

THESIS

ARCHITECTURAL DESIGN
OF
A BUS TERMINAL IN BEIRUT

BY

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A.U.B. May 1951

" This thesis is submitted to the Civil Engineering
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I N T R O D U C T I O N

The increase in the number of motor vehicles during the last decade was so large that the transport of passengers and the problem of traffic became a real problem for the authorities in charge, and this in parallel with the increased amount of the population- due to Palestinian refugees and lately Persians.

In 1924 when the first car arrived to Baalbeck people threw grass in front of the vehicle thinking that it was a flying horse. According to the statistics, in 1932 there were in Lebanon one car per thousand people; now we have one car per 100 persons; and still, in Beirut one car per 30 persons, not forgetting that the number of cars is increasing with a tremendous acceleration.

This increase in the number of motor vehicles involves many problems, regardless the financial decline of the country; the problem of easy traffic, the problem of Parking and the problem of Maintenance.

Hence my attempt in this short thesis is to solve as much as I can the Problem of passenger transportation.

CHAPTER I

Thesis- Definition: A terminal is the end of a movement in transportation; in my case it is the starting and ending place for passengers transportation to the villages of Lebanon. It includes all the terminal facilities, that is to say all those arrangements, mechanical and otherwise which make easy the transference of passengers at either end of any stage of the journey; It is a Bus terminal for passengers only, so that it doesn't include the freight transport.

CHAPTER 11I M P O R T A N C E O F T E R M I N A L S

Lebanon being a touristic and summer and winter resort country with all the splendor of ancient civilisation ruins in parallel with its natural beauties, mountains, lakes, cascades and caves (Kadicha, Afka, etc.). Also the increased amount of population going up to the mountains during the hot days of summer; it is important to facilitate and organize the transport of people. Because sometimes people are loosing a great deal of time waiting in a bus before it gets full, because if there is one empty place the owner of the bus will not start his journey; also due to decentralized locations of bus stations people are lost in finding the right bus to the right destination; not forgetting that people are at the mercy of the caprices of the bus owners; the drivers take any itinerary they want wasting a great deal of time, stopping here and there wherever they like; leaving aside the fluctuation in the price regardless to the fixed amount by the government.

Beirut city is so crowded and congested that Busses parking here and there in front of transport offices are increasing the congestions, (by the way) the Government took the necessary measures to forbid the parking of busses in front of the transport agencies.

Another reason for the choice of a terminal is that Bus transportation is bound to play a very important part in the economic growth of Lebanon and this is due to its advantages over such vehicles

of conveyance as Railway.

Hence a centralized and well organized bus Terminal with indoor unloading, loading, parking and maintenance places helps a great deal in solving some if not all of the evils mentioned above; it will help people by saving their time which is the most important item nowadays, also unnecessary fatigues and their money.

Some of the advantages of the bus service may be outlined (1) as follows .

1. A route may be shifted without loss of equipment.
2. No tracks are necessary.
3. A breakdown of one vehicle doesn't tie up all vehicles of the line passing the point of trouble. The only disturbance is in the case of one vehicle that actually breaks down.
4. They are less costly when traffic demands are expensive.
5. They are able to act as feeders to long-distance rail lines.
6. They are usually allowed the privileges of streets which are elased¹ to railways.
7. The bus system possesses greater flexibility than that of rail lines.

(1) Economics of Motor Transportation by George W. Grupp chpt. XIV

CHAPTER 111

SURVEY OF AGENCIES & STATISTICS

Due to the lack of organization of the agencies offices and also the fear of Competition from each other it was a real problem to me to secure accurate and reliable data. Nevertheless here are some which I hope will be of any help in throwing some light on the actual situations.

Agency	Routing	Number of busses/day	Time Schedule	Time of Start	Time of Finish
1. Ghazel Transport	Beirut- Bikfaya Dhour- Shouer	25	every $\frac{1}{2}$ hour	8 o'clock A.P.	7 o'clock P.M.
2. El-Arz Transport	Beirut Tripoli	15	"	9 o'clock A.P.	6 o'clock P.M.
	Beirut- Bikfaya	25	"	8 A.P.	7 P.M.
	Beirut- Tripoli	15	"	9.30 A.P.	5 P.M.
3. Three- Star- Transport	Beirut- Bikfaya	12	every 1 hour	8 A.P.	5 P.M.
4. Saad Transport	Beirut- Tripoli	12	"	8 A.P.	7 P.M.

Beirut-Allepe --- 4 Busses max. 2 before noon and 2 afternoon

Beirut- Damas --- 8 " "

All these figures refer to summer time Schedule.

During winter the service starts at 11.00 o'clock A.P. till -

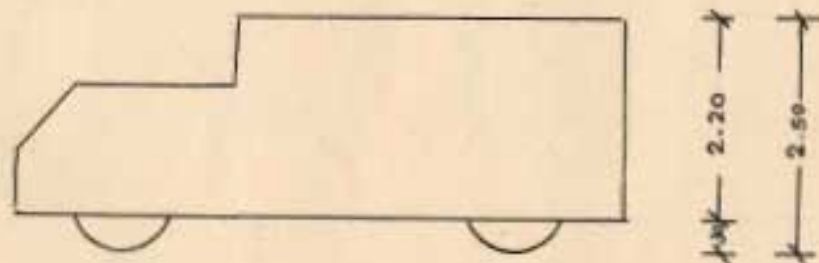
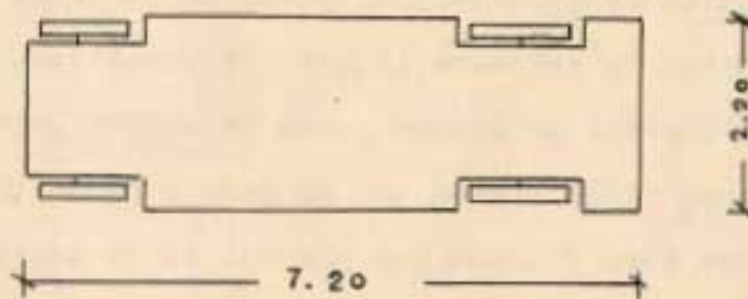
5 P.M. and one bus per hour atmost.

Beirut-Alley-Bhandoun-Sofar 6 Busses per day because 60% of the people have private cars.

Beirut-Hammana 5 Busses per day.

Usual Bus Dimensions

A bus for 25 persons is 7,20 X 2,20 and the height is usually 2,50 cm.



