination of coin. The purpose of triple chutes is threefold: (1) to accommodate the various coins in a player's possession; (2) to permit operators to establish a play price for which no single coin exists; (3) to encourage repeated play by discounting the price per game, when a player engages to play several successive games.

For example, in Austria the basic play price of a single game is 2S (2 schillings). But no 2S coin is minted, the common denominations being 1S, 5S and 10S. The first coin chute on a pinball destined for delivery to Austria is, therefore, designed to accept the 1S coin and is captioned (in the German language) to direct the player to deposit two 1S coins for one play. The second chute accepts the 5S coin, which entitles the player to play 3 games. The third chute accepts the 10S coin, for which the player can play 6 games. The price per game is, thus, discounted, when either 5S or 10S is deposited.

Multiple-Player Pinball

An incidental purpose of a coin-chute capable of crediting several successive games is to permit two or more players, playing in competition, to share the expense of play. Indeed, since 1960, departing from the traditional single-player pinball game, manufacturers have produced games designed to encourage competitive play. While single-player games continue regularly to appear on the market, manufacturers also periodically produce 2-player¹ and 4-player¹ games.



A typical 2-player pinball game may be played by a single player or, competitively, by two players, shooting alternately until the allotted number of balls per player have been shot.

1. A 2-player game may be played by a single player or by 2 players. A 4-player game may be played by a single player or by 2, 3 or 4 players.

When two or more players competitively play a multiple-player game, each player shoots a ball in turn, until the allotted number of balls per player have been shot; and the score of each player is separately registered on a separate totalizer. During play, the score of each player may advance dramatically beyond the score or scores of the other player or players—or decline relatively to an opponent's score—thus intensifying the competitive spirit and the pleasure of play.

Duration of Play

Reference in the preceding paragraph to “the allotted number of balls” requires a brief historical survey of the quantity of balls at the disposal of a pinball player.

As pinball games, following BALLYHOO, increased in complexity and cost, the pricing of 7 balls for (U.S.) 1 cent was abandoned; and for several years the common pricing was 10 balls¹ for (U.S.) 5 cents. In 1933, when glass marbles were replaced by polished steel ball bearings, the number of balls per game was reduced to 5. Today, the standard pinball game is adjustable to either 5-ball or 3-ball play; and—in an era of monetary inflation—3-ball play is increasingly favored by operators to reduce the duration of play and, thus, increase hourly earnings.

Illumination and Scoring

Three familiar characteristics of modern pinball, being closely related, evolved in unison: (1) illumination, (2) automatic scoring, (3) the back cabinet, which in current pinball technology is the primary device to attract players to a game.

Illumination and automatic scoring appeared simultaneously in SKYSCRAPER, a 10-ball game of 1933. The facade of a “skyscraper” office building lay prone on the surface of the playfield. As balls were shot into numbered holes, corresponding numbers painted on the “windows” of the “skyscraper” were lighted to indicate the advancing score. The total sum was, as in earlier pinball, determined by addition in the player's head.

In 1935 a low back cabinet was added to pinball; and both illumination and scoring were concentrated in the back cabinet.

The first truly automatic score-indicator was a metal disc, located in the back cabinet and perforated with small holes grouped in the configuration of numerals. As the balls in play hit various scoring objectives, the disc rotated; and the light of a lamp behind the disc shone through the holes to project the advancing score on a white translucent area of the back cabinet frontal glass. Obviously, the device was limited by size to the projection of comparatively low totals.

As the desire for very high scores intensified in the ego of players—and the advertising value of the

frontal glass was increasingly recognized—the back cabinet was gradually enlarged; and the glass was chiefly ornamented with several series of illuminable numbered panels—1 through 9; 10 through 90; 100 through 900; 1000 through 9,000; 10,000 through 90,000. If, for example 80,000, 7,000, 600, 50 and 4 remained lit at the end of the game, the final score was 87,654. The player was obliged to revert to the early method of mentally summarizing the score; and the flashy but sprawly numeral panels foreclosed the possibility of the 2-player and 4-player games previously described—a development necessarily postponed until the invention in 1958 of the revolving drum counter currently used in pinball.

The Drum Score Counter

The drum score counter is similar in principle to the odometer which registers miles or kilometers in an automobile, consisting of 4 parallel, vertically disposed plastic wheels or drums on a common axis. The digits 1 through 9, plus a zero, are painted on the circumferential surface of each drum. Usually, a stationary “dummy” segment of a drum, marked only with a zero, is added. As the drums rotate successively, in response to the player's skill in shooting balls, any score—from 10 to 99,990—may be registered as rapidly as the ball action commands. When a coin is deposited to start a succeeding game, the drums automatically reset to 00,000. The motive force which advances the visible score by revolving the drums is the solenoid described in note 6, page 23. Reset to zero position is by simple spring action.

The Replay Mechanism

Although the drum score counter is in a high category of pinball progress, probably the top rank in pinball technology must be accorded to the Replay Mechanism.

From the earliest era of pinball, manufacturers and operators sought a means to recognize extraordinary skill with modest awards. No satisfactory solution² to the problem of “patting the player on the back” was found until the invention in 1941 of the Replay Mechanism, which permits a player who attains a specified score³ to continue to play without deposit of coins.

Each Replay is a right to play, free of charge, a complete game of 3 or 5 balls, depending on the price.

1. A specialized type of pinball—the one-ball game—was popular from 1935 to 1950, but, being obsolete today, is not considered in a general survey of Coin-Operated Amusement.

2. Early efforts to reward skilled players involved merchandise prizes or actual coins, as described in note 2, page 23.

3. A player may also be entitled to one replay if the last 2 digits of his final score match the 2 digits which light on the backglass at the end of the game.

ing of a particular machine, as previously described. The number of Replays to which a player may become entitled, while playing pinball, is displayed through the glass of the back cabinet by means of a Replay Counter, similar in operation to a single drum of the score counter. Replays credited on the Counter are obtained by the player simply by pressing a Replay Button, the Counter resetting to zero, credit by credit, as the Replays are played.

Although the standard Replay Counter is capable of crediting up to 25 Replays, a player is seldom sufficiently skilled to "win" in excess of 3 or 4 Replays in a single game. Indeed, score cards posted on pin-

ball games usually provide for only a maximum of 4 Replays per game.

Although not permitted in some jurisdictions of the United States¹, the Replay Mechanism is in general use throughout the world and is, undoubtedly, a major factor in the continued popularity of pinball—second only to the innovative principles of play, which remain to be discussed.

1. Some jurisdictions permit only Add-A-Ball play in which, during the course of a game, a player receives additional balls in reward for attaining specified scores. Most pinball games are convertible to either Replay or Add-A-Ball play.

A typical 4-player flipper-type pinball game, illustrated on the opposite page, may be played by one player or by two, three or four players in competition, each paying the price of a complete game and each shooting a ball in turn until the allotted number of balls per player are shot. A detailed view of the playfield appears on page 32.



Principles of Pinball Play

A MASSIVE BOOK would be required to describe the innumeral scoring objectives which, through the years, have been incorporated into pinball, ranging from the pin-guarded hole to a ray of light which, when momentarily blocked by the passage of a ball, influenced a photoelectric cell¹ to add to the player's score²; and details of obsoleted pinball targets could interest only an antiquarian. However, a review of present-day scoring apparatus—with occasional reference to antecedent devices—is useful to an understanding of the continued popularity of pinball.

