

An Application of
Work Simplification to the Tanning Industry

by

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Massachusetts Institute of Technology
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THESIS AUTHORIZATION

Date May 5, 1941 _ _ _ _ _

Name Frederick C. Came _ _ _ _ _

Topic An Application of Work Simplification in the Tanning Industry
_ _ _ _ _

This is your authority to proceed with the thesis investigation as outlined in your preliminary report. Please return this sheet with the original copy of the finished thesis.

Signature of the Advisor, indicating completion of a satisfactory preliminary report.

Advisor

Signature of the Supervisor, indicating proper registration for credit, and generally satisfactory progress.

Supervisor

Massachusetts Institute of Technology
Cambridge, Massachusetts
April 15, 1941

Professor George W. Swett
Secretary of the Faculty
Massachusetts Institute of Technology
Cambridge, Massachusetts

Dear Sir:

In accordance with the requirements for graduation, I
herewith submit a thesis entitled An Application of Work Sim-
plification to the Tanning Industry.

I wish to express my appreciation for the ready advice
of Mr. Herbert F. Goodwin of the Department of Business and
Engineering Administration, and the kind assistance of Mr. Samuel
Haight and his associates at the American Hide and Leather Company.

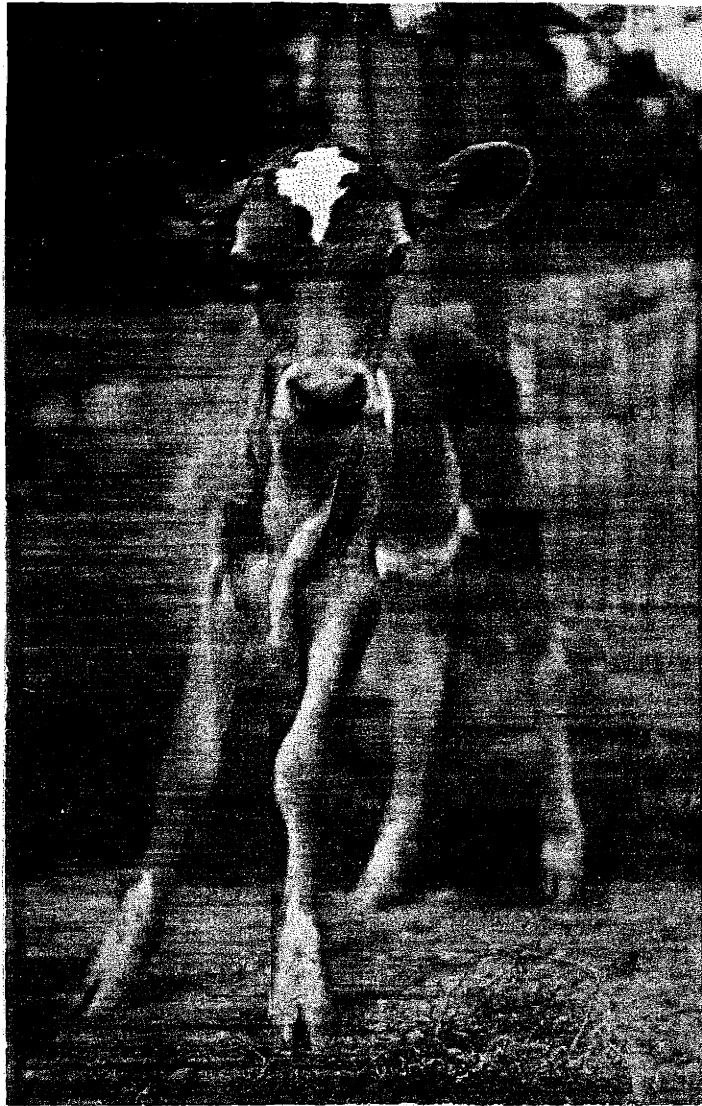
Sincerely yours,

Frederick C. Came

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1. Raw Material -- for calf leather

Introduction

This paper is a study of production methods and facilities in the tanning industry. It is an endeavor to put down on paper many of the generally accepted practices used in tanning leather, and then to study these practices critically in an attempt to simplify the procedure and standardize the methods used. The section of the tannery discussed here is known as the Beam House.