CHAPTER IVC L A S S I F I C A T I O N

It is a small scale Bus Terminal, which covers only one section of the mountains. Beirut- Beir-Mery-Dhour-Shouer Boit de Boulogne, and Beirut Tripoli.

I chose this section because first of all it is the longest section, most populated, and also as is shown in the statistics the percentage of people that own private cars is less compared to the other sections such as Alley Bhamioun and Sofar. Also Beirut Tripoli section is one of the most important supply arteries of Beirut which connects Beirut to Aleppo, Beirut to Homs, Beirut to Lataquieh etc. This Terminal can be owned either by one person or it can be a partnership business; because it is not big and doesn't need very complicated administrative system.

CHAPTER VLOCATION & SIZE OF THE TERMINAL

In choosing the site for this terminal the following points were considered.

1. Accessibility of the station from all portions of the city and its suburbs by private vehicles, busses, and interurban lines.
2. The consonance of the development with the civic plans of the community.
3. The consonance of the development with the physical expansion of the district.
4. The expanse of Construction and operation.
5. The expanse of Demolishing and buying of the existing constructions.

Accessibility of the terminal from all portions of the city is secured because it is located at the very center of the city on a main thoroughfare which is one of the most important arteries connecting Beirut to Damascus, also the terminal has got easy access and egress due to one way traffic on that main thoroughfare.

The building is recessed of about 5 meters from the actual boundary of present road, because the actual road is narrow and in case of future enlargement of the road the building will remain safe.

The land is quite expensive due to its location near the center of the business district, but on the other hand the buying of the properties, displacement rights (Khloue) and demolishing expenses are small, because there are no new buildings on the land and the present ones are one or two story old houses, also a large part of the land is occupied by two wooden and tin construction garages.

One other reason for the choice of the plot is that in case of a future expansion of the terminal, there is enough space behind and this gives easy access to the Second road behind which will be of great help in case of congestion.

The terminal requires an area of about 70 X 50 meters; the building itself needs only an area of 55-25 meters. All the interior partitions are made on the bases that the terminal will handle around 1200 persons per day and 15 busses at a time.

CHAPTER VIGENERAL DESCRIPTION OF THE TERMINALGrand floor

It consists of a large lobby at the entrance which gives ample space to the circulation of the people going in and out.

A general store at the left hand side of the entry will give all the necessary facilities to those who want to buy before going to their destination; it includes all the necessary articles and goods.

A spacious Ticket Room gives on the foyer, and just opposite of it all the toilet facilities are provided which includes separate services for different sexes; A Luggage Room is provided just after the ticket room so that people having trunks or other accessories may deposit there till their departure. A mail service will be very helpful in emergency cases. 2 waiting Rooms, one General Waiting room and the second for women specially, the General Waiting room is provided with telephon^e booths and parcel lockers. The Ground floor is also provided with a small store for newspapers, magazines and refreshments near the Women's Waiting Room.

Second construction at the end of the main building separated from it by a covered alley is reserved to the Drivers Quarter, Garage and Fire Brigade, in front of which a filling station is provided to the busses.

The loading and unloading platforms are covered with concrete sloping slab, part of which is reinforced glass to give light. Also this roof is provided with draft to help the ventilation by releasing the exhaust from Motors.

First Floor

The front part showing to the street is reserved to the Administration of the Bus Terminal with offices and private toilet facilities, it is completely separated from the remaining part of the floor.

The remaining part is occupied by a small scale 5 Rooms hotel with a quite large restaurant and a bar. A skylight is provided in order to give light to the foyer on the ground floor, to the restaurant, and hotel quarter on the second floor also providing aeration to the pantry and kitchen.

CHAPTER VII
CONSTRUCTION DETAILS
OF
THE TERMINAL

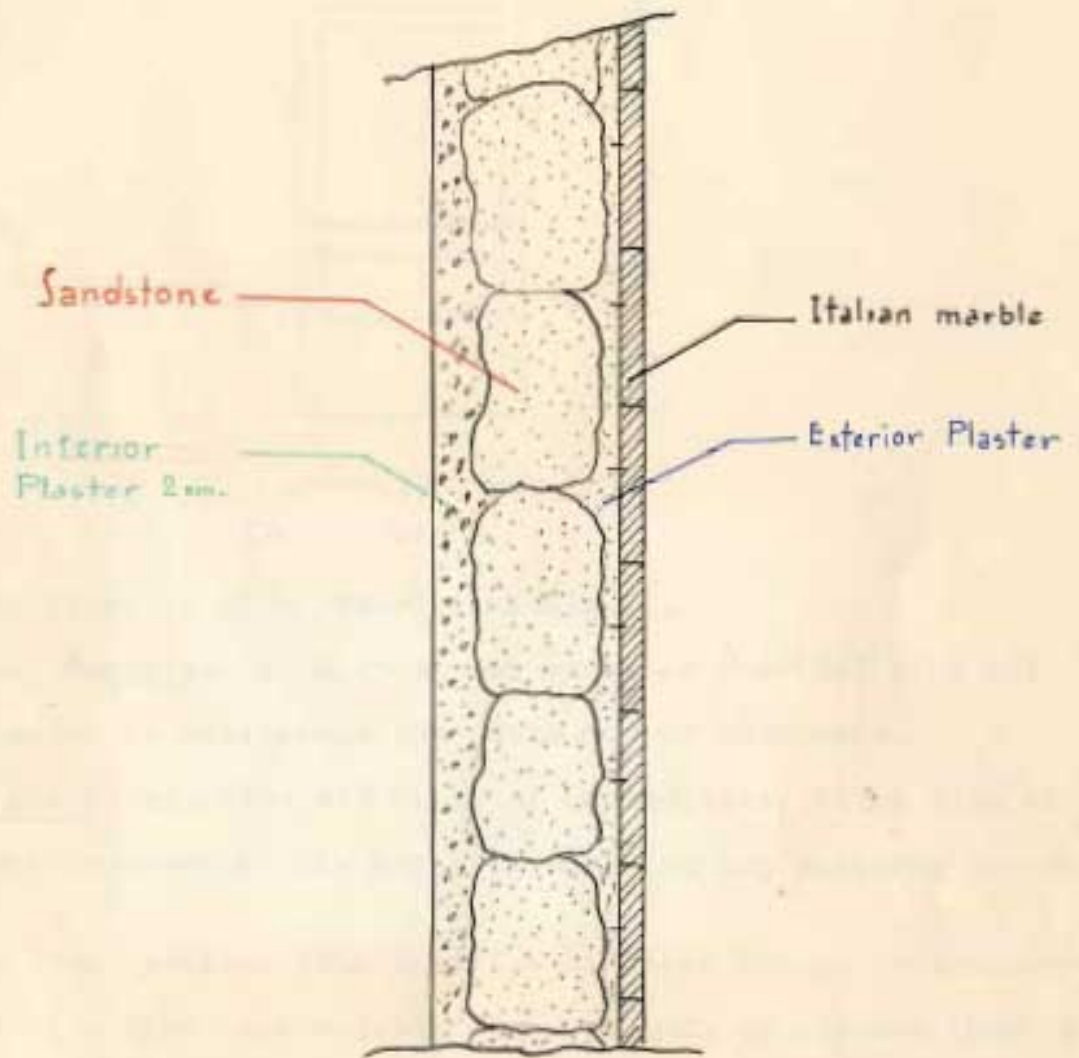
It is a reinforced concrete frame construction with footings, beams and columns. The outside walls are sandstone construction. The facade of the Ground floor is black cream and white marble, Italian as shown by the specimen