Rollovers and Buttons

The simplest pinball scoring device is a switch-actuator, which protrudes slightly above the surface of the playfield and, when depressed by the passage of a ball, closes or opens a switch beneath the playfield. One type of surface switch-actuator, the Rollover, is formed of wire; a second type, the Button, is cast of plastic. Both styles must be carefully designed to respond to the pressure of a rapidly moving ball, without obstructing the free movement of the ball.

Buttons and Rollovers are widely used in pinball technique; and, although simple in operation, are usually extremely important to the play of a particular game. Often, in addition to adding to his score by hitting a Button or Rollover, a player may qualify other targets as scoring objectives, increase the score-value of designated targets, or activate apparatus such as the Kickback Kicker, described on page 30, or the Free Ball Gate, described on page 31.

Bumpers and Targets

As related on page 23, the solenoid, described in note 6, page 23, was first used in FLEET, manufactured in 1934. Balls were prevented by metal rails from direct entrance into several high-scoring holes on the FLEET playfield; and, in order to place a ball in a guarded hole, the player first shot the ball into the mouth of a miniature cannon aimed at a guarded hole. Entering the cannon, the ball closed a switch, energizing a solenoid, the plunger of which forcibly propelled the ball into the desired high-scoring hole.

Two years after the appearance of FLEET, Bally Manufacturing Corporation introduced a game appropriately named BUMPER, the playfield being studded with a dozen coiled wire springs called bumpers. Each bumper was suspended from an upright post centered within the coil of the bumper. When a ball struck any point in the perimeter of a bumper, the spring structure swerved inwardly toward the post, closing an electrical switch to advance the player's score by the indicated value of the hit bumper.

The spring bumper continued as a favored scoring objective, until production of pinball was suspended in 1942. When manufacture was resumed in 1946, the bumper principle was wedded to the solenoid to produce a scoring apparatus which is never absent from the playfield of modern pinball—the Thumper Bumper.

The design of the Thumper Bumper may be conveniently described by enumeration of essential components, which, incidentally, reflects the general principles of other solenoid-operated devices:

- (1) Stationary components, i.e.,
 - (A) The Body, a hollow plastic cup which serves
 - (a) To attach the Thumper Bumper assembly to the playfield,
 - (b) To position the Skirt relatively to the entire Thumper Bumper assembly,
 - (c) To position the Flange & Stud assembly relatively to the entire Thumper Bumper assembly,
 - (d) To provide a base for a detachable Cap and a housing for a lamp by which the Cap may be illuminated;
 - (B) The Cap, a decorative inverted "saucer" fabricated of translucent plastic, attached to the Body by means of screws, and usually marked with the score-value of the Thumper Bumper;
 - (C) The Case, a plastic member directly below and mating with the Body by means of press-fit studs, serving
 - (a) To position the entire Thumper Bumper relatively to the playfield,
 - (b) To provide a retainer for a spring, which returns the Skirt to normal position, after being depressed by the impact of a ball;
- (2) Movable components, i.e.,
 - (A) The Skirt, a thin plastic ring positioned concentrically with the entire Thumper Bumper assembly, the upper surface being tapered, upwardly and inwardly from the outer circumference, while the lower surface is flat and normally parallel with and slightly elevated above the playfield, a slender plastic "tail" extending from the center of the flat surface downwardly through the Case and the hole in the playfield in which the Case is seated;

1. The electrical characteristics of a photoelectric cell are modified by the action of light.

2. The only photoelectric pinball game manufactured, lacking the kinetic impact of a ball against a tangible target, was a notable failure.

(B) The Flange & Stud assembly, consisting of,

(a) The Flange, a cupped metal ring, positioned concentrically with the entire Thumper Bumper, flared upwardly and outwardly from the inner to the outer circumference, with the upper edge being normally parallel with and slightly below the lower surface of the Cap,

(b) Two elongated metal studs or rods, attached to the Flange and extending downwardly through holes in the Skirt and holes in the playfield to link with the motive component;

(3) The motive component, i.e., a solenoid, generally as described in note 6, page 23.

A ball shot against any point on the perimeter of a Thumper Bumper rolls up the tapered surface of the Skirt, depressing the Skirt sufficiently to cause the "tail" of the Skirt to close a switch directly below the Thumper Bumper. The closed switch completes a sub-circuit which (a) registers points gained by hitting the Thumper Bumper, (b) energizes the solenoid coil. The solenoid plunger is drawn forcibly downward by the magnetic pull of the energized coil. The plunger being attached by means of Studs to the Flange of the Flange & Stud Assembly, the Flange is pulled violently downward, the flared rim of the Flange striking the ball and forcibly propelling the ball outward from the Thumper Bumper. A hit against a Thumper Bumper, therefore, not only adds to the score, but also intensifies ball action—the "thumper-bumped" ball usually slamming against other scoring objectives.

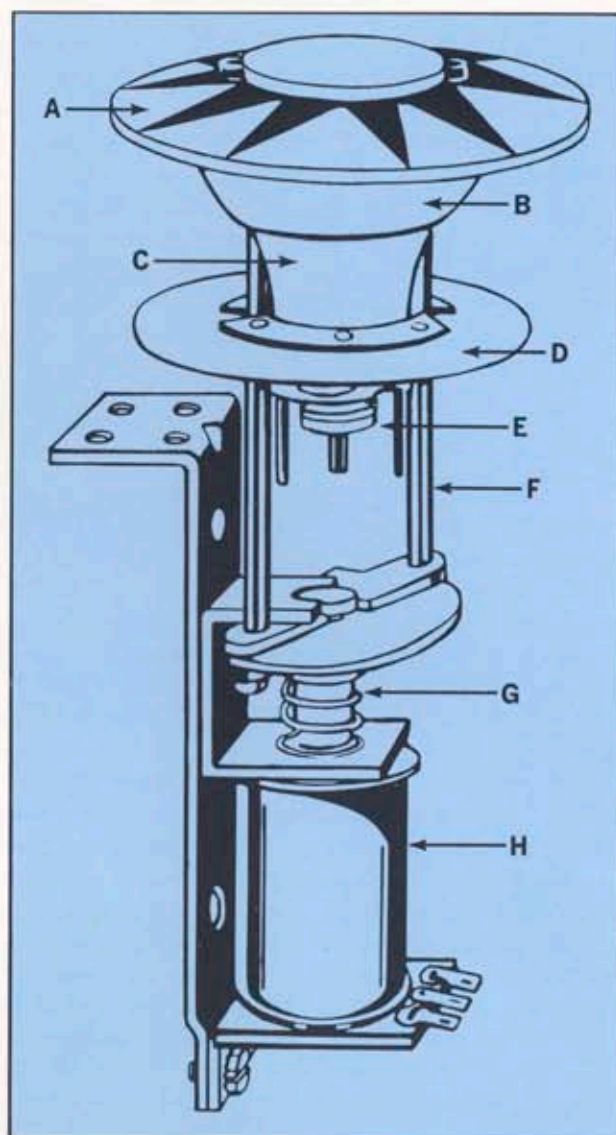
When the ball is propelled away from the Thumper Bumper, the Skirt is returned to normal position by the spring housed in the Case. As the solenoid plunger nears the end of the downward stroke, a projection attached to the plunger opens a second switch, demagnetizing the coil. A spring load on the plunger returns the plunger—and, thus, the Flange & Coil Assembly—to normal position.