The author understands that many persons who may read this presentation are not at all familiar with the tanning procedure as it is practiced today, and to make this paper clear, a non-technical description of the work done is included. It is suggested that this be read before any attempt is made to digest the rest of the paper; also its use as a reference during the later reading will serve to clarify the text.

This report covers only the first stages of leather tanning. It is also restricted to the production of calf leather. The uninitiated reader should understand clearly that there are many types of leather, and each is produced by a particular process, each different from all the others. This differentiation is caused by both the structure of the raw material and by the use to which the final product is put. All skins which pass through a tanning process become leather, but not all leather is the same.*

* See footnote on following page.

The raw material which is tanned to produce calf leather is the calf skin. This should be apparent, but since the reader may wonder when the calf ceases to be a calf, and becomes a cow, I shall give the specifications used by the calf tanner in determining the actual state of the raw material. In doing this we shall come to the first step in the tanning process.

When a calf, or a cow, is slaughtered to be used as meat, the skin is taken off and preserved to be shipped to the tanner. This operation is done in a number of ways at the present time, but it is sufficient to say that in general the skin is cut along the belly, and then is separated from the carcass by slicing along the layer of fat that lies between the skin and the meat. This skin removal is known as the "take-off," and the value of the skin depends closely upon the care which is exercised in this "take-off."

* (from page 2)

Type of Leather

Raw Material Source

Calf leather
Side leather
Patent leather
Kid leather
Sheep leather
Reptile leather
 Alligator
 Lizard
 Snake
Buck leather
Horse hide, Cordovan
Ostrich
Kangaroo and Wallaby
Pigskin
Shark
Seal

Calf skin
Cattle hide
Cattlehide, goat, horse, calf
Goatskin
Sheepskin

Alligator
Indian and Java lizard
Watersnake, python, cobra, boa
Deerskin
Horse hide
Ostrich
Kangaroo and Wallaby
Pig
Shark hide
Sealskin

The skin may now be preserved in several ways. We shall consider only the main method of preservation in this paper.* This method consists of rubbing with salt to prevent the decay of the skin while being transported to the tannery. Skins in this condition are known as "green-salted." After this salting the skins are tied together into compact bundles, and are then shipped to the tanner.

When the skins are received at the tannery they are stored in a refrigerator, to prevent bacteria growth and resultant decay. Some of the bundles of each shipment are inspected for quality, and for size.

When the time comes to use the skins they are brought from the refrigerator to the "Hide House," one section of the Beam House, where the first real operations take place. The bundles are opened onto platforms and piled so that all face the same direction. That is, all of the necks are pointed in the same direction, and the skins are stacked, one on top of another. There are many of these stacks, one beside another, but we need only trace one particular group.

The first actual operation takes place when the "trimmer" enters the scene. The "trimmer" is the man who trims off, with a

* Skins arrive at the tannery in four different conditions. When they are fresh from the animal, they are called "green;" when salt has been rubbed on the flesh side, they are "green salted;" when rubbed with salt and dried, they are "dry salted;" when the drying has been thorough as from stretching on boards in the sun, they are called "dried."



One of our experienced inspectors examines representative lots of all skins on arrival.

sharp knife, all of the edges of the skin which cannot be made into marketable leather. This task varies according to the particular skin, but in general he must trim around the neck, the shanks (the legs), and the "butt" (the base of the tail). Some skins still have the tails and the heads, and these must also be removed if they are present.

The actual procedure followed by the trimmer is to grasp the skin and to pull it onto a sloping table. He then grasps any piece of the skin to be removed with one hand, and cuts it off with a sharp knife held in the other hand. The trimmings are saved in bags, to be sold later as scrap. When the skin has been fully trimmed, it is thrown onto a pile, to await "sizing."

The "sizing" operation is where the distinction of calf-skin and cow hide becomes apparent. Skins are "sized" by men of long experience. These men pick the trimmed skins off the stacks made by the trimmers, and stack them again according to their size. The classification of sizes is shown below. The weight and size relationship is, of course, only an average.