T.257

BLACK, GREEN and WHITE MARBLE

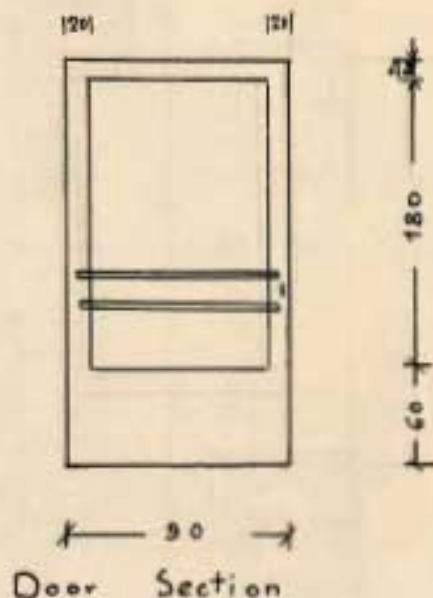
The outside walls of the rear part of the building Ground floor is brick construction with grey color stucco. All the Interior wall are 15 cm hollow (Knapen) bricks.



Ground floor outside wall section

The main entrance doors are all of iron (profile) with translucent glass

Sections



The floor is of terazzo tiles fig....

The Newspaper, Magazine & Refreshment store is provided with all features in order to facilitate the needs of the customers.

The General Store: contains all kinds of commodities; it is like an ABC store, the customer on his way back home can buy anything he wants.

Ticket Room: The spacious ticket office is large enough to accommodate three agents at a time the outside stand is made of plywood (contre-plaque) polished and glass windows fitted in iron stands. The back wall is reserved for bulletin boards (prices, time schedule, lockers etc.).

Foyer: which is the heart of the building is exceptionally well lighted by high fluorescent and recessed lighting and by skylight.

Toilet Room: Enough space is reserved to toilet room for both sexes. Ladies' area is provided with tables for make up and fixing, men's area is provided with lavatories and urinals. The room is located near the