Another type of bumper is the Mushroom Bumper, so called because of resemblance to a mushroom or toadstool. The Mushroom Bumper consists essentially of (a) the Post, attached to the playfield, and (b) a spring-loaded Cap & Plunger, the Plunger section being loosely inserted in the hollow cavity of the Post and pressing against the movable blade of a switch, normally maintaining the switch in the open position. When a ball contacts a Mushroom Bumper, pressure of the ball against the lower surface of the Cap elevates the Cap & Plunger, releasing the restraint on the movable switch blade. The switch is momentarily closed effecting the predetermined result of a hit against the Bumper. As the ball rebounds from the Bumper—with the assist of an elastic rubber ring stretched around the Post—the

spring load returns the Cap & Plunger to normal position, causing the switch to return to the normal open position.

Related to bumpers in function is the Target, which is essentially a vertically disposed switch, projecting above the surface of the playfield, with a colored disc attached to the movable blade. When a ball strikes a Target, the movable blade is flexed, momentarily closing the switch to effect the scoring or other purpose of the Target.

Although neither the Target nor the Mushroom Bumper induce the dramatic action which a Thumper Bumper imparts to a ball, both possess the merit of providing important skill objectives in considerably less space than required by a Thumper Bumper. The number of Targets and Mushroom Bumpers on a playfield, therefore, usually exceeds the number of Thumper Bumpers.



Generalized view of Thumper Bumper, showing components: A, Cap; B, Flange of Flange & Stud Assembly; C, Body; D, Skirt; E, Case; F, Stud of Flange & Stud Assembly; G, spring-loaded Plunger of the Solenoid; H, Coil of Solenoid.

As in the case of Rollovers and Buttons, Thumper Bumpers, Mushroom Bumpers and Targets may perform functions other than addition to the total score, often acting, when hit, as "keys" which open previously closed avenues to advantageous skill objectives.

The score value of the Thumper Bumper, Mushroom Bumper or Target may increase—or the auxiliary function may become effective—during play either on a random "mystery" basis, effected by the internal mechanism, or as a result of the player's skill in hitting designated "key" objectives. The alteration in potency is signalled by illumination of the translucent Thumper Bumper Cap or of a translucent plastic disc set flush with the surface of the playfield and adjacent to the related Target or Mushroom Bumper.

Kickers

The pinball apparatus which excels all other scoring objectives in imparting energetic action to the ball is the Kicker, 3 principal styles of which are common on pinball playfields. All are activated by the solenoid, described in note 6, page 23.

(A) The Slingshot Kicker¹ is never absent from a pinball playfield. Usually located at the lower end of the field, the purpose of a Slingshot Kicker—in addition to scoring points—is to propel the ball back up toward the upper end of the playfield, prolonging play, as the violently kicked ball strikes scoring objectives which may have been missed during the original zig-zag course of the ball, from top to bottom of the playfield.

(B) Another type of Kicker designed to volley the ball back toward the top of the playfield for a "repeat performance" is the Kickback Kicker, which is frequently but not invariably used in pinball. Located in the left out-alley, the Kickback Kicker serves a double purpose: (1) to rescue the ball from sinking in the out-hole, (2) to return the ball to continued scoring action. However, the Kickback Kicker is active only when a playfield disc, adjacent to the Kicker, is illuminated, either on a "mystery" random basis or when the prescribed "key" target is hit, depending on the design of a particular game.

(C) An important Kicker included in all² pinball games is the Ball Ejector, a solenoid-activated kicking device located at the bottom of a shallow hole in the playfield, commonly called a kickout hole, although a fanciful title, related to the theme of a particular game, is often applied to the hole.

A ball shot into a kickout hole closes a switch, registering the score value of the hole—or effecting auxiliary functions assigned to the hole—and energizing the solenoid to kick the ball out of the hole. Ejection of a ball from a kickout hole may occur immediately or may be delayed³ until a later ball hits a designated kickout trigger hole. In either case

the ball is shot from the hole with considerable force, usually resulting in extraordinary scoring action.

Bonus Scores

When pinball manufacture was resumed in 1946, after wartime suspension, a new style of scoring technique—the Bonus—was introduced. The Bonus is a tentative score, which increasingly accumulates in the course of play but is not added to the player's final score until he succeeds in hitting a "Collect Bonus" scoring objective⁴.

The original Bonus arrangement, which continues in use today, is known as the Advancing Bonus—usually with a thematic title. The advance of the Bonus is usually in increments of 1,000—from, for example, 1,000 to 10,000—indicated by successive illumination of numbered plastic discs in the surface of the playfield and is in response to the player's success in hitting an "Advance Bonus" target.

The highest lit Bonus score remains lit until a "Collect Bonus" target is hit, when the Bonus value is transferred to the score counter described on page 25, while the Bonus indicator resets to the lowest Bonus value. If a player fails to "collect" the Bonus, the indicator may reset to 1,000 as each ball enters the out-hole. Usually, however, the highest lit Bonus remains lit—or increases to a higher value—until

1. Contact of a ball with a Slingshot Kicker is against the outer radial surface of an elastic rubber ring, which is stretched tautly between two posts, providing a "target" 5 in. long. Centrally located between the posts and within the encircling rubber ring is a solenoid-operated kicker arm, which projects above the surface of the playfield between two vertically disposed switches, the movable blade of each switch touching the inner radial surface of the rubber ring.

When a ball strikes any point along the expanse of the rubber ring, the pressure of the ring against the movable switch blades momentarily closes electrical circuits which (a) register the score-value of the Slingshot Kicker, (b) energizes the ball-kicking solenoid.

Similar to the Slingshot Kicker in design and scoring function is the Rebound, the rubber ring "target" area of which may vary from 2 in. to 5 in. in length, depending on the position of a particular Rebound. The Rebound utilizes only one switch, centrally located between the posts; and the solenoid kicker is not used, the ball merely bouncing off the elastic rubber ring. Rebounds are chiefly stationed along the sides of the playfield to provide scoring capability to otherwise "dead" surfaces.

2. When kickout holes are not included in the play scheme of a game, the Ball Ejector is, nevertheless, the apparatus which delivers balls from the internal mechanisms to the ball-shooter.

3. In some games 2 balls may be captive in 2 separate kickout holes. When a third ball is shot to hit targets which eject balls from both kickout holes, 3 balls may be simultaneously on the playfield, resulting in a frenzy of scoring action, as the balls collide and carom to hit scoring objectives.

4. Some games incorporate a specialized style of Bonus known as the Spell-Name Bonus in which the highest lit tentative Bonus score is "collected" when the player succeeds—by hitting scoring objectives identified by letters of the alphabet—in lighting all the letters which compose the name of the game, the completely illuminated name appearing either on the backglass or on translucent plastic discs set in the surface of the playfield.

"collected" or until the end of the game, offering the player—or his opponent in a multiple player game—an opportunity to "collect" the Bonus with any ball shot. Some pinball games are so designed that the top accrued but tentative Bonus remains effective, from game to game, providing an inducement to continued play.

Early in 1971 Bally Manufacturing Corporation introduced a new type of Bonus, conveniently described as the Catch-a-Flash Bonus but usually identified by a name related to the decor of a particular game. When a "Start Bonus" target is hit, numbered illuminable plastic discs in the playfield light in rapid succession—1000, 2000, 3000, 4000, 5000—repeating the cycle from 1000 to 5000 until a "Collect Bonus" target is hit, when the player scores the Bonus value which is lit at the moment the "Collect" target is hit.

Free Balls, Extra Balls

An extremely popular pinball attraction, the Free Ball Gate, was introduced in 1963. Although varying in construction, all Free Ball Gates are designed to open a passage to the ball-shooter, when an "Open Gate" target is hit. A ball shot through an open Gate is, thus, returned to the player as a Free Ball. Usually, the Gate, not only opens an avenue to the ball-shooter but also closes an adjacent entry to the out-hole, channeling the ball from oblivion to further scoring action on the playfield.