B	less than 5'	7#	Green weight (weight when green salted and trimmed)
D	5' - 7'	9#	
F	7' - 9'	11#	
H	9' - 11'	13#	
J	11' - 13'	15#	
K	13' - 15'	17#	

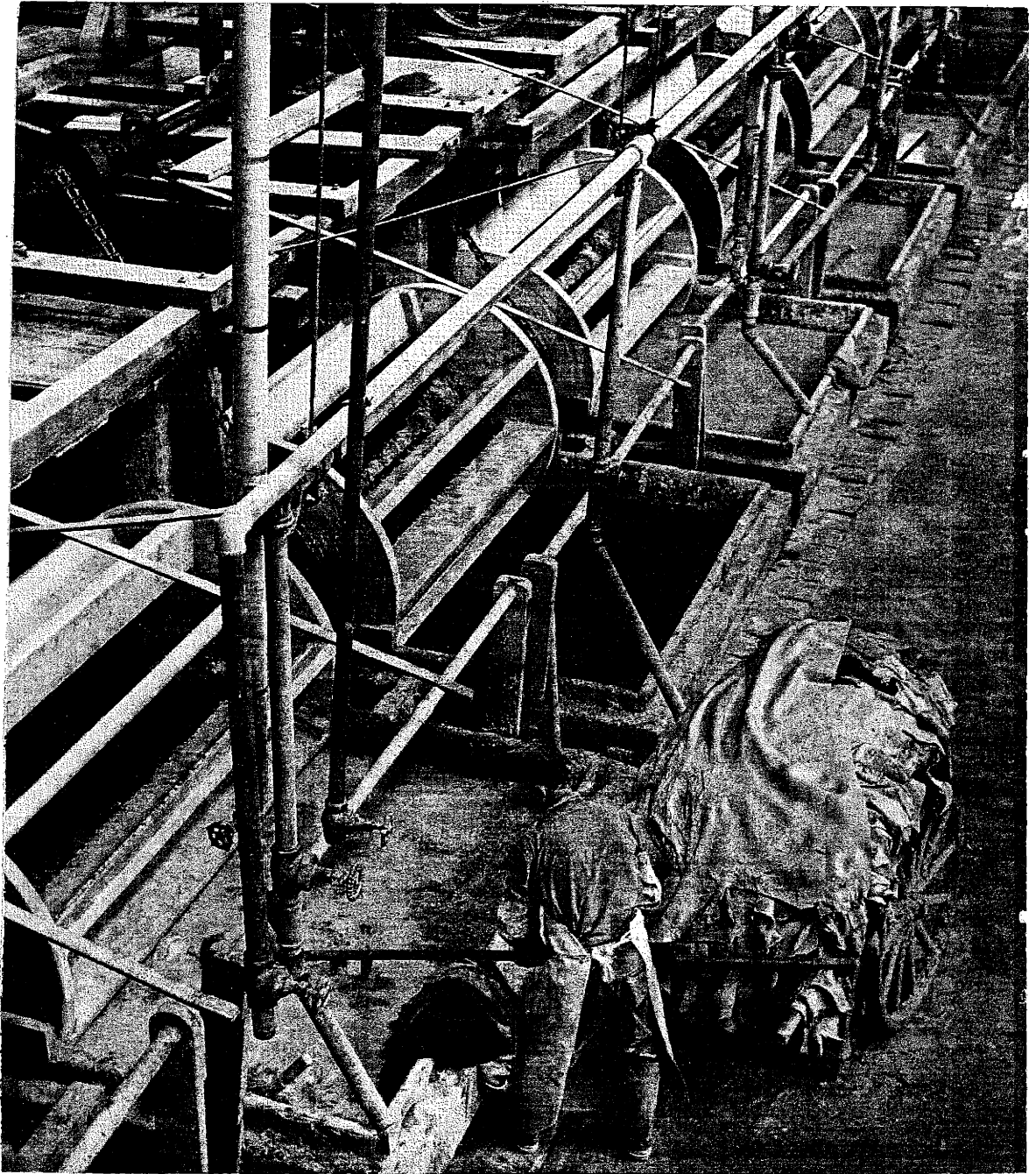
The skins up to and including "H's" are considered to be

calfskins. The "J's" and "K's" are called "Kips," and anything larger or heavier than a "K" is called a "hide." It should be noted that one never speaks of a cow skin nor of a calf hide. It is always a calfskin or a cowhide. The terminology is very strict. Some calf tanners do tan "Kips," but in general they are shipped to a cow hide tanner.