BISRIANTA

Time Schedule	
10	11
12	13
14	15
16	17
18	19
20	21
22	23
24	25
26	27
28	29
30	31

BINPATA

Time Schedule	
10	11
12	13
14	15
16	17
18	19
20	21
22	23
24	25
26	27
28	29
30	31

YRIPOLI

Time Schedule	
10	11
12	13
14	15
16	17
18	19
20	21
22	23
24	25
26	27
28	29
30	31

ALIPPO

Time Schedule	
10	11
12	13
14	15
16	17
18	19
20	21
22	23
24	25
26	27
28	29
30	31

B. BOUTER, BISHANTA

CHOUERAO, BINPATA

WOMS, YRIPOLI

ALIPPO, INFORMANT

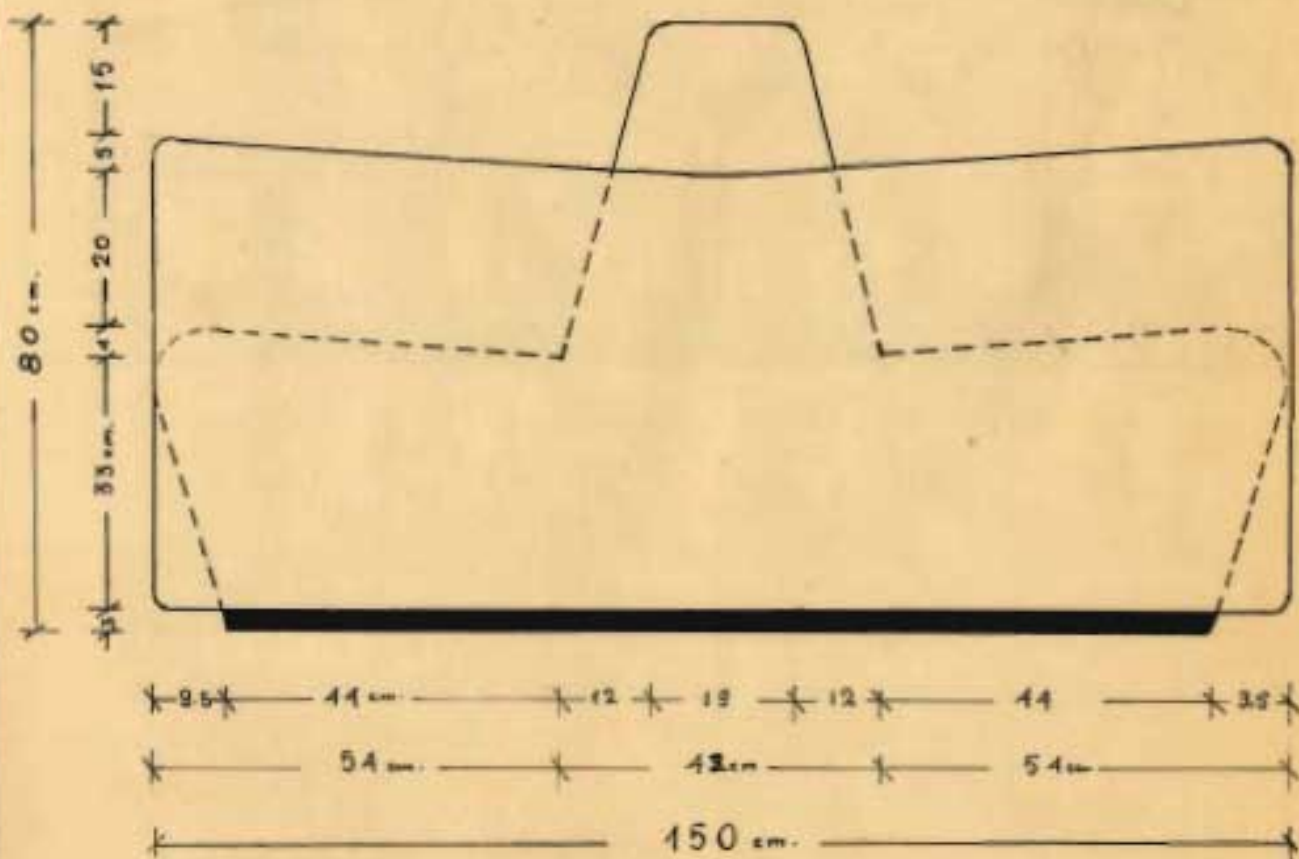


loading platform so as to facilitate the circulation and service. The inside walls are covered with white glazed tiles to a height of 150 cm; the room has high window to light and aerate at the same time.

Luggage Room: The luggage room, with express and checking facilities has two counters which are accessible from the foyer and more luggage storage space is provided next to it.

Mail: A mail service is provided for ordinary, air-mail and insured correspondence, it is directly related to the main Government post office, because even it can handle packages (colis).

Waiting Room: The walls of the octagonal Waiting room are decorated with hand-colored photographic murals of the Beirut city and of all the resort centers of Lebanon. Individual coil-lockers and telephone booths for passengers convenience. Also, in order to avoid unnecessary fatigue, the waiting room is provided with two sided long benches with handles for every two or three persons. 2-3 panel large doors (plywood construction) on both sides showing to two platforms facilitate the access and egress of passengers from or to the Waiting room. The roof is partly of reinforced glass in order to give more light. There is a public-address system with loudspeakers. The illumination is by high fluorescent and recessed lighting and by skylight.



BENCH SECTION

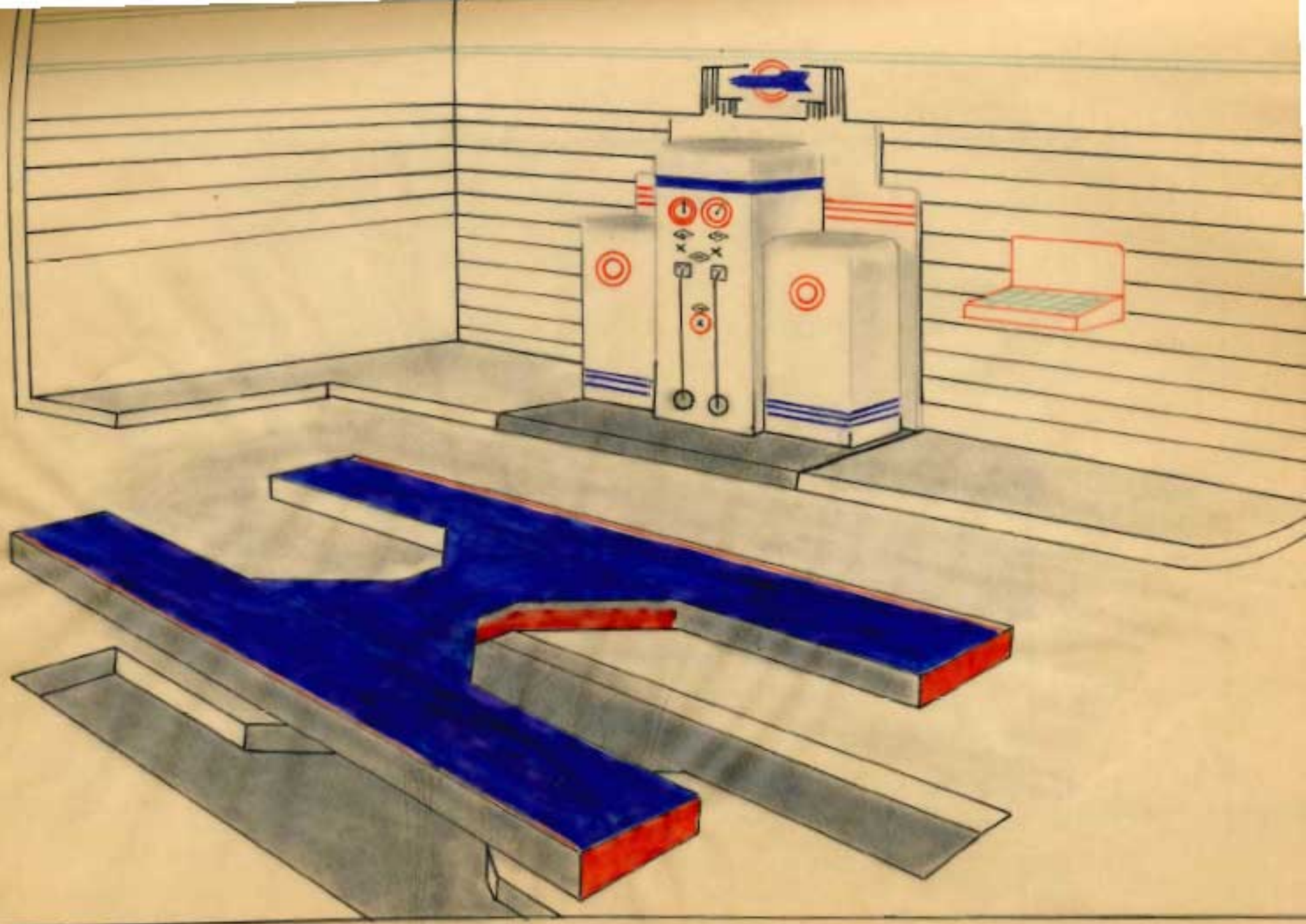


LONGITUDINAL SECTION OF WAITING ROOM

A ventilation system is provided for the hot days of summer and a central heating system for winter.