Related to the Free Ball is the Extra Ball¹, which is not recovered from the playfield but is delivered directly from the internal mechanism to the ball shooter, when a ball in play hits the appropriate "Extra Ball" target.

The Flipper

From the earliest days of pinball, players habitually and with considerable gusto practiced the art of nudging—popularly described in a word of unknown etymology as "gunching"—an effort to manipulate ball action by pushing, wobbling, bumping or shaking the entire cabinet sufficiently to deflect the course of the ball without activating the "tilt" signal, which promptly penalizes² the player. Each "gunch" is usually accompanied by gyrations of the player's body and a psychokinetic grunt of command. The true pinball aficionado is remarkably adept at nudging and considers "brinkmanship"—with the "tilt" as adversary—as a skill factor equal in importance to the nicety with which he handles the ball shooter.

Because the nudge is a universal ritual of pinball play, Bally Manufacturing Corporation in 1947 introduced NUDGY, a pinball game with a built-in automated nudger. Merely by pressing a button on the side of the cabinet, a player could cause the entire playfield to jerk toward the rear of the cabinet, affecting the ball in play similarly to the action of a

manually "gunched" game. The experiment was not a success, players being convinced that their finesse in old-fashioned nudging excels the insensitive force of a solenoid.

However, two years after the fiasco of NUDGY, games appeared with a powerful automatic but localized "nudging" device. The new invention, called the Flipper, was an immediate and tremendous success and is used in all popular pinball games today. Indeed, the Flipper is such a mandatory characteristic of pinball that in France pinball games are commonly called *Les Flippers*.

The Flipper is a slightly tapered, rubber-clad plastic arm 3 in. long, disposed parallel to and slightly above the surface of the playfield. The wider extremity of the Flipper is secured to the upper end of a rotatable vertical post, the lower end of which is linked to a solenoid-operated lever apparatus. When the solenoid is energized, the abrupt rotation of the post causes the Flipper to swing in the manner of a bat with sufficient force to propel a Flipper-flipped ball the entire length of the playfield.

Invariably, in modern pinball design, a pair of Flippers guard the central exit to the out-hole³, with a 2 in. gap between the Flippers. Each Flipper is activated by the pressure of the player's finger on a Flipper button. The right Flipper button is visible on the right side of the cabinet of the game illustrated on page 27, the left button is positioned in a corresponding location on the left side of the cabinet.

As a ball nears the central out-hole exit, a player may, by pressing a Flipper button—or both buttons—flip or bat the ball back up the playfield, for two purposes: (1) rescue of the ball from the out-hole; (2) accumulation of additional score-points, as the reprieved ball busily hits scoring objectives.

Random propulsion of the ball, however, is not necessarily the most productive Flipper strategy. Although the casual player may merely jab the buttons impulsively, the practiced pinball scholar manipulates Flippers with deft delicacy. A typical display of Flipper finagling is described by Tom Buckley in his wise and witty essay, *Mother Is A Pinball Machine*⁴:

1. The Extra Ball feature is important in pinball design, not only as an attraction to players, but also because the Extra Ball circuitry facilitates conversion of a game from Replay scoring to Add-A-Ball scoring, described in note 1, page 26.

2. Formerly a "tilt" invalidated a player's total score. Now, however, when a game is nudged with sufficient violence to light the "tilt" signal, all scoring objectives are deactivated, and the "guilty" ball, i.e., the ball in play at the moment the "tilt" occurs, is prevented from further scoring. As the next ball is shot, the "tilt" signal disappears and scoring objectives are reactivated.

3. Occasionally, a game is designed with a third Flipper in the upper area of the playfield, activated by one of the standard Flipper buttons and flipping the ball toward a specially desirable scoring objective.

4. Published in the August, 1966 edition of *ESQUIRE*.

"He could press the button now, sending the ball back up the board, but without direction. Instead he waits for a fraction of a moment. Then he pivots the flipper slowly¹, trapping the ball in the acute angle that the ball makes with the rail alongside it. All concentration, he eases his fingers off the button. The ball rolls downward a half inch along the flipper. Now! Dead on the mark, the [flipped] ball hits the ultimate target . . ."

Mother Is A Pinball Machine prophesied that in the near future "... the technique of flipper play will be radically altered." The reference is to the Movable Flipper, the prototype of which Buckley examined, while visiting the Bally Manufacturing Corporation factory, and which, indeed, was introduced to the pinball public in October 1966. The technical term, Movable Flipper, is not precisely descriptive, for all Flippers are, as previously described, movable. The added significance of the word "movable" in Movable Flipper² is that, when a "Close Flippers" target is hit, both Flippers—and all attached operative paraphernalia—move inwardly, completely closing the gap between the Flippers, as shown at the bottom of the playfield illustrated at right³.

Although the Flippers may be activated, as usual, to bat balls back up the playfield, while the "Flipper gap" is closed⁴, a ball cannot possibly escape through the central out-hole exit and remains a busy captive on the playfield—until accidentally hitting an "Open Flippers" target, restoring the Flippers to normal positions with a 2 in. aperture between the two opposed ends of the Flipper arms.

As the present survey is on press, pinball designers and engineers in secluded research departments are developing new playfield actions and new scoring objectives, which will be the "sensations" of tomorrow. One may safely assume, however, that the basic devices reviewed will continue in use as familiar and favored characteristics of modern pinball.



1. Excepting the word "slowly," Buckley's description is accurate. The speed of Flipper movement is not variable. But a Flipper arm can be held in the position of extreme forward swing, forming the "acute angle" mentioned; and an adroit player can perform the maneuver which Buckley describes.

2. Advertising copywriters avoid the semantic difficulty by referring to a pair of Movable Flippers as the Flipper-Zipper, the allusion being, of course, to the zipper used to close gaps in garments.

3. Although Flippers are used in all modern pinball games, Movable Flippers are used only periodically to add a "deluxe" aspect.

4. In some games the "Flipper gap" is closed by a solenoid-operated device called a Playmore Post, the top of which is normally flush with the surface of the playfield in the open area between the Flippers. When an "Up Post" target is hit, the Post rises and blocks the "Flipper gap" as effectively as closed Movable Flippers.

Bird's-eye view of playfield of **FIREBALL**, which is completely illustrated on page 27, shows several old and new play principles. At the bottom of the panel, Moveable Flippers, described at left, appear in closed position, preventing ball from exiting through central out-hole. Toward the top of the playfield, at extreme left and right, a ball is visible in each of two kickout holes—temporarily held captive as, described on page 30. Directly to right of the left captive ball, is another ball, which demonstrates a very new technique. The ball—called a Messenger Ball—is permanently captive in a closed channel and moves only when hit by a ball in play, score-power of the Messenger Ball depending on distance the ball travels up the channel. If Messenger Ball travels to top of the channel, the Free Ball Gate, described on page 31, opens. Black circle illustrates another new technique. Flush with the surface of the playfield, the disc continuously spins, twirling balls into a frenzy of scoring action.

Bingo Pinball

THE ANCIENT GAME OF BINGO was adapted to pinball in 1951, a revolutionary revision in pinball design which required reversion to the partially guarded holes used in early pinball—holes individually numbered from 1 through 25¹ being the principal² scoring objectives on a bingo pinball playfield.

