The Globe trotter

WINTER 1972 No. 687

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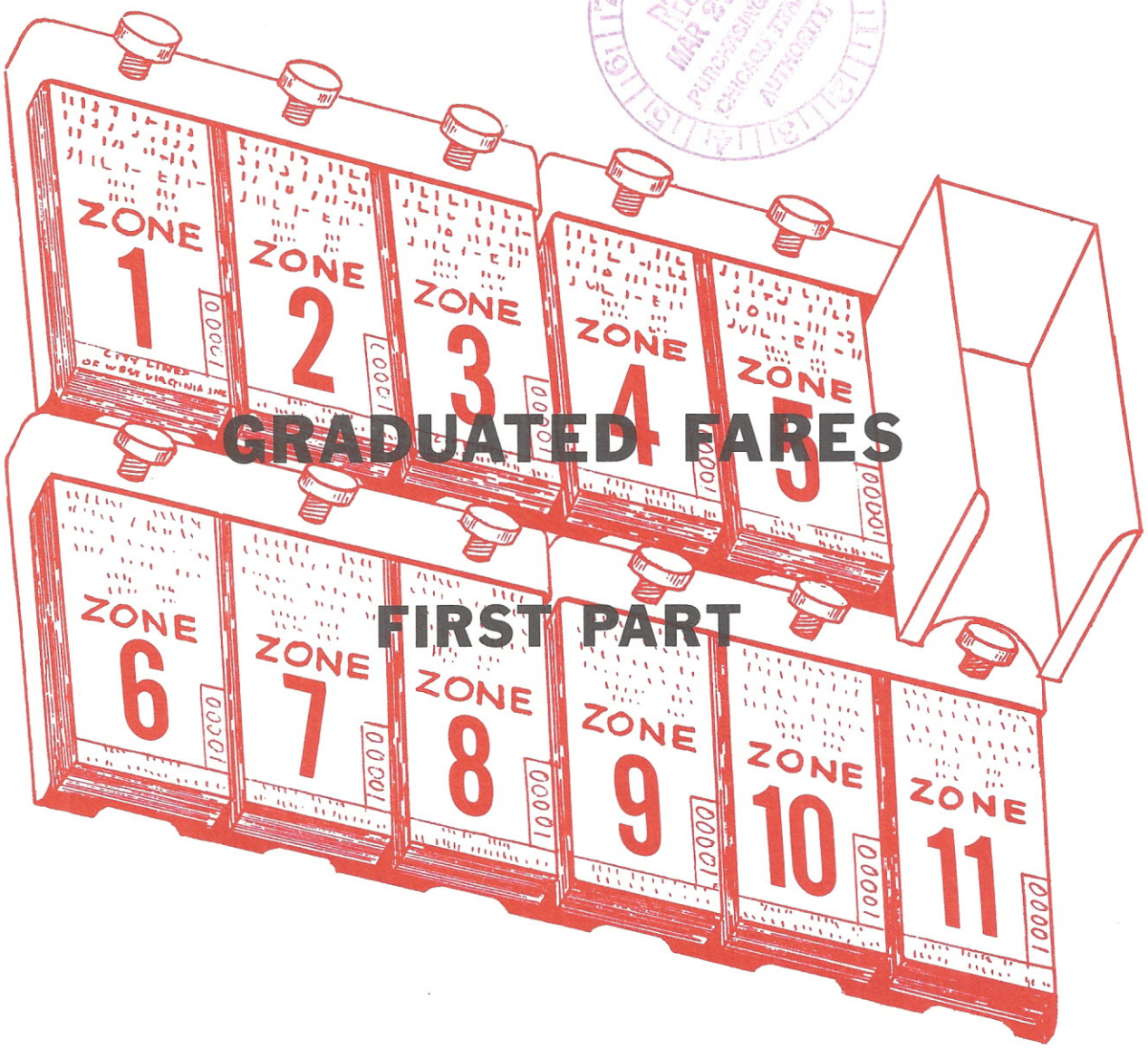

GRADUATED FARES

FIRST PART

GLOBE TICKET COMPANY

Tickets for Transit

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GRADUATED FARES, FIRST PART

AUTOMATED GRADUATED FARE COLLECTION ON RAPID TRANSIT

The electronic encoding of signals on tickets in Rapid Transit and the interpretation of such signals by companion equipment; such as turnstiles, which act upon that interpretation, is an art well enough developed. It is difficult to imagine that any rapid transit installation, building or in the planning stage, would not employ that sort of procedure in its fare collection.

It is well known that London Transport has experimented with this concept on several lines for a number of years. The Long Island Railroad used a form of it experimentally at several commuter stations. The Illinois Central commuter lines use it regularly. The much described Lindenwold Line out of Philadelphia into New Jersey had its fare collection procedure from the start designed for automated operation and has used it successfully since inaugurating service a few years ago.

The Bay Area Rapid Transit District (BART), in the San Francisco-Oakland area, has placed its contract for a sophisticated form of automated fare collection. The concept of automated collection is included in the plans for the rapid transit system of the Southern California Rapid Transit District (SCRTD) and in the systems under consideration or in the planning stage in other large cities.