When the skins are "sized" they are placed in stacks, and these stacks are made on top of skid platforms. After the sizing is complete the skins are taken to stamping machines. At these machines the skins are stamped with a number, in the "butt," and this number then stays with the skin until the time it is ready to be sold. The number is stamped in the "butt" with a perforating machine, and then all skins of the same number are stacked together on skid platforms. When they are stacked in this way the whole group containing the same number is known as a "pack." Each pack is made up of only one size of skin and weighs about 4000 pounds. The number of skins may vary, of course, from 290 to 900 skins. From this point on we shall follow a pack rather than a skin. (See Appendix

The operations of trimming, sizing, and stamping are done in one day, and the packs are made up. Also, just before closing time, these packs are taken into the Beam House and left beside the pit where they will receive chemical treatment.

The next morning, about 4 a.m. men come to work and throw these skins into the pits for the soak. These pits are simply

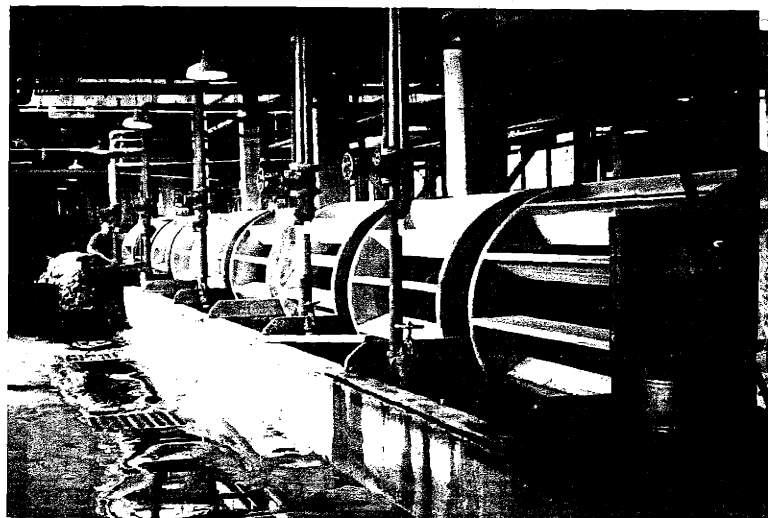


3. Floor Level Pits

Where skins are cleaned and prepared for tanning.



4. Lines of Pits



5. Lines of Pits

large holes in the floor, lined with concrete, each holding about 2000 gallons. There is also a large paddle wheel which agitates the water, and circulates the skins in the pit. The water is warmed to a temperature of about 70°F, and the skins are allowed to "wash out" for about two hours. This "washing out" cleans some of the dirt and salt off the skins, and also softens them.

After the skins have "washed out" sufficiently they are pulled out of the pits and taken to "hair fleshing" machines. These machines remove excess flesh from the skins, and generally aid in making the skin a constant thickness. The action of the machines is very simple. There is one roller covered with spiral knives, there is one roller covered with rubber, and there is one roller which has a rough corrugated surface. The operator (known as a hair-flesher) lays the skin in the machine, and steps on a foot pedal. The action of the rubber rollers is such as to hold the skin firmly against the knived roller, which removes the excess flesh, while at the same time the rough roller turns and forces the skin to come out of the machine after passing by the fleshing blades. After the "hair fleshing" operation the skin goes back into the pit from which it was taken.

When the pack has all been "hair fleshed," and all replaced in the pit, it is soaked for a varying period of hours. This consists of allowing it to wash out again, with the paddle turning, until the whole pit reaches a temperature of 85°F. After the pit has been "warmed up," as this washing and soaking is called, lime

and sodium sulphhydrate are added to the water. This is paddled enough to get a good solution, and then the paddle is turned off and the pit is left at rest.