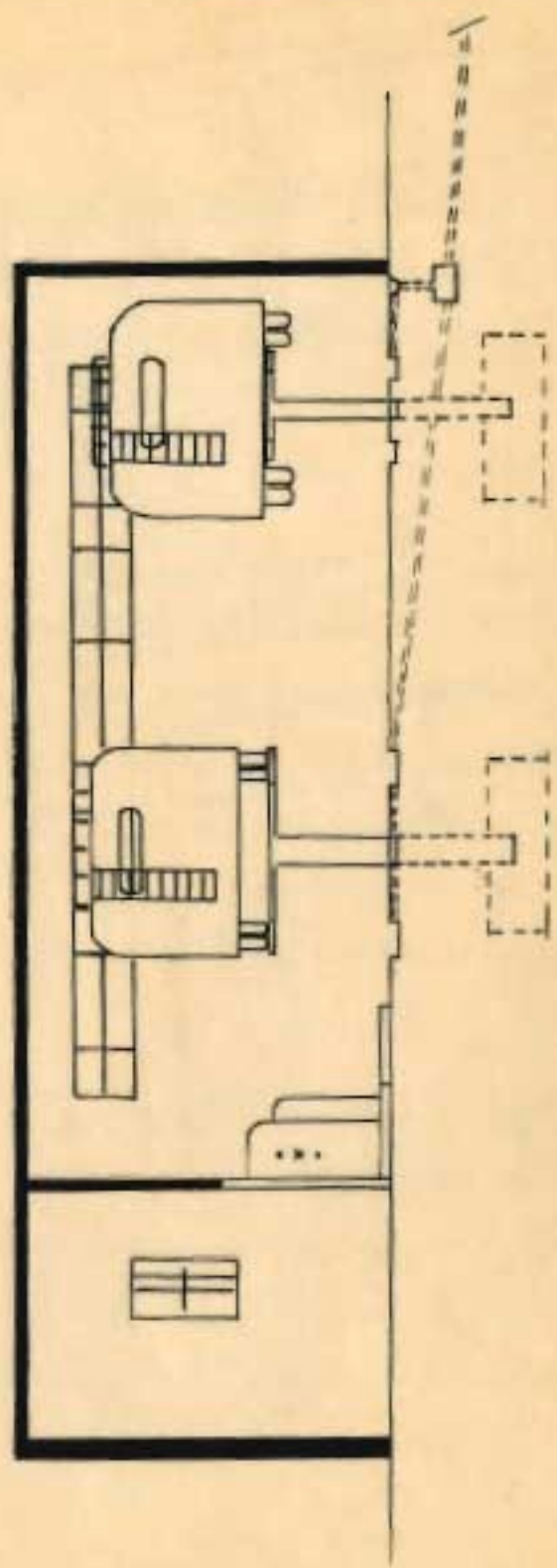
Garage: In order to facilitate the repairs and cleaning of busses the terminal is provided with a small scale private garage which contains 1 greasing bay, one washing bay and one repairs bay. It is located at the very end of the terminal; it is completely isolated from the building, it is a separate unit by itself, because first of all to keep away all the dirt from the main building, second not to disturb passengers with noise, third to avoid the main building from any unforeseen danger such as fire and explosion. The ceiling is about 5 meters which gives ample space for raised cars. It is well lighted by a long high window also electric lighting is provided in the accessories room. All wiring are in conduits. The washing floors are graded to an angle of 3cm. to a meter. Heating facilities are installed to maintain a temperature of 65⁽¹⁾ Fahrenheit, in order that engines may be easily started. All gasoline and oil storage tanks are underground to reduce hazards of fire and explosion. The equipments are so many that it is hardly possible to specify them moreover this depends on the local dealer's service, and the amount of motor vehicle equipment which the owner may happen to possess. Nevertheless here are some items which I think are very essential for any size of garage.

(1) Principles of Inland Transportation
by Stuart Daggett chpt. XXIII Terminals



GREASING BAY

GARAGE SECTION



1. One 20 inch drill press
2. One medium-sized draw-cut saw
3. One emery wheel
4. One oil filter for filter for reclaiming crank-case oil
5. One battery of tanks for new lubricating oils, together with a convenient means of emptying the barrels without manual lifting
6. One work bench with vises
7. One toolboard for wrenches, clamps, and special tools.
8. One charging plant.

Drivers Quarter: Next to the garage and in the same unit a special space is provided for drivers with 3 bed rooms and all toilet facilities. This is because in case of an emergency the administration will have the facility to call on duty one of the drivers. Also when some batchelor drivers want to lodge in the terminal or for drivers living very far, if they want to stay in the terminal special quarter is reserved for them.

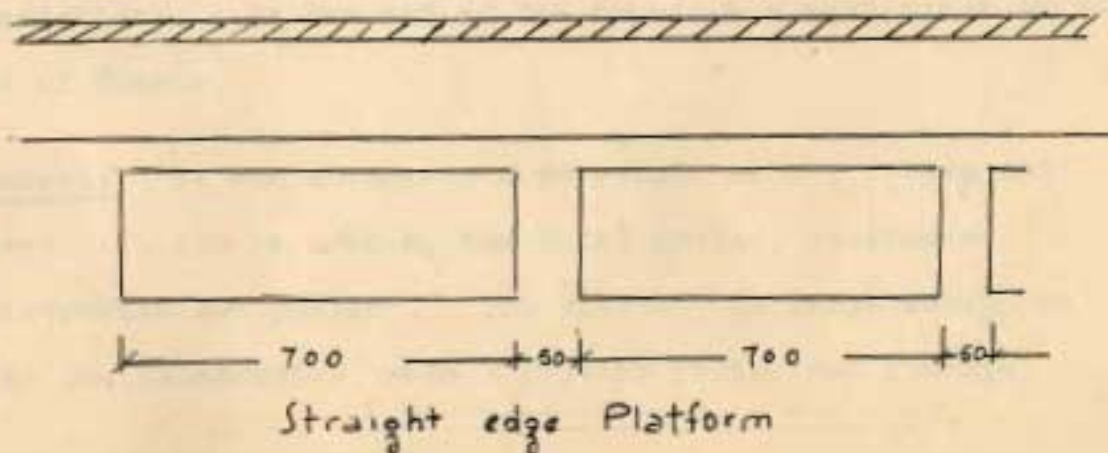
Fire Brigade: Next to the drivers quarter is the fire brigade service, in case of emergency or any hazard of fire in the terminal, the administration instead of calling the public fire brigade which will take a great deal of time will have ready in hand its own fire section. It is a small scale section, which will be of great help in isolating a fire or explosion till the public fire brigade arrives.