It is certain that most new rapid transit installations will be built to include systems in which the distance traveled governs the fare to be paid. Many of the systems already in existence will be converted to automatic operation under graduated fare structures, because it is now technically and economically feasible for electronic equipment to take the place of the manpower needed in the operation of a graduated fare system.

AUTOMATED GRADUATED FARE COLLECTION ON SURFACE LINES

It is also conceivable that, eventually, the idea of electronically controlled automated fares will spill over for use on surface lines, as soon as the more compact equipment required for use on buses or other surface vehicles has been perfected. Here also the use of graduated fares is likely to receive much impetus, through availability of equipment, designed to control them economically.

We see daily the development of local transit systems into Metropolitan Authorities which, in part, own

their reason for being to the necessity of consolidating the transit pattern of densely populated city areas with the surrounding suburban territories, previously often served by small independent companies. In most cases this means greater distance travelled in direct connection between the densely populated area and its often large and wide spread commuter inhabited surroundings. This again points toward graduated fares, zone systems if you like, for which equipment for automated handling may eventually be developed.

PREVIOUS ATTEMPTS

During several years in the fifties a commission, created by A.T.A. concerned itself actively with the problem of zone fares on buses, without, in the end, coming to conclusions that offered an economical, practical advantage over the control methods then in use and which depended largely on the operator. In part the failure to come through at that time was caused by the fact that the electro-mechanical equipment then visualized was not developed beyond the design and prototype stage. At the time, the market for such equipment appeared to be too limited for expensive research and development, as well as low cost mass production.

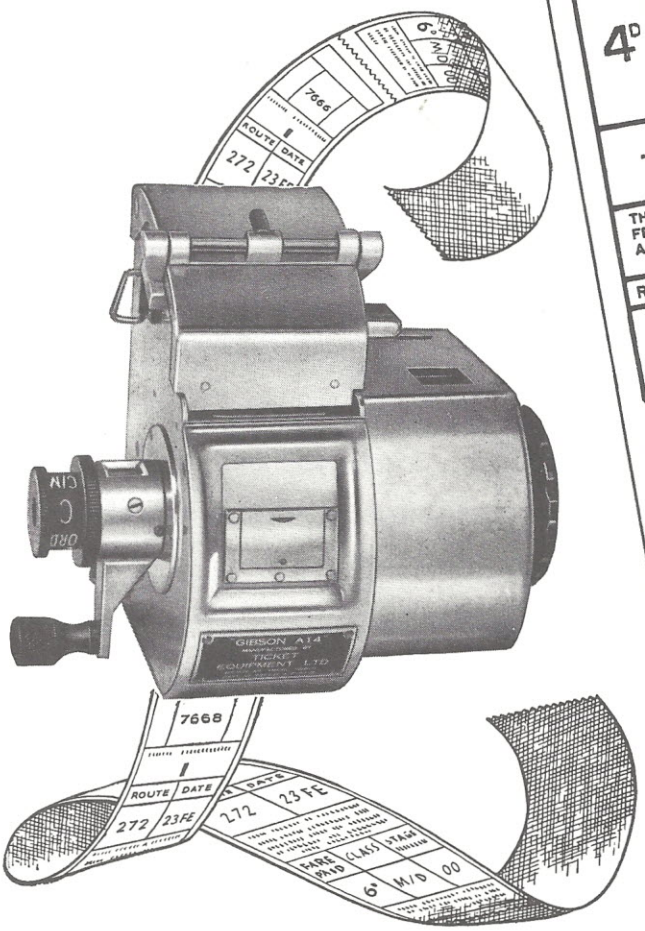
With the development of extended Metropolitan transit areas, with their longer distances of travel, this conclusion may be changed considerably. Also the use of graduated fares on present and future rail commuter and other rapid transit installations may well have an educational effect upon the public toward acceptance of graduated or zone fares on surface lines as well.

FOREIGN METHODS

It is well known that most surface lines in Europe use graduated fares in one form or another, not only under two-man operation, but, increasingly, on one-man operated vehicles. London Transport is, perhaps, a good example. Here, for many years, equipment similar to that shown in Figure 1 has been in use under graduated fares. Now, many London Transport vehicles are built or converted, to be operated by the driver only, and the ticket issuing equipment is then attached to a counter within his reach.

However, in the case of most foreign operations, the control over the length of the ride, for which the passenger has paid, does not rest with the surrender, upon exiting, of the ticket that shows the boarding or destination zone. On the buses of London Transport, in fact, the passenger can keep the ticket if he likes. He is encouraged upon leaving the vehicle, to deposit his ticket in a metal, open container, placed in a convenient spot, so that he may not litter the bus or the street with it. Aside from the vigilance of the conductor, or of the driver on one-man vehicles, the control is exercised by inspectors who board the vehicle at random stops and who go through the bus, inspecting every ticket held by any of the passengers. The control may be termed essentially psychological.