The similarity of bingo pinball to traditional bingo is in several respects quite superficial. Bingo—as played in gaming rooms of Nevada and at charitable soirees in New York—is played by a group of persons against the “house” for a cash prize. Bingo pinball is played by a lone player, his adversary being the complex of obstacles on the playfield, designed to challenge his ability as a player; his anticipated reward being merely Replays³, i.e., rights to continue to play free of charge. In group bingo the player purchases and holds a card—or several cards—on each of which is printed a random mixture of 25 numbers, arranged in 5 horizontal rows with 5 numbers in each row. The card⁴ in bingo pinball appears on the backglass of the game; and, although resembling a regulation bingo card, differs in an extremely important characteristic. Among the 25 numbers on a group-play bingo card—not necessarily all numbers in the series 1 through 25—numbers higher than the number 25 may appear. The 25 numbers on a bingo pinball card constitute a randomly arranged mix of the numbers 1 through 25, each number in the series—but no number higher than 25—being present.

The bingo pinball card, thus, includes no number beyond the player’s mastery of the playfield, scoring holes of which are correspondingly numbered—in numerical order from top to bottom and from left to right of the playfield, i.e., not irregularly arranged, as in the card.

As the bingo “house” caller draws numbered balls at random from a mechanical mixing device and announces each number drawn, players who find “called” numbers on their card or cards flip a sliding mask across the face of each “called” number. A player wins when numbers on a card are masked in a pattern stipulated prior to the start of play, e.g., all numbers on a card or the numbers along the four edges of a card or the numbers which form the letter X through the center of a card. The bingo pinball player endeavors to shoot 5 balls⁵ into numbered holes to light corresponding numbers in the backglass card, his ultimate purpose being to light 3, 4 or 5 adjoining numbers in a straight line—horizontal, vertical or diagonal.

As in all human enterprises, from selecting a career at age twenty-one to winning a spouse at any age, an element of luck is involved in bingo pinball play. But manual skill—or lack of skill—is a significant factor, not only in respect to a player’s ball-shooter “touch” to deliver a ball to the left or right side of the playfield, as scoring circumstances may

dictate, but also and particularly in regard to his use of the nudge—described on page 31—to deflect a ball from an unpropitiously numbered hole and toward a productively numbered hole. A practiced bingo pinball player can often “gunch” a ball across the entire width of the playfield, without activating the “tilt” signal. When ancillary tentative modes of winning⁶ are offered on the backglass and may be obtained, as added scoring objectives, by deposit of additional coins, a degree of judgment skill is usually required—the decision to continue to deposit or to refrain from depositing further extra coins.

Although deposit of a single coin entitles a player to play a complete game of bingo pinball, multiple-coin play is a distinguishing feature of bingo pinball. Indeed, a player may deposit an unlimited number of coins before shooting the first ball, his purpose being to (a) qualify for the ancillary modes of winning, mentioned in note 6, below, (b) to increase the score-values of 3, 4 or 5 in-line numbers which he proposes to light in the backglass card.

By advancing the score-values to the limits of his desired expenditure of extra coins—and subsequently succeeding in illuminating aligned numbers—a player may score a large quantity of Replays. Critics of bingo pinball scoff at the possibility of a successful player patiently playing off 200 or 300 Replays, suggesting that redemption of Replays⁷ is the invariable rule. The harsh judgment of bingo pinball is, however, invalidated by a device used in all bingo pinball games manufactured in recent years and identified by the activating key, popularly called the KumbacKey. If a player wins Replays in excess

1. In recent years 20-hole bingo playfields—with 20-number cards on the backglass—have been favored by designers. However, to facilitate the analogy with traditional bingo, references are to the original 25-hole, 25-number bingo pinball games.

2. In some bingo pinball games the passage of a ball across a Button, as described on page 28, may validate special scoring advantages.

3. Some jurisdictions authorize redemption of Replays in merchandise. An interesting example is Finland, where Replays may be redeemed in coupons, which may in turn be accumulated and traded for merchandise in participating department stores.

4. In some bingo pinball games, two, three or up to six cards are used. The player can win on any and all cards which qualify by deposit of additional coins.

5. After shooting the basic 5 balls, a player may obtain extra balls by deposit of additional coins.

6. Modes of winning other than by alignment of lit numbers on the card have been too numerous in the history of bingo pinball for detailed examination. A typical example is a signal which, when lit by deposit of additional coins, permits illumination of the 4 numbers in the corners of the card to score as 5-in-a-line.

7. See note 3, above.

of the quantity he can conveniently play at the moment, the location manager simply utilizes the key to remove accrued Replays from the Replay Register and gives the player a ticket which authorizes play of the cancelled Replays at another time. When the player returns, perhaps a week later, the location attendant, using the identical key which erased the Replays, restores to the Register the quantity of Replays the player may desire to play, writing a new ticket for Replays the player may wish further to defer.

Often, of course, players do not return to play their ticketed Replays. Indeed, a player need not—and frequently does not—bother to accept a deferred

play ticket. He sought to score an impressive number of Replays for psychological reasons—to demonstrate his clever superiority, to bolster his ego, perhaps to compensate for a recent disappointment—and, having achieved his goal, he requires no tangible certificate of his prowess. He walks away from his hoard of Replays—which the location management, nevertheless, promptly expunges—entirely satisfied with simple victory. He is the person Marshall McLuhan visualized, when he wrote in *Understanding Media*: “Games are a sort of artificial paradise . . . by which we interpret and complete the meaning of our daily lives. In games we devise means of nonspecialized participation in the larger drama of our time . . .”



BONUS 7, popular bingo pinball, departs from the traditional “in-line” method of scoring. Replays are scored by lighting numbers in color zones on card. Other modes of winning may qualify when additional coins are deposited.

Psychology of Pinball

FRENZIED BALL ACTION appears at first glance to be the basic ingredient, the *sine qua non*, of pinball. However, the pinball designer, while striving to animate his innovations with exciting and surprising action, is primarily guided by three psychological principles not related to the mere hustle and bustle of the ball.

Balance

If triumph in pinball, i.e., achievement of high scores and, perhaps, Replays, is extremely difficult to attain, a player who is aware of his usual competence may be discouraged by his inability to cope with a particular game and forego the game after repeated defeats. The casual, careless player will promptly abandon a "tough" game. Conversely, if success is a routine event for players of a game, all players will quickly be bored by the flaccid opposition. The pinball designer must, therefore, strike a balance between "too easy" and "too hard," between the challenge demanded by the dexterous, alert player and the less talented player's biological need to "make a winning sometime"—in the words of the sentimental song, *I'm Always Chasing Rainbows*.

The ways in which balance may be built into pinball are innumerable, usually involving "tricky" shots which are accomplished, not by skill alone, but by skill and "the breaks"—the gentle, mysterious assistance of Fortuna, who impartially smiles—or frowns—in turn on the champion and the duffer.

Verge of Success

Balance between success and failure in pinball play is not necessarily related to a player's final score. Equally important is the player's performance during play. The total score may not register Replays, but, if a player ends a game on the verge of success, his relative satisfaction usually prompts him to further play. Indeed, the slender margin of his defeat convinces him that the next game played will crown him with laurel. The phenomenon of confidence induced by slight failure is known in the pinball industry as "came-close-try-again" appeal—a quality which the

economic laws of pinball earning power compel all designers to incorporate in every game.

Terminal Suspense

Related to the "verge of success" principle are two types of pinball suspense, colloquially called "last inch suspense" and "last ball suspense." Both terms refer to the pleasurable anxiety experienced by a player who knows that his mediocre score may suddenly be elevated to a high or, at least, acceptable score—either by the scoring action of a ball within the "last inch" or two of the out-hole or by the activity of the "last ball" available for play.