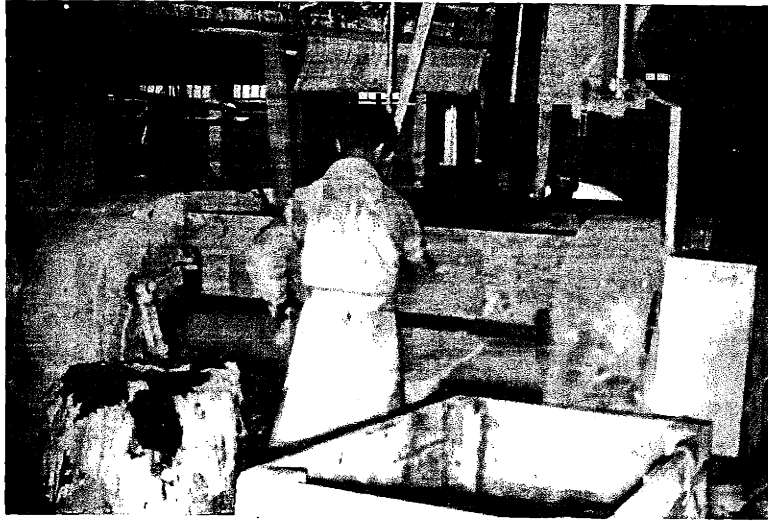
During the next five days the skins are agitated by slight turning (this means that the paddles are turning) every few hours, and the pit is kept at a constant temperature. Nothing else is added during this time, and nothing is removed.

On the seventh day the skins are removed from the pit and taken to the "unhairing" machines. These machines are similar to the "hair fleshing" machines, but in this case there is no rough roller. The skin is placed in the machine, and in passing the roller knives the hair is pulled out, and much of the epidermis is removed.* The hair goes into a conveyer, and we shall follow it later. (See illustrations 6 and 7)

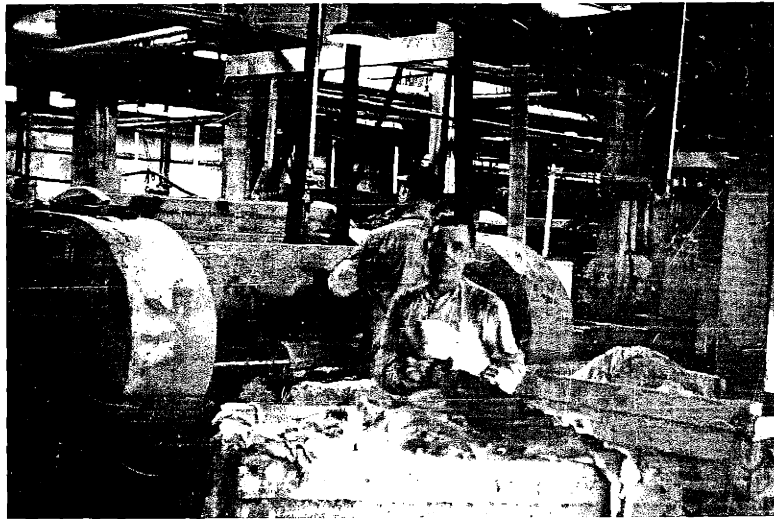
The skin now goes to a "cheeking" machine. This machine removes the excess thickness of the skin at the neck. The neck is put through the machine, and the excess is sliced off by pulling over a stationary blade which cuts off all but a certain predetermined thickness. The operator of this machine is a "cheeker." (See illustration 8)

A second fleshing operation follows the cheeking. This is known as "lime fleshing" and in this operation the skin is cut down to a constant thickness. (See illustration 8) The

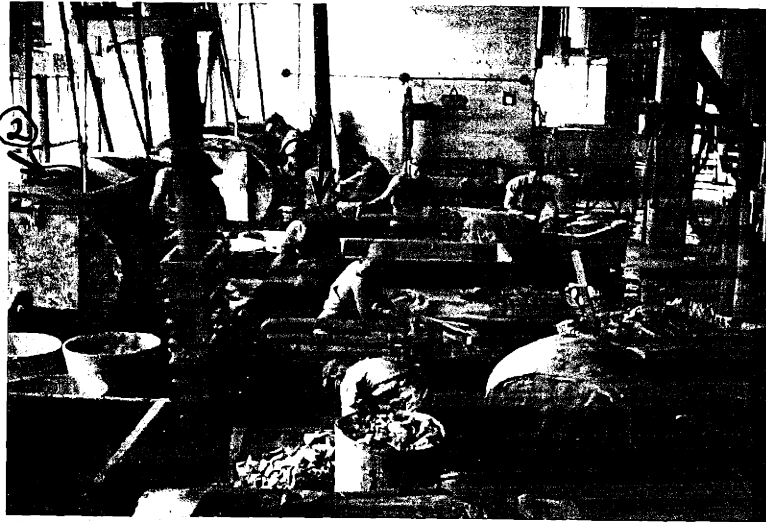
* The skin is built up of many layers; the outside is known as the epidermis. Wilson - Tanning.