①



FARE PAID	CLASS	STAGE BOARDED
4D	ORD	19

LONDON TRANSPORT 21106

THIS TICKET IS AVAILABLE FROM STAGE Nº INDICATED ABOVE AND MUST BE SHOWN ON DEMAND.

ROUTE	TICKET Nº
207	6454

NOT TRANSFERABLE

FARE PAID	CLASS	STAGE BOARDED
4D	ORD	19

LONDON TRANSPORT 21106

THIS TICKET IS AVAILABLE FROM STAGE N. INDICATED ABOVE AND MUST BE SHOWN ON DEMAND.

ROUTE	TICKET Nº
207	6453

NOT TRANSFERABLE

LOCAL PRACTICE

Where zone fares are used in our country, we depend in many cases on the memory of the driver, particularly on inbound runs over few zones, where the majority of the passengers ride into the central area. But, where zone checks (not fare tickets as in most foreign countries) are used, we insist on having them surrendered to the driver when the passenger gets off, as proof that he is leaving in the zone into which he has paid his fare.

SIMPLE SYSTEM OF SEMI-AUTOMATED COLLECTION OF ZONE FARES

In the fifties, while the A.T.A. Zone Fare Commission was at work, we submitted two simple versions of a semi-automated zone fare control system. Because of the increase in thinking along the lines of graduated fares, it may be of some value to illustrate and explain these methods here once again.

Figure No. 2 shows the sketch of a bus, equipped for operation under one of these methods, described at the time as follows:

METHOD 1 OF ZONE FARE COLLECTION:

ENTER REAR AND/OR FRONT

EXIT FRONT

PAY LEAVE.

Vehicle

Vehicle if possible having the following facilities for entrance and exit:

Front Door: Sufficient width to accommodate two single files of passengers, for simultaneous boarding in two files or for one file entering, while another exits.

Rear Door: Sufficient width to allow two files of passengers to enter simultaneously.

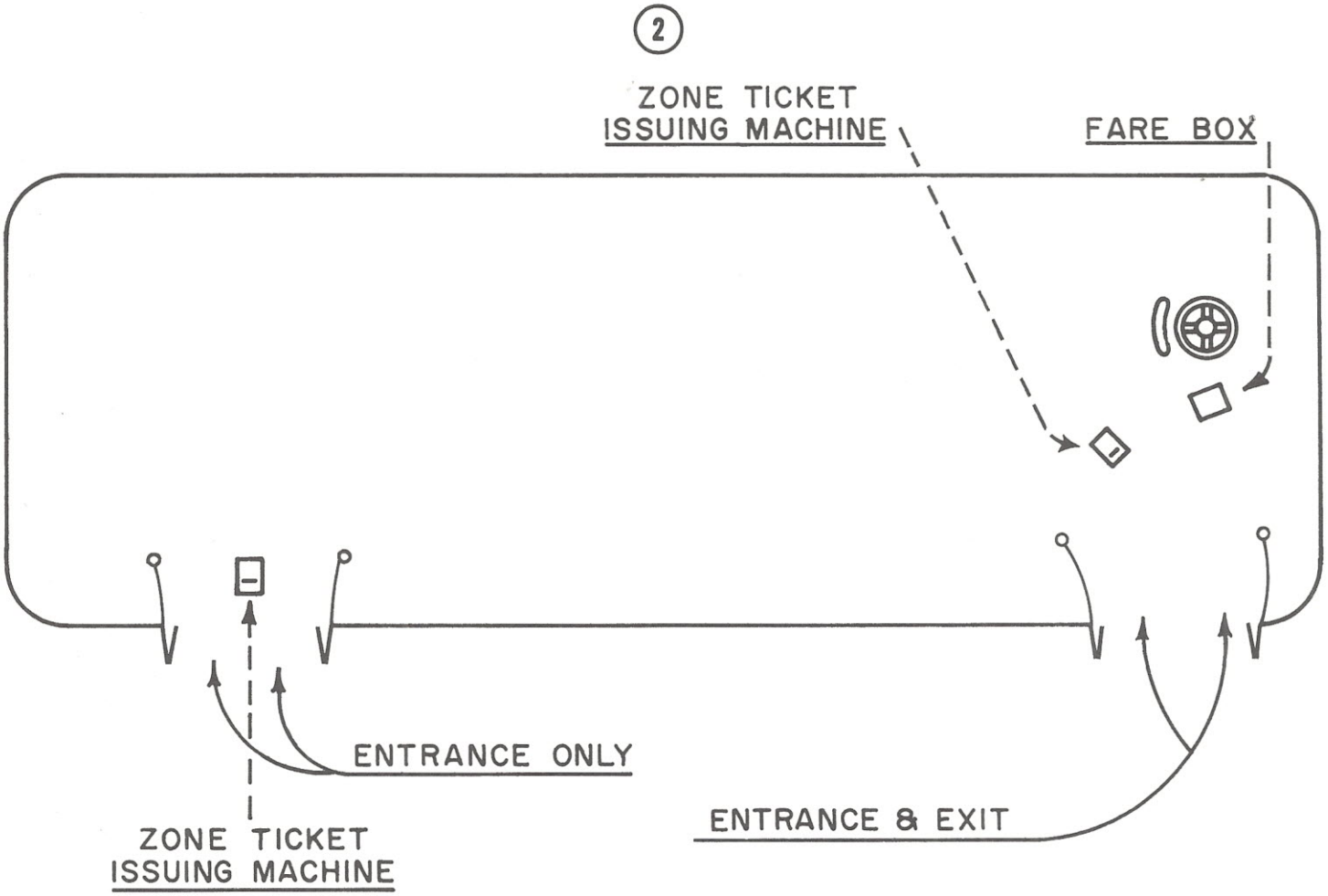
Equipment

At front door:

1. **A Zone Ticket Issuing Machine**

The machine, by impulse from the driver, is set for each zone and remains set for this as long as the vehicle is in that zone. The machine tenders and issues zone tickets, showing the entry zone number. The machine can be made to give an audible signal for each issuance. The machine is placed between two entrance/exit lanes.

It is conceivable that changes in the zone number setting at zone limits may be accomplished automatically be a device located outside, along the roadway, at each zone limit. It would be capable of imparting a signal to the zone number setting device on the vehicle, causing it to change to the next setting.


2
ZONE TICKET
ISSUING MACHINE
FARE BOX
ENTRANCE ONLY
ZONE TICKET
ISSUING MACHINE
ENTRANCE & EXIT

2. **A Zone Number Flashing Device**

The zone number in which the vehicle is traveling may be flashed on an indicator, located at the operator's station, for the convenience of the passenger as well as the operator.

3. **Fare Collection Equipment**

The operator collects the fares. Thus it is necessary to use a fare box, either of the registering or vault type. Accurate and fast appraisal of the fares is essential, even when several coins of different value are deposited. Various signal devices, or a visual check can be used to accomplish this. A combination unit, receiving coins as well as zone checks and separating the latter from the former for viewing may also be considered.

At rear door:

4. **A Zone Ticket Issuing Machine as at front door**

The machine is placed between two entrance lanes and in such a way that

a) passengers cannot miss it,

b) passengers already inside the bus cannot reach back to operate the machine

The machine can be made to have its issuing part exposed or to operate only when doors are open.

Operation

Entrance

Passengers enter through both lanes of rear door and by one lane of front door. Passengers receive a zone check from the machine, as they enter. The zone check shows the boarding zone.

Exit

All passengers exit via one lane at front door. They surrender their zone check. The driver calculates the fare due, from the boarding zone number on the zone check surrendered and the exit zone number flashed in the vehicle. He collects the fare.

METHOD 2 OF ZONE FARE COLLECTION
ENTER REAR AND/OR FRONT
EXIT FRONT
PAY ENTER TO COIN RECEIVER

Method 2 differs from Method 1 only in the following aspects.

Equipment

A Coin or Token Operated Zone Ticket Vending Machine.

The machine, by impulse from the driver, is set for each zone and remains set for this as long as the vehicle is in that zone. The machine receives one or several coins or tokens and issues a zone ticket, showing the exit zone. The exit zone number is determined automatically by these factors:

a) the entrance zone (where the vehicle is operating)

b) the amount of money paid into the machine.

The machine drops the payment into a vault type lock box.

The machine can be made to give an audible signal for each transaction.

The machine is placed at the front and rear entrances, as for Method 1.

Operation

Boarding

Passengers with correct fare or token enter by both lanes of the rear door and at least one lane of the front door. Passengers requiring change or tokens, enter by one lane only of front door.

Passengers place the correct fare to their destination zone into the ticket issuing machine. The machine automatically issues a zone ticket showing the destination zone.

Exit

All passengers exit via one or two lanes at the front door. They surrender their zone ticket for exit zone control.

At heavy loading/unloading points, passengers with correct fare board by the rear door, while exiting passengers leave by both lanes of front door.

Reference is made above to passengers who require tokens or need change. In the many instances where the EXACT FARE method prevails, this is, of course, obviated, except for the very few passengers who now do not have the exact fare and who, in most cases must be given refund slips. They would enter at the driver's station and, in addition to a refund slip, receive a zone check from him, commensurate with the number of zones to be travelled by the passenger.

The equipment for both these methods is now not available on the market, but units performing similar functions are being used for other purposes, so that the adaptation of such equipment for zone fare control would not offer too great a problem.

Pending the development and production of electro-mechanical or electronic equipment for zone control

(3)

ZONE FARE COLLECTION, OUTBOUND, NOT REQUIRING ZONE CHECKS IN NORMAL OPERATION OF 4 ZONES

	OUTBOUND	Fare: Base $.30 Each add. Zone $.10
Zone 1 (City)	Pay Enter:	$.30
Zone 2	Pay Enter: Pay Leave:	$.20 $.10
Zone 3	Pay Enter: Pay Leave:	$.10 $.20
Zone 4	Pay Enter: Pay Leave:	$.00 $.30

ZONE CHECKS REQUIRED AFTER ZONE 4

Zone 5	Pay Enter: Pay Leave:	$.00 take Zone Check 5 $.40, or $.30 plus Zone Check 5
Zone 6	Pay Enter: Pay Leave:	$.00 take Zone Check 6 $.50, or $.40 plus Zone Check 5, or $.30 plus Zone Check 6

on surface vehicles, the transit industry is confined to a variety of manual control methods. We feel that it will be of interest to transit operations to have a look once again at the principal ones of these applications.