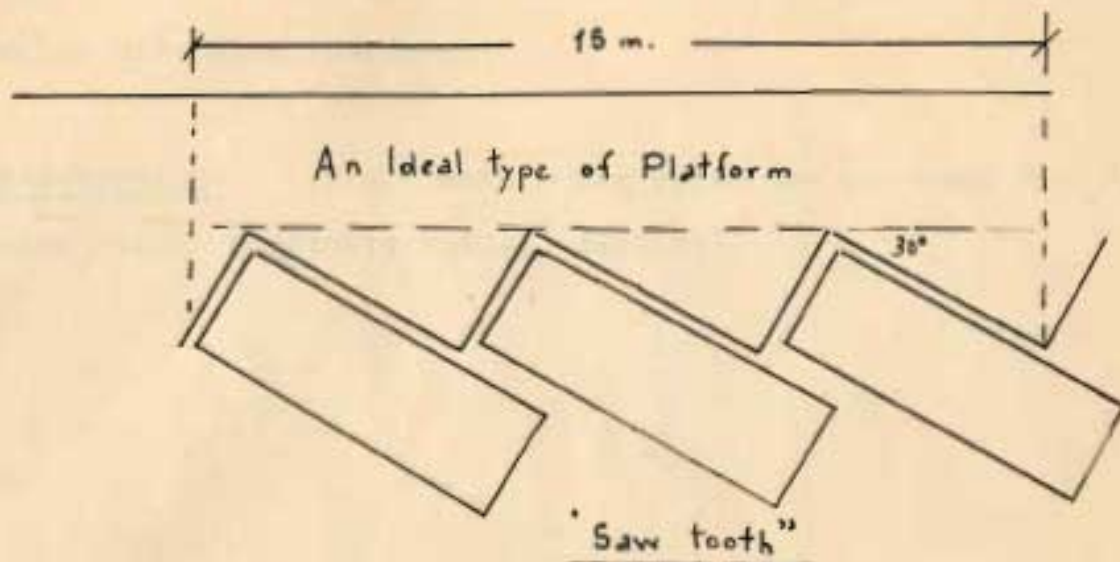
Filling Station: The front space of the garage is provided with a filling station. All the busses that come, unload their passengers first, then come and fill their gasoline or oil, pump their tires, then go to the loading platform.

Parking Space: On two sides of the filling station is reserved for parking. When the number of cars exceeds the number of parking places on the platform, they can park in these parking area, also if there are damaged or broken busses which need a longer period of time to stay they can be placed in the parking area.

Loading and unloading Platforms: When there is a load of goods, passengers or livestock to be transported by truck, the first thing to consider is how these are to be loaded and unloaded.

Platforms: The platform is the connecting link between the waiting room and the bus. For this reason its position and design are of great importance in the successful operation of busses. A small, narrow platform retards quick loading and unloading if more than one vehicle is used. Platforms therefore should be built sufficiently large to provide enough room for passengers, or another way to overcome the difficulty of a narrow roadway is to build "Saw-tooth" platforms. Hence "Saw-tooth" platforms economize space, saves time, facilitate the performance etc.





from these two figures we see that in a 15 meter length of platform. In the first case we can place 2 busses while in the second case 3 busses.

Second Floor: The second floor is reserved for, hotel, restaurant and Administration; the outside walls are of bricks and ivory.

Hotel: It is a small scale 5 B. Room hotel, which will handle 12 people, this is provided for the passengers which don't know any place, they can lodge for 1 or 2 nights, also for passengers which have missed their bus and instead of returning to another hotel they can pass the night in this one. It can also be used by the public in general, because it is a quite good hotel with the accommodations. At the end of the corridor a rest place is reserved a kind of fumoir.

Restaurant: It can accommodate 50 people at the tables and counters. It can be used by the hotel people, passengers, administration and public. The kitchen is large enough to provide the necessaries with a private pantry and storage.

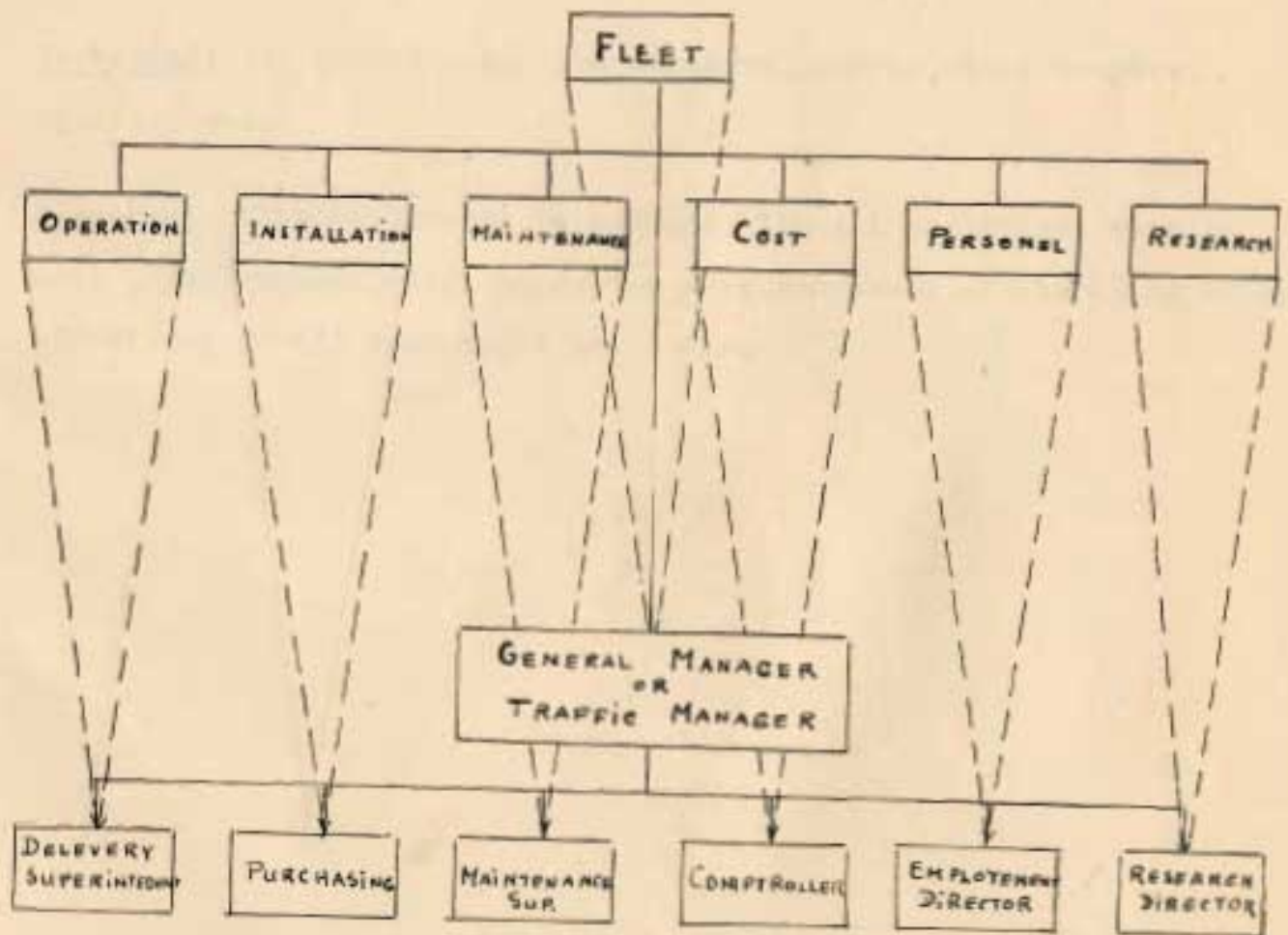
The access to the kitchen is independent by a spiral staircase from the unloading platform.