6. Unhairing Machine



7. Unhairing Machine
Barrel Man and Operator



8.

(1) Shows the cheeking machine. In this picture the operator is turned half way around grasping a skin off the pile. The man in the foreground is shoveling the "cheeks," cut off by the machine, into a barrel.

(2) Shows the lime fleshing machine.

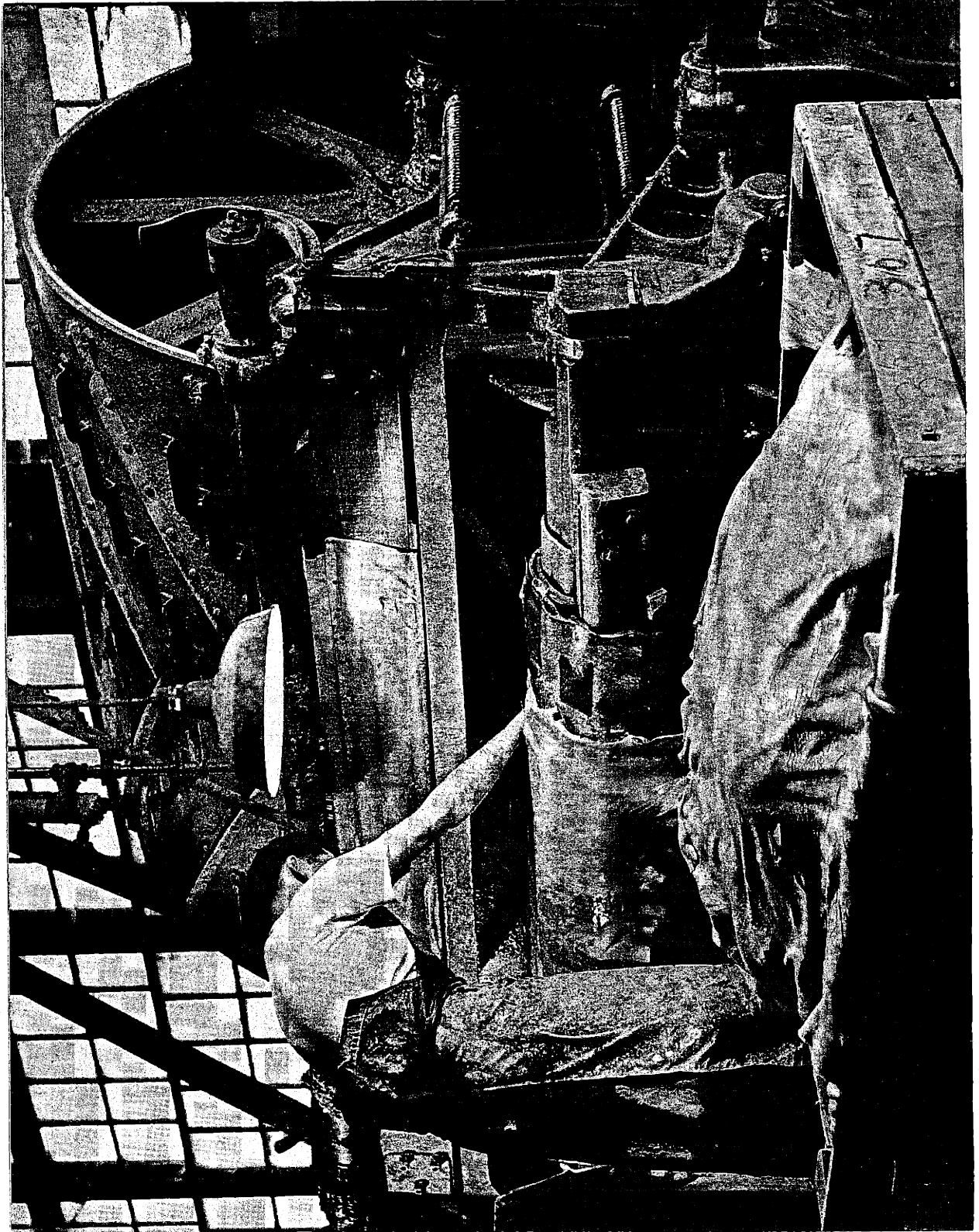
(3) The man who does the trimming. The skin is trimmed and thrown into the box truck just to the right of the trimmer.