OUTBOUND COLLECTION IN UP TO FOUR ZONES, WITHOUT IDENTIFICATION

The descriptions shown as No. 3 and 4 make clear how four zones, including a city zone may be served by judiciously applied Pay Enter and Pay Leave methods of operation. It requires no identification within up to four zones. Identification is needed only for those travelling beyond four zones, when the passenger load has usually thinned out. In No. 4 the scheme is illustrated with simple, imaginary overlaps. The method is normally employed in Outbound travel. Since it requires some payment when exiting, except in the boarding zone, it is not favored for Inbound travel, where, within the city area, it is usually desirable to operate through the use of both doors, in order to facilitate boarding and leaving.

Since the introduction of Exact Fare on many properties, some thought must also be given to the question of whether, under this method, it can be considered a

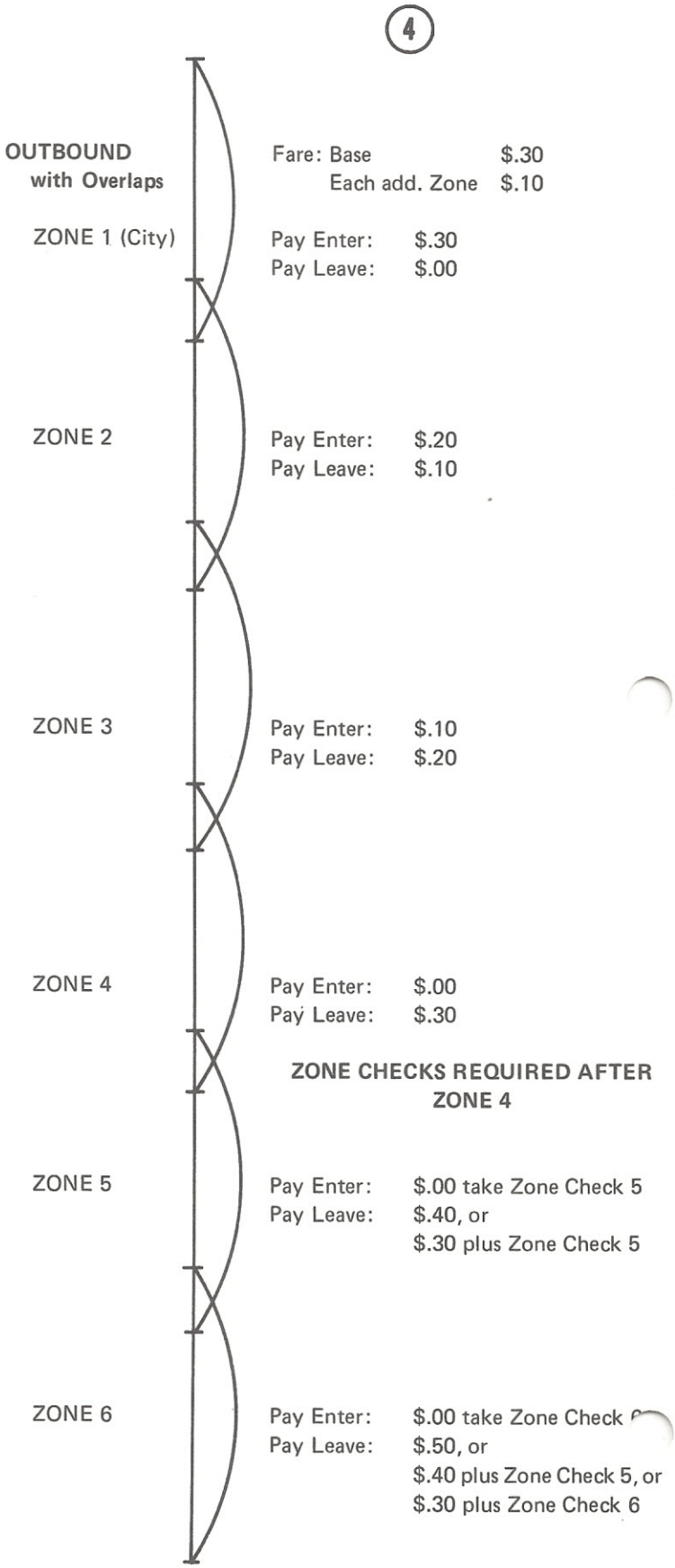
handicap that, in Zones 2 and 3, two payments must be made, one upon boarding and one upon leaving, with Exact Fare required for each.

ZONE FARE COLLECTION, OUTBOUND, WITH IDENTIFICATION

The description marked No. 5 shows the much employed method of payment upon boarding and identification, as to their exit zone, of all passengers who pay a fare beyond the city zone. In this case again, in use Outbound, the first zone has been established as the City Zone, within which no zone check is issued to those paying a one-zone fare and no checks are taken up from those who leave within that zone. Full payment of the entire fare is made when boarding.