Both modes of suspense must be present in an effectively designed pinball game; both may be generated in a variety of ways. A typical manner in which "last inch" suspense may be enjoyably relieved is assignment of a score-value of 1,000 to the left and right out-alleys, the 1,000 points gained, as a ball retires from play, often boosting a player's score from hopeless to encouraging status. An example of "last ball" suspense is a player's hope that the final ball of a game may hit a "Collect Bonus" target, as described on page 30, adding the tentative Bonus—which might be as high as 10,000—to the total score.

Progressing to the general psychology—one is tempted to use the word "philosophy"—of pinball, several propositions have been advanced. George W. Jenkins, retired sales manager of Bally Manufacturing Corporation, insisted that pinball offers vicarious adventure in a world in which the perils of the frontier are largely tamed. Another theory is that pinball offers a harmless method to discharge aggressive psychic hostility—a battle with a foe which "fights back" fiercely but without personal animosity. Mastery of pinball may, indeed, serve as an antidote for the vexations and frustrations which assail men and women.

McLuhan's dictum on games in general, quoted on page 34, is, of course, particularly applicable to pinball. However, the common sense explanation of the continued world wide popularity of pinball, through nearly half a century, may be that pinball is a simple, low-priced, easily comprehended and readily available form of Coin-Operated Amusement.

Arcade Equipment

HISTORICALLY, the term "arcade equipment" derives from a dictionary definition of arcade: "a long, arched building or gallery." The earliest forms of Coin-Operated Amusement¹ were housed in structures conforming to the definition, called penny arcades and located in the amusement parks which flourished in the western world, particularly in the United States, during the final decade of the nineteenth century and the first half of the twentieth century².

The success of arcades in amusement parks prompted entrepreneurs to establish independent arcades, usually interspersed between bleak barrooms, cheap restaurants, burlesque theaters, tattoo parlors and pawnshops in urban districts of low cost night life—the haunts of lonely, rootless men in quest of inexpensive entertainment.

Shortly after the end of World War II, amusement arcades, divested of risqué peep shows, appeared in the United States in commercial areas fre-

quented by the "family trade"—a development which in the course of time led to the coin-operated amusement centers which are increasingly major departments in retail general merchandise establishments.

Prior to the postwar refinement of amusement arcades, however, as early as 1940, coin-operated games described by both manufacturers and operators as "arcade equipment" escaped the confines of specialized amusement arcades and—in taverns, restaurants, hotel foyers, airway, bus and railway terminals—competed with pinball. The competition continues and, indeed, annually increases, as the technology of arcade games improves. Today the term "arcade equipment" is not used to imply suitability to a particular type of operating locale, but, rather, as a convenient—and extremely inclusive—classification of equipment.

Typical Arcade Games

Semantic purists include in the class of arcade equipment only innumerable styles of target shooting games, automobile racing or driving skill games, simulated aerobatics or flights to outer space, as well as games based on baseball, hockey, soccer or other athletic sports. The true essence of the arcade game is encapsulation of a dramatic or dangerous human activity on a scale with which players can cope—experiencing a vivid sense of adventurous confrontation, without the necessity of previous training or the perils of actual tests of endurance and courage.

Unlike pinball, in which the contest between man and machine occurs on a field frenetic with action but as formalized as a chessboard, the arcade game presents to the player a visually and audibly realistic "theater" of activity—a jungle in which ferocious beasts prowl and growl, a city attacked by bombers, a raceway crowded with automobiles as fierce and noisy as the jungle animals. Or, often, in order to intensify the make-believe terror of the play-theme, the scene is a surrealistic exaggeration of reality.

Miscellaneous Equipment

Equipment other than "typical arcade games" is often listed in the category of arcade equipment, e.g., (a) miniature bowling alleys, played either with balls

1. See Note 5, page 1.

2. As late as 1920, Chicago, Illinois, boasted of 5 amusement parks. As, first, the automobile increased the mobility of citizens in their search for pleasure, and, later television immobilized countless persons in their homes and neighborhood taverns—and land values rose—amusement parks gradually disappeared. The largest Chicago park, which sprawled across 80 acres (32.4 hectares), survived until 1965.



The young lady is shooting a ray of light at the photoelectric submarine target on page 37.

or with a heavy metal disc called a puck¹; (b) quiz games, which require players to attempt, by pressing appropriate buttons, to select correct answers to multiple-choice questions successively illuminated on the face of the game; (c) kiddie-rides, animated models of saddled horses or other animals, automobiles, airplanes, stagecoaches and other vehicles, which are patronized—usually under adult supervision—by children between three and twelve years of age.

Quiz games were introduced in 1947 and, although relatively unimportant as Coin-Operated Amusement, regularly appear in updated versions. Coin-operated bowling alleys in styles comparable to present-day models² crashed the field of Coin-Operated Amusement in 1949 with an impact equal to the furor which attended the advent of pinball in 1931. Although excessive size—as compared to pinball—and, possibly, the repetitive nature of bowling³ prevented coin-operated alleys from supplanting pinball in the affection of the public, bowling games remain a stable, successful type of equipment. Similarly, kiddie-rides, first popularized in 1952⁴, comprise a continuing, if minor, portion of the annual placement of Coin-Operated Amusement.

Arcade Game Renaissance

The modern renaissance of arcade equipment, i.e., the appearance of games equally acceptable to amusement arcades and to operators who serve taverns and similar locations, began in 1940. Not surprisingly, in view of war in progress in Europe and Asia and martial preparation in the United States, the new arcade games were all “gun” games, usually with targets depicting military combat on land and sea and in the air. Indeed, advertisements of one “gun” of the era, shown at right and on page 36, described the game as “designed to permit operators to cash in on popular interest in war and the National Defense Program.”

The earliest “gun” games of 1940 were photoelectric in principle, the player “shooting” a ray of light at a photoelectric cell⁵ affixed in the face of a moving target. Of course, sound effects, including “a sharp staccato machine gun bark”—to quote the advertisement previously mentioned—and the boom of explosions were added to avoid the dull silence of the ill-fated photoelectric pinball game described in note 2, page 28. A paramount advantage of photoelectric equipment was that a player might stand 10 or 15 feet from the target, discharging his harmless missiles of light over the heads of patrons at a bar or seated at tables.

Photoelectric “guns” were quickly supplemented, but not supplanted, by “guns” which fired steel pellets—ball bearings—within a “war zone” safely enclosed in transparent plastic. The impact of projectiles against the movable blades of switches

attached to targets briefly closed electrical circuits to register hits.

1. Another form of coin-operated game played with pucks is a table version of the historic deck and patio game, shuffleboard, which, however, is of minor importance in Coin-Operated Amusement.

2. Extremely miniaturized bowling games—some with a mannequin which the player manipulated to deliver the ball—appeared as early as 1935, but did not continue in public esteem.

3. Various departures from official bowling rules are offered to provide novelty, but the variety of scoring systems which may be developed around 10 pins remains limited.

4. A coin-operated model of a galloping horse was privately shown at the 1932 Coin Machine Convention. But, “left at the post” by the spectacular advent of pinball, the horse—first popular kiddie-ride—was stabled for two decades.

5. See note 1, page 28.



Target in **RAPID FIRE**, pioneer gun game of 1940, was a photoelectric cell in a submarine which dove “under water” and rose again in another section of the seascape. Gunstand—see page 36—could be placed 10 or 15 ft. from the target cabinet.