action here is the same as it is for the hair flesher. In going through this machine some edges are left ragged so a trimmer cuts off unusable parts. This trimming is the next operation. (See illustration 8)

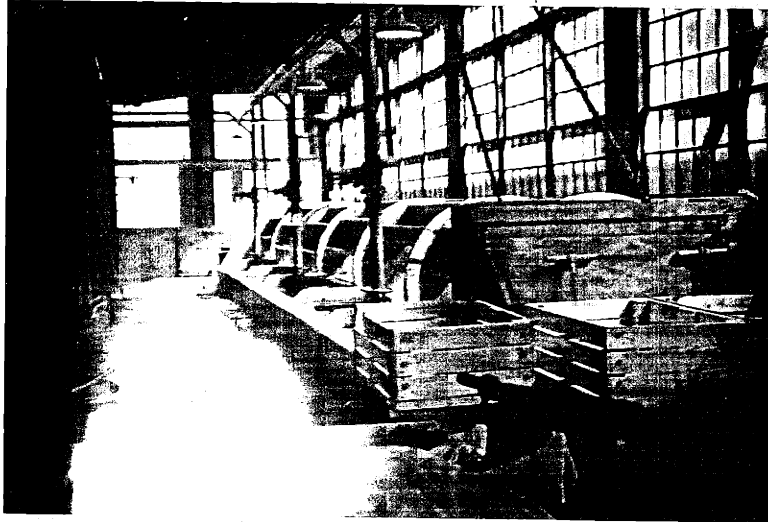
When the skin has passed through the "lime flesher" and the trimmer, the work on the flesh side has been completed. The next operation (see illustration 9), scudding, or beaming, finishes off the grain (hair) side of the skin. The scudding machine consists of a large drum, 5' to 10' in diameter, and 10' long, which has spiral blunt knives on it, and a heavy rubber flap used to hold the skin against the blades. These blades clean the "scud" and the dirt off the grain side of the skin. The "scud" consists of the hair roots, and any epidermis which remains on the skin.

If we consider at this point what has been done to the skin, we find that it has been softened, shorn of hair, cleaned, and generally been worked on mechanically. The other operations we shall consider are primarily of a chemical nature.

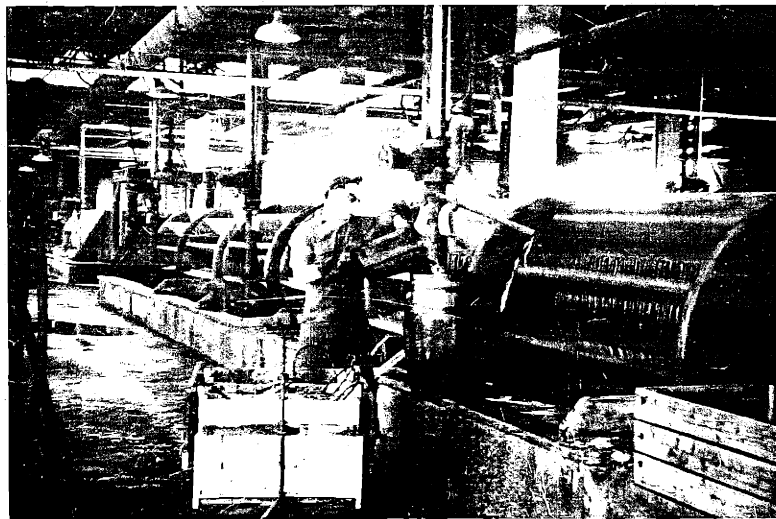
When the whole pack has been scudded, it is weighed, and inspected. The inspection is done while throwing the skins into another pit. This pit is one of a special group, used only for a single type of operation. (See illustration 10) In these pits the skins are "puered." This means that a type of bate is added to the water and the skins are turned for a time. The action of this bate removes much of the gelatin from the skins, leaving the fiber. It is this fiber which is leather.