This is not the case in Figure 6. In the first place, identification is reversed. Outbound, passengers who board in Zone 2 or beyond pay the regular one-zone fare upon boarding and, whatever additional zone charge there may be, upon leaving. They are identified by a boarding zone check. If they have no check upon exiting, they pay the full fare from Zone 1. Here again we deal with two payments for all passengers who travel beyond their boarding zone.

Whereas Figure 6 required the payment of a one-zone fare from each passenger, Figure 7 shows a method, again exemplified Outbound, which is entirely based on Pay Leave. As in the previous case, however, riders receive a boarding zone identification check, as they



(5)

Fare: Base $.30
Each add. Zone $.10

OUTBOUND, SINGLE PAYMENT, DESTINATION CHECK IDENTIFICATION

ZONE 1 (City)	ZONE 2	ZONE 3	ZONE 4
Pay Enter: $.30 no check Pay Enter: $.40 check 2 Pay Enter: $.50 check 3 Pay Enter: $.60 check 4	Pay Enter: $.30 check 2 Pay Enter: $.40 check 3 Pay Enter: $.50 check 4	Pay Enter: $.30 check 3 Pay Enter: $.40 check 4	Pay Enter: $.30 check 4
Pay Leave: $.00	Pay Leave: check 2	Pay Leave: check 3	Pay Leave: check 4

PASSENGERS WHO HAVE OVERRIDDEN THEIR ZONE, PAY THE ADDITIONAL UPON EXITING

(6)

Fare: Base $.30
Each add. Zone $.10

OUTBOUND, PAY ENTER AND PAY LEAVE, BOARDING ZONE IDENTIFICATION

ZONE 1 (City)	ZONE 2	ZONE 3	ZONE 4
Pay Enter: $.30 no check	Pay Enter: $.30 check 2	Pay Enter: $.30 check 3	Pay Enter: $.30 check 4
Pay Leave: $.00	Pay Leave: $.10 or check 2	Pay Leave: No check $.20 Check 2 $.10 Check 3 $.00	Pay Leave: No check $.30 Check 2 $.20 Check 3 $.10 Check 4 $.00

get on, except in the City Zone No. 1. Their payment, as they exit in the various zones, is made on the basis of having either no check (maximum fare), or checks from intermediate zones. Here, only one payment is made at any time, which could be an advantage under Exact Fare operation.

ZONE FARE COLLECTION, INBOUND

Figure 8 shows a simple method, Inbound, which is in wide use by many properties, where the number of zones and the nature and density of riding permit this. There is no identification of passengers. By the nature of the operation the majority of passengers travel all the way into the Central City area (Zone 1) and pay the equivalent fare. Only a relative few get off in intermediate zones, and the operator is expected to keep track of these exceptions.

The method shown in the next Figure, No. 9, closes the possible loopholes offered by Figure 8. All passengers who ride, Inbound, beyond Zone 4 are identified as to the zone into which they have paid their fare. At the limit of City Zone 1 the driver "works" the vehicle, meaning that he stops, with both doors closed, goes through the bus and takes up all zone checks, remaining in the hands of passengers and which will mostly be those for Zone 1. He collects any additional fares due from those who have no zone check (originating in Zone 4) and those with checks from Zones 3 or 2. All must pay the additional zone charges into Zone 1. This "working" of the vehicle may also be done by special collectors, if the frequency of travel warrants this. They would board the vehicle at or shortly before it reaches the City Zone No. 1 limit and take up zone checks and collect additional fares, where needed, while the bus is in motion.

CENTER CITY NO-FARE AREA

The Pay Enter Inbound – Pay Leave Outbound method, Figure 10, has found much favor. For passengers who travel into the City No-Fare Area and out again, either by direct travel or by transfer in that are it means the payment of two fares. Also they must be identified as through riders, whether they transfer or not.

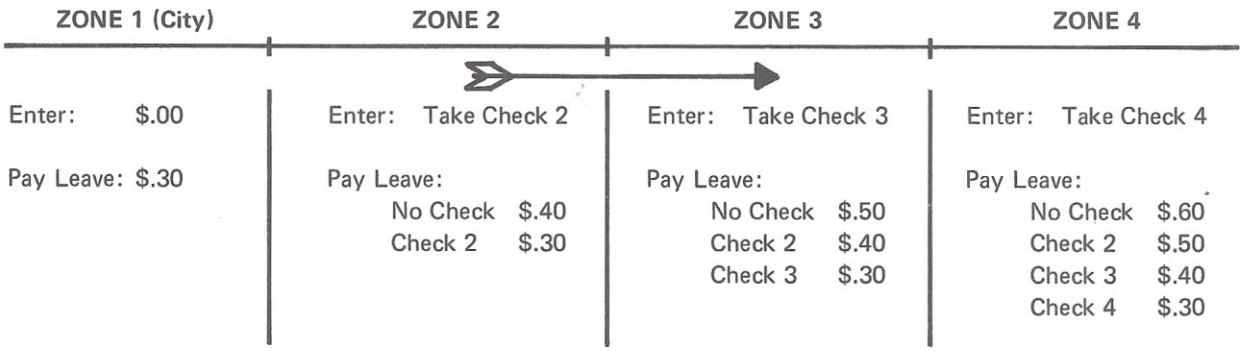
As shown on the diagram, the procedure establishes a "Free" area in the Central City district, within which both vehicle doors can be operated. The area is considered "Free", because passengers who board within that area and also alight in it, pay no fare. Only those who board outside that area pay when entering, if Inbound, and those who board within or beyond that area, Outbound, pay as they leave.