Administration: Five spacious big rooms are provided for the administration, with a private toilet service.

Chapter VIII

ORGANISATION & ADMINISTRATION

One of the first essential requirements in successful motor vehicle operation is a proper organization. By organization is meant the operation, installation, maintenance, cost, and the human element side of motor transportation. Dissipated, undirected unorganized energy in any of these phases is disastrous. No organization looks like a ship that has lost her bearings in the fog.



AN ORGANIZATION PLAN

Fleet refers to the vehicles used; Busses

Operation One of the chief departments in a fleet organization plan is the operation department. The branch confines its activities to the actual running, routing, scheduling, loading, unloading, assignment, and distribution of the fleet.

Installation The department of installation, purchases, supplies auxiliary deries, and all other necessary equipment.

Maintenance It attends the inspection of vehicles, repairs.

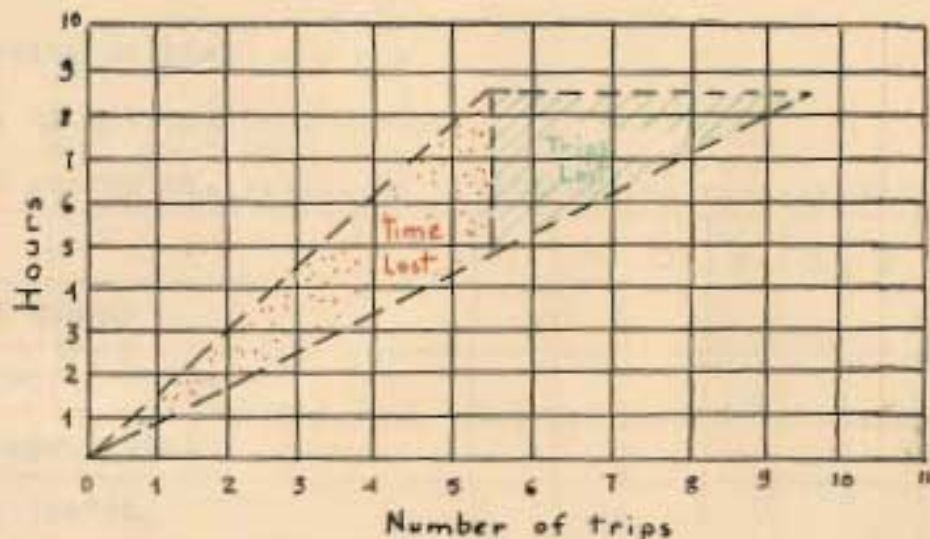
Cost It's duty is to ascertain the cost of all details connected with the running of busses.

Personnel: It includes all the employee, clerks, book keepers, typists, etc.

Research: This department is charges with all analytical work in cost , performance, also to devise ways and means of obtaining greater efficiency in all operations and tasks.

CHAPTER IXMISCELLANEOUS

Time Schedule: This is very important, because it will avoid congestions on the loading or unloading platforms; It will save time, and it will be economical to the owner because due to lack of planning a great deal of time is lost and also the number of trips are diminished as is shown in the graph.



A graphic presentation of how the lack of planning resulted in a loss of four trips a day to a bus owner. Hence in my case every bus will make 3 trips per day, and the time schedule will be for every $\frac{1}{3}$ hour trip. There is a public-address system with speakers in all public spaces and rest rooms. Clocks and luggage time-stamps are all controlled from a master electric clock.

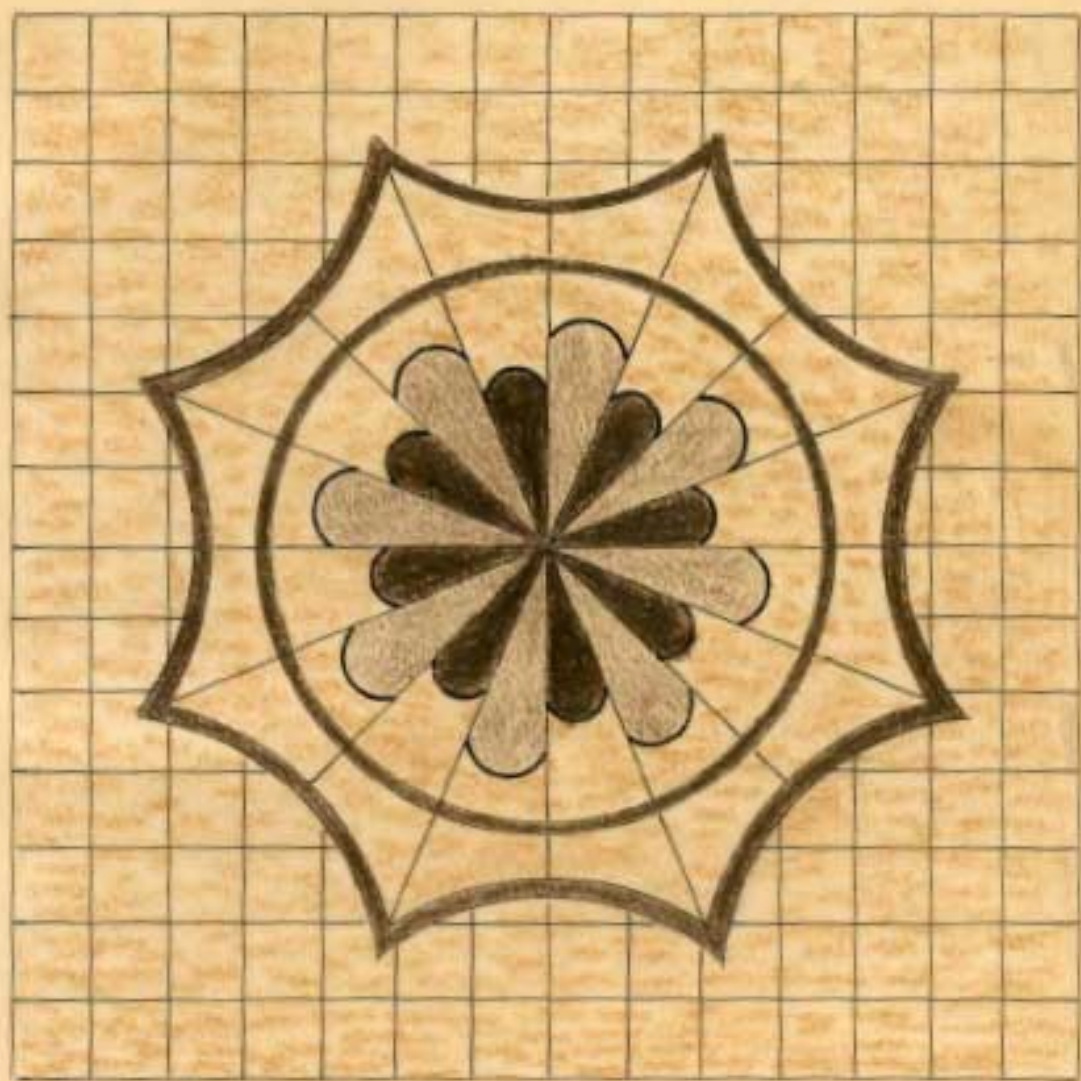
Drivers. The most important of all the personnel in successful terminal operation- aside from administrative help- are the drivers. Incompetent drivers produce a bad effect not only on the pocket-book of the terminal owner, but on society as well. Once they are selected they should be trained so as to give maximum efficiency and also behave correctly with the passengers and they must be provided with a Driver's Daily Report and a Driver's Mechanical Report.