2. After the hair has been loosened by various soakings of the skins in the Beam House processes, this "scudding" machine scrapes it off.



10. Puer Pits



11. Mixing acid for pickle pits

After the proper amount of gelatin has been removed, the skins are taken from the pit and put into a pickle pit. This pit contains a mixture of water, salt, and sulphuric acid. (See illustration 11) The reaction between the salt and the sulphuric acid produces hydrochloric acid, and this acid does the pickling. The pickling operation preserves the skin by treating it with acid in much the same way as cucumbers are preserved by pickling.

It is at this point that we shall stop in this discussion. Many other steps follow, but it is in the processes mentioned above that leather is really made. It is hoped that this first explanatory story will make the rest of the thesis more easily understood.

Methods of Approach

There are several approaches which could be used in attacking this problem. Obviously, the desire of management is to cut costs, so let us use that approach. Let us decide what must be done, and how this is to be done, and we should have the base essentials, and thus the lowest costs.

The fewer the men employed the lower will be the payroll. Using this premise we shall try to eliminate unnecessary jobs. The lowering of the cost of material will result in the lower cost of the product. The higher the income from by-products the greater the profit.

The start in this case was to analyze the Beam House as it existed, and to put down definitely what was being done. This is shown on page 19. A study of this will show that some of the men were working on jobs which added something specific. The rest were just helping in one way or another.

A breakdown of the men employed shows the following results:

Get Ready

Trimming	7	
Green lime	3	
Sizing	2.5	
Stamping	2	
Positioning (barrel)	10 2/3	
Transportation		
Out of lime	2	
Out of puer	2	
Out of hair flesh	2	31 1/6

Do

Liming and sulphhydrate	1	
Hair flesh	4 1/3	
Unhair	3 2/3	
Cheek	3	
Lime flesh	3	
Scud	4	
Puer	1	
Pickle	1	21

Put Away

Soak for lime	2	
Out of pickle	2	4

Inspecting

Green skins	1	
Scudding Inspection	3	4

General day work

	6	6
--	---	---

One Hair Man

	1	1
--	---	---

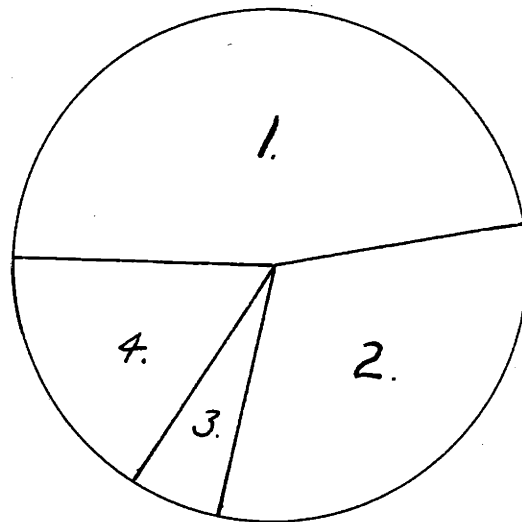
67 1/6

Necessary Operations

The actual work which makes leather can be listed very easily. The hair flesher takes off excess flesh. The lime and sodium sulphhydrate loosens the hair and the epidermis. The unhairer removes the hair. The cheeker cuts the skin to thickness and the lime flesher finishes this operation. The scudding cleans the grain side. The puering removes the excess gelatin, and then the pickle preserves the skin. These are the necessary operations.

Now let us see how many of the men are employed in doing these operations. (See page 19) Four and one-third men are hair fleshers, 1 man does the lime and sulphhydrating, 3 2/3 men are unhairers, 3 men are checkers, 3 are lime fleshers, and 4 men work on scudding. The actual work of the pickle and puer is done by 2 men in supervisory positions. Thus we find that 21 men are directly employed in