Zone identification Inbound as well as Outbound for those who ride within the zones beyond the "Free" area must be considered in line with some of the examples dealt with previously.

(7)

Fare: Base $.30
Each add. Zone $.10

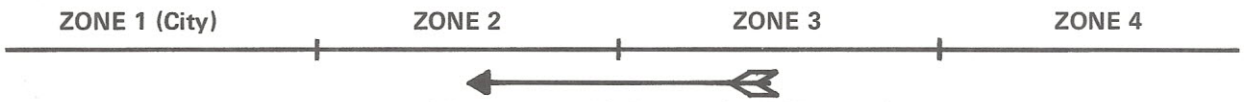
OUTBOUND, ALL PAY LEAVE, BOARDING ZONE IDENTIFICATION



(8)

Fare: Base $.30
Each add. Zone $.10

INBOUND, MEMORY CHECK IN OUTER ZONES



PASSENGERS PAY FULL FARE TO DESTINATION

MOST PASSENGERS TRAVEL INTO CITY ZONE 1

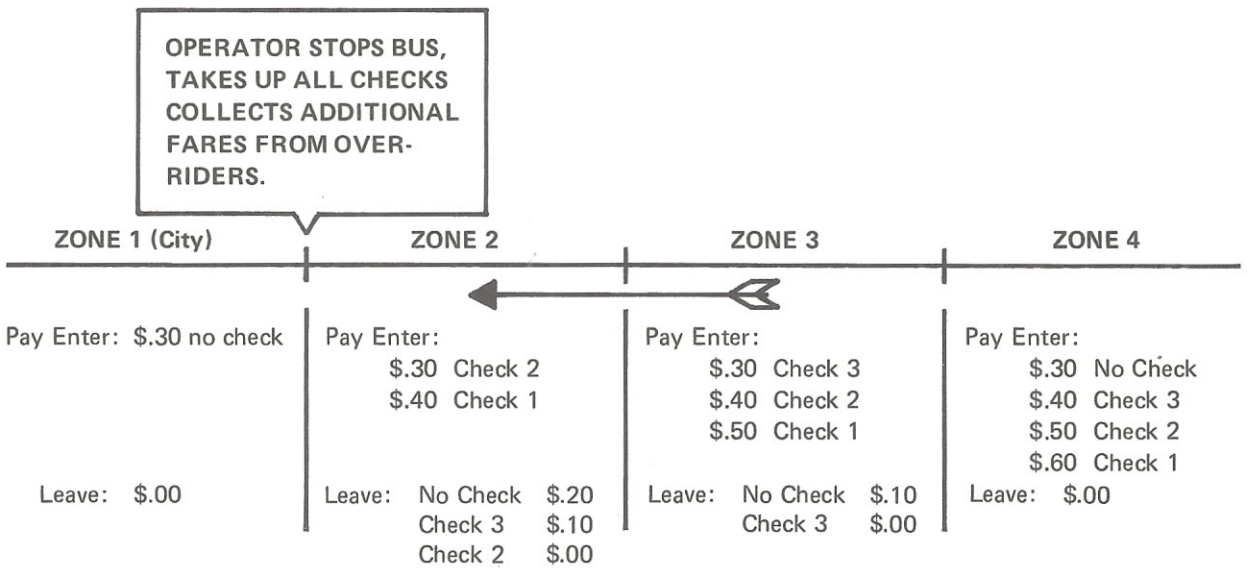
INTERMEDIATE PASSENGERS HAVING PAID INTO ZONES 4, 3 OR 2 ARE TO BE REMEMBERED BY OPERATOR.

NO CHECKS ARE USED.

(9)

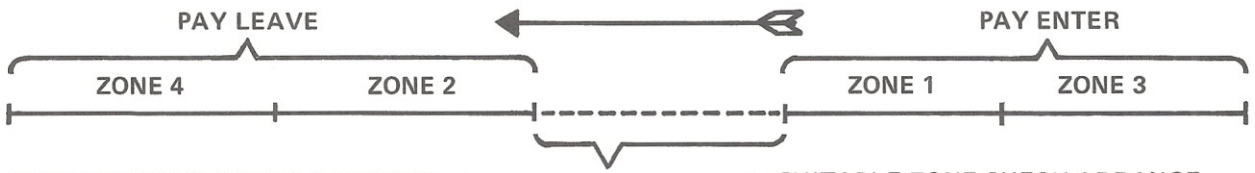
Fare: Base $.30
Each add. Zone $.10

INBOUND, VEHICLE CHECK (WORKING VEHICLE) AT CITY BOUNDARY



(10)

DIAGRAM OF PAY-ENTER, PAY-LEAVE PLAN WITH NO-FARE CENTRAL CITY AREA



SUITABLE ZONE CHECK ARRANGEMENTS, WHERE NEEDED.

SPECIFIC CENTRAL CITY AREA. BOTH DOORS OPEN. NO FARE COLLECTED.

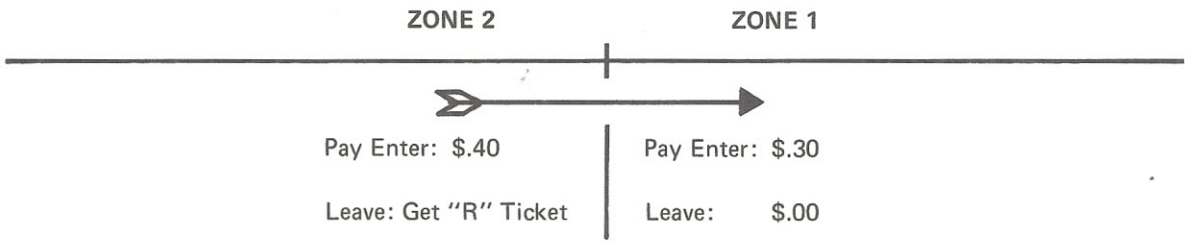
SUITABLE ZONE CHECK ARRANGEMENTS, WHERE NEEDED, AS WELL AS IDENTIFICATION OF TRANSFER PASSENGERS OR THOSE ON THROUGH LINES, TRAVERSING THE NO-FARE CENTRAL CITY AREA AND CONTINUING BEYOND IT.

IN THIS EXAMPLE THE ZONES HAVE BEEN NUMBERED WITH ODD NUMBERS ON ONE SIDE OF THE CENTRAL AREA AND EVEN NUMBERS ON THE OTHER, SO THAT, WHERE THROUGH PAYMENT OF FARE TO FINAL DESTINATION IS DECIDED UPON, IN THE PAY-ENTER ZONES, THE ZONE INTO WHICH THROUGH RIDERS HAVE PAID THEIR FARE CANNOT BE CONFUSED.

(11)

Fare: Base $.30
Each add. Zone $.10

DIAGRAM OF 2-ZONE PLAN, WITH USE OF "R" (RETURN) TICKET



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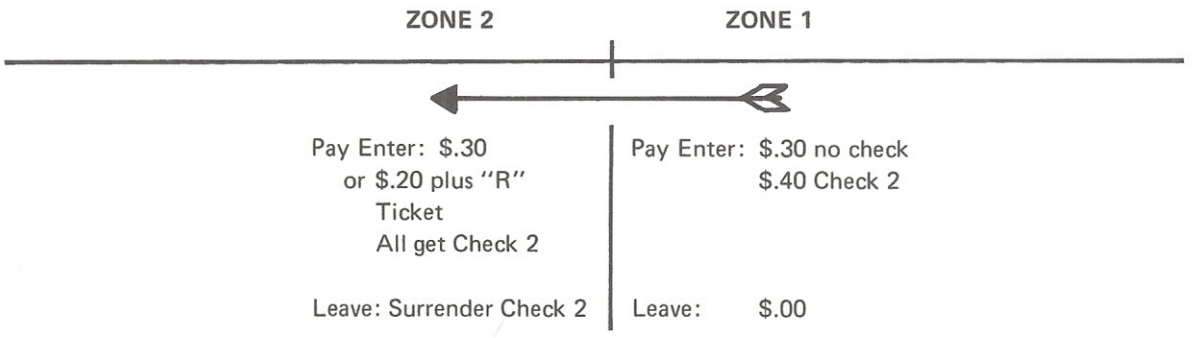

THE "R" TICKET MAY ALSO BE MADE REDEEMABLE IN CASH OR USEABLE AS PART PAYMENT ON OTHER RIDES.

ZONE CHECK PLAN WITH "R" RETURN TICKET

A minor plan may also be mentioned here which has been in use on systems with only one outer zone, outside the principal City Area. The Figures 11 and 12 show Inbound and Outbound phases of this plan. It is taken for granted, in this case, that, Inbound, the vast majority that originates in Zone 2 will ride into the City Zone 1 and, perhaps, beyond. All who board, Inbound, within Zone 2, pay $.40, meaning the base, single zone fare, plus one zone. Most riders continue into Zone 1, but those few who get off while still within Zone 2, receive an "R" ticket from the operator, as they leave. It is assumed that they go to their place of employment in that zone and return home from there in the evening. When thus returning, this time Outbound, they pay only $.20, in the case of the example illustrated, plus their "R" check received in the morning. This makes up the remaining $.10 of their one-zone fare. In order to make the "R" check idea acceptable and also give it more versatility, it may also be used as part of the fare in other ride situations, or refund may be demanded for it.

This ends Part 1 of two issues on
GRADUATED FARES.
The second and concluding part
will follow in the Spring number of the
Globe Trotter