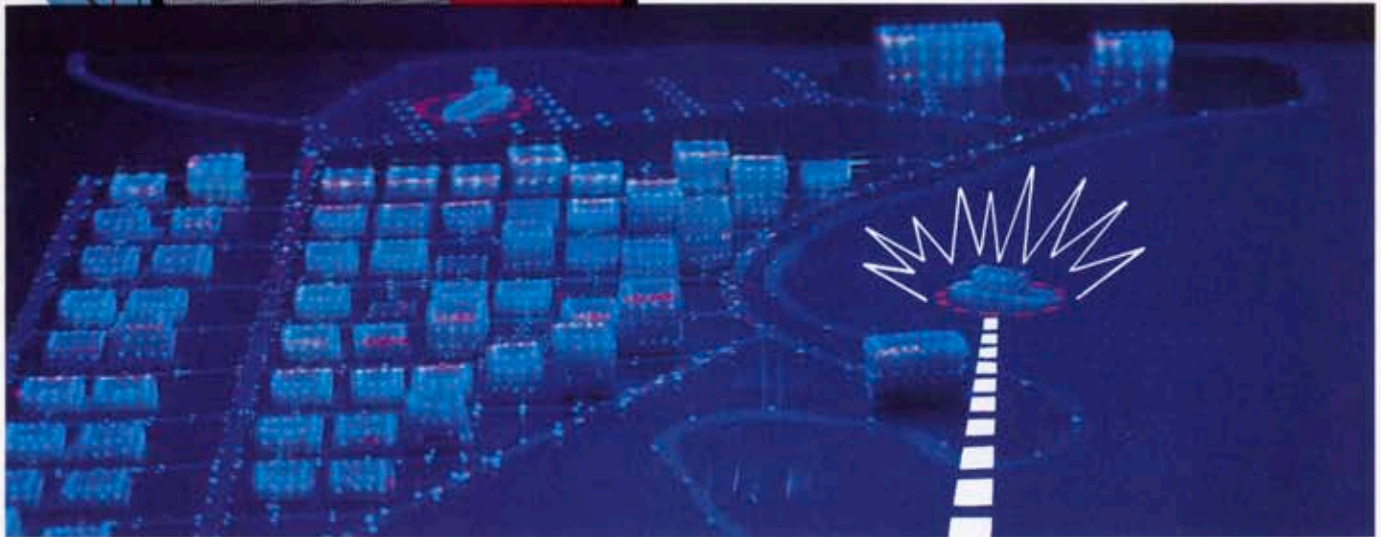
Post-War Arcade Games

Numerous models of both photoelectric and pellet "guns" were marketed in vast volume, until the manufacture of Coin-Operated Amusement was suspended in 1942. When production was resumed in 1946, two extremely important technological innovations were introduced in arcade game design—revolutionary concepts which continue in common use today.

First, in order to evoke an illusion of distance and depth, without unduly enlarging the front-to-back dimension of the cabinet, the scenery with attached moving targets is placed vertically in the cabinet, utilizing the entire height of the cabinet. By means of diagonally disposed mirrors, the target environment is "straightened out" and appears to the player, not only as on a horizontal plane, but also as extending to a horizon far beyond the rear wall of the cabinet.

Obviously, neither a ray of light nor a tangible projectile can be manipulated to influence targets concealed within the cabinet and visible to the player only as images in a mirror. The second post-war innovation was, therefore, developed as a necessary corollary to the first: imaginary alignment of weapon and target¹. When the weapon is so accurately aimed

1. The mirror and imaginary alignment techniques are utilized in arcade equipment other than target games. In automobile race games, for example, the car "driven" by the player weaves from lane to lane of the raceway by switching apparatus analogous to apparatus described in respect to target games, juxtaposition of the concealed switching apparatus being in response to the player's manipulation of a simulated steering wheel and accelerator.



Although white broken line and white burst are added to indicate a missile flight and hit, illustration is an actual color photograph of a section of the continuously changing 3-dimensional terrain which a player views when peering into the target area of **TARGET ZERO**. Terrain is mounted on an endless belt, traveling vertically within the cabinet, and capable of swerving to left or right in response to the player's manipulation of control-stick mounted on front of the cabinet. By means of a diagonally disposed mirror, the terrain appears to the player as on a horizontal plane. The

illusion is that the terrain is stationary and the bomber jet—with the player as pilot—is flying across the terrain. The swerving of the terrain evokes the illusion that the player is banking his jet to aim at red-circled targets. Missile is released by player pressing trigger button in the control stick. Although a nonfunctional ray of light streaks toward the target, a hit is accomplished by the imaginary trajectory method described above. Sound effects—missile screams and explosive booms—and a burst of red light around a hit target add to the illusion of air attack.

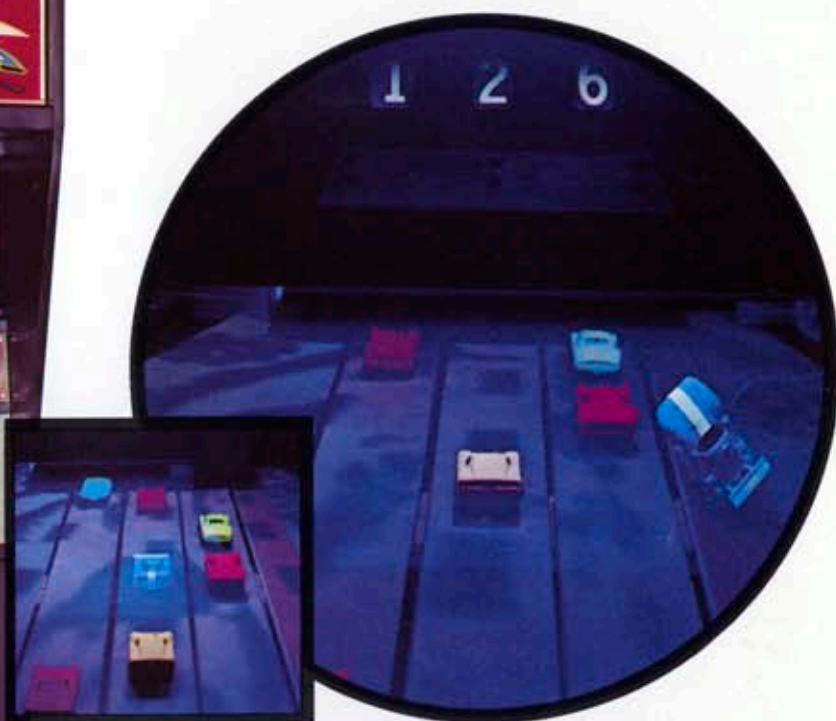
at the mirror image of a target that an actual emanation from the weapon would strike the image, then the juxtaposition of switching apparatus which moves with the weapon and switching apparatus which moves with the target is such that the electrical circuit partially completed by the player's finger pressure on the trigger is totally completed by the juxtaposed switching apparatus, causing the target to behave as if actually hit. The concealed target falls—or otherwise displays the effect of a hit—and a hit is registered on the score totalizer. The player sees the result of his skill in the mirror, although probably most players do not recognize the realistic

action as a "mirror trick." Usually a nonfunctional beam of colored light spurts from the weapon with each pull of the trigger, and appropriate sound effects add to the illusion of gunfire.

Although conventional methods of display are utilized to a considerable extent in arcade equipment, the majority of successful games today employ the mirror image and imaginary trajectory techniques. Like slot-machines and pinball, however, arcade games are subject to continuous development; and future equipment may well cause present-day arcade games to appear as old-fashioned as the early "guns" of 1940.



ROAD RUNNER challenges player to steer a racing car through fast moving traffic in a triple-track speedway and to control speed of his car by means of a foot-pedal accelerator at bottom of cabinet.



Illustrations are actual color photographs of action in **ROAD RUNNER**. Square inset shows player's car—blue car in center lane—successfully maneuvering between rival cars. Circled view shows result of a collision with a rival car. Player's car is hurled up in the air to land on the starting strip at right. Wrecked car remains on strip—losing mileage count—until player can safely steer his car back into the race. Rival cars are not mirror images, but 3-dimensional miniature automobiles, carried on endless belts at variable speeds, and viewed through a diagonally disposed transparent mirror. Driver's car—miniature automobile suspended above the raceway, out of the player's line of vision—is reflected in the mirror and, thus, superimposed on the directly viewed track. Mileage-loss wrecks are avoided if the player skillfully steers his mirror image car from lane to lane, while driving the car at maximum speed to score maximum miles before the end of the race. The illusion of acceleration of the speed of player's car is accomplished by causing belts which convey rival cars to reverse direction and move toward the player.



Bumper-type pool table, as illustrated, started the modern coin-operated pool table boom in 1954.

Pool Tables

COIN-OPERATED POOL TABLES preceded pinball by four years, being first offered to slot-machine operators in 1927. Although moderately successful for a brief period, particularly in southern and southwestern sections of the United States, the early pool tables did not continue as a permanent type of Coin-Operated Amusement. Probably, the attempt to compress official pool rules within the confines of a table sufficiently compact—20 in. by 40 in.—to permit use in small locations—and to sell for (U.S.) \$20.00—doomed the original coin-operated pool table to failure.

A coin-operated pool table in a size—4 ft. by 8 ft.—approximately conforming to regulation pool table dimensions was introduced in 1930, priced at (U.S.) \$160.00. Never attaining genuine popularity, the early big tables were forced from the market in 1932 by the emergence of pinball with earning power exceeding pool table profits and selling for 10 percent of the price of the table.

Modern Pool Tables

The problem of presenting an attractive challenge to pool players in a miniaturized table was finally solved by the invention in 1954 of the bumper-type pool table, similar to the illustration¹ at the top of the page. The cluster of rubber-clad posts in the center of the table forms an obstacle which compensates for the reduced playing area. Sizes of original bumper pool tables varied, but ultimately were standardized at 56 in. by 40 in.².

Bumper pool was immediately and tremendously successful; and many manufacturers³ of pinball and arcade equipment hastily converted assembly lines to bumper pool tables and variants⁴ of the basic bumper pool concept. The popularity of bumper pool encouraged manufacturers to build and operators to buy coin-operated regulation pool tables, i.e., tables dimensioned in accordance with official pool rules and without the central cluster of bumpers. Unlike the full-scale tables of 1930-1932, the modern coin-operated regulation pool tables quickly achieved world wide popularity.

Both bumper pool and regulation pool in coin-operated tables are widely played today; and every indication is that pool tables will continue to be extremely important in Coin-Operated Amusement.

1. Courtesy of Irving Kaye Company, Brooklyn, New York (U.S.A.), leading manufacturer of pool tables and related equipment.

2. Bumper pool, as a distinctive variant of the several styles of official pool, has attained such popularity that bumper-type pool tables are now manufactured, not only in compact models, but also in tables which approach official pool table dimensions, i.e., as large as 77 in. by 45 in.

3. Production of pool tables is now largely confined to manufacturers specializing in pool and billiard equipment.

4. Several amusing versions of bumper pool were offered, including one with a color sensing device to distinguish between red and white balls. The incredibly complicated rules of the novelty pool tables, however, foreclosed the possibility of success; and bumper pool, as illustrated, and official pool preempted the field of coin-operated pool tables.

Future of Coin-Operated Amusement

TECHNOLOGICALLY, Coin-Operated Amusement will, undoubtedly, continue to advance with the general progress in applied physical science. Electronic—as compared to electro-mechanical—principles are already employed to a limited degree for complex computations in bingo pinball and in arcade equipment, not only for sound effects, but also for actions not readily accomplished by electro-mechanical means and electronic techniques will probably be increasingly adapted to Coin-Operated Amusement, as presently unforeseen necessity arises.

Expansion of Operations

Operationally, two extremely important developments—at opposite ends of the amusement spectrum—are already highly visible on the future horizon of Coin-Operated Amusement.

First, the modern liberal attitude toward gaming, not only on the part of the public, but also on the part of government officials, augurs a substantial spread of slot-machines, during the current decade. Numerous States of the United States, squeezed between the constantly rising cost of governmental services and the restiveness of taxpayers, are devoting earnest attention to propositions to license and tax slot-machines. Similarly, other nations of the world have already legalized slot-machines or are moving in the direction of legalization.

Marketplace Playlands

Second to the anticipated expansion of slot-machine placement in the future of Coin-Operated Amusement is the growing importance of marketplace playlands—coin-operated amusement centers located in chain stores, discount houses and supermarkets¹. As managements of retail establishments discover that earnings of marketplace playlands, per square foot of floor space, equal—or often exceed—sales profits, they are increasingly disposed to allocate considerable areas to Coin-Operated Amusement.

Equipment installed in marketplace playlands—usually on a share-profit basis by operators who select and own the equipment—consists largely of arcade games, including bowling alleys and kiddie-rides, although pinball may also be used.

Aside from the cash flow directly generated by Coin-Operated Amusement, marketplace playlands result in two significant merchandising advantages. First, the supervised amusement centers provide convenient “parking places” for children, while mothers shop. Second, the presence of games equally attractive to adults and minors encourages periodic shop-

ping excursions by the entire family—with consequently increased sales, the habit of “impulse” buying being notoriously stronger in husbands than in wives watching a budget.

Related to the two trends discussed, is the rapidly increasing practice of installing slot-machine casinos² on cruise ships. Because minors are not permitted in the shipboard casinos, some lines are now planning areas with a selection of arcade equipment for the amusement of children traveling with their parents.

A third prospect for Coin-Operated Amusement should be considered in an appraisal of the future: the dawning awareness on the part of eastern European, African and Asian governments of the psychological value of simple, low cost amusement. As previously stated, the Ministry of Culture of the Union of Soviet Socialist Republics already operates amusement centers in Leningrad and Moscow, equipped with arcade games of western manufacture; and interest in Coin-Operated Amusement appears to be intensified in recent years in the controlled-economy bloc of nations. Several far eastern Asian nations, including the Republic of China (Taiwan), are presently considerable importers of all types of coin-operated equipment, from arcade games to slot-machines; and the exploitation of Coin-Operated Amusement in the People's Republic of China is not beyond the realm of eventual possibility. A number of African republics are displaying genuine interest in Coin-Operated Amusement for the triple purpose of (1) supplying an inexpensive diversion to citizens, (2) providing an added attraction to tourists, (3) generating tax revenue.

Starting as a trivial, small-shop enterprise in the late nineteenth century, Coin-Operated Amusement grew gradually to a major international industry, employing thousands of men and women around the world in every category of skill. The sudden surging spread of Coin-Operated Amusement, during the brief span of the current decade, presages spectacular growth, during the balance of the decade and beyond. Indeed, a common zest for pinball and other forms of Coin-Operated Amusement may one day be a bond between the peoples of the world at least as strong as cultural exchanges on “higher” levels of human activity.

1. The three terms mentioned signify in the United States various types of larger retail establishments, some limited to a specialty, e.g., food, others selling a wide variety of merchandise.

2. Table gaming is not feasible on shipboard because of the instability of a ship at sea—a factor which does not influence slot-machines.