DRIVER'S DAILY REPORT							
Bus No. ---							
Make ---							
Capacity of bus ---							
Name of Driver ---							
Left garage at.....M	Returned at	M.					
	1	2	3	4	5	6	TOTAL
Trip Number							
Number of Stops							
Mileage, total							
Time loading							
Time unloading							
Running time loaded							
Running time unloaded							
Total running time							
Time lost by delays							
Causes for delay							
Gasoline consumption litres.							
Oil consumption litres.							
Grease consumption litres							

Advertising forms: Busses can be put to use in a dual capacity simultaneously, namely; as a means of delivery and as advertising mediums, also there are many other means to advertise, newspaper radio show, etc.

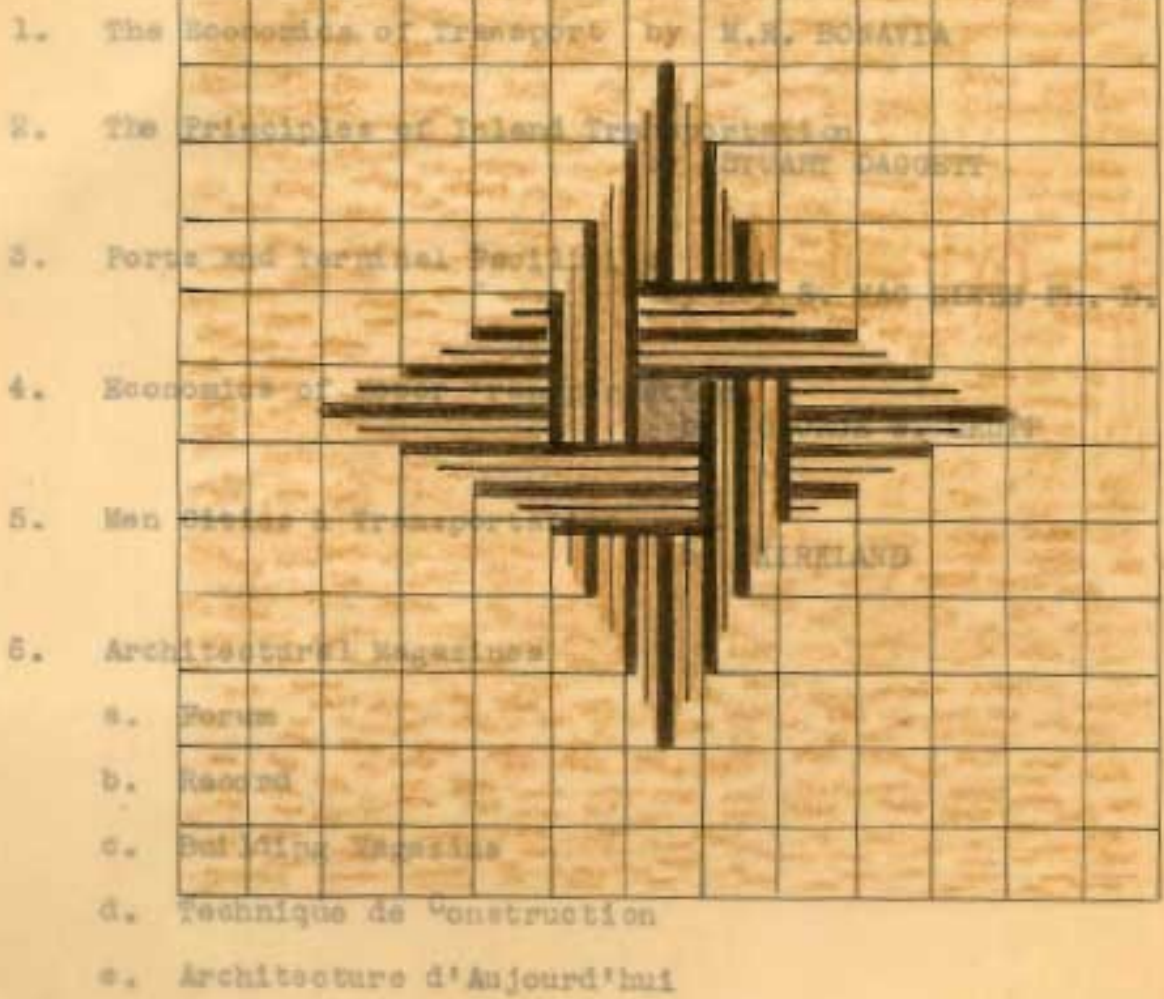


SCALE 1:20 FLOORING PATTERN



SCALE 1:20 LOBBY FLOORING PATTERN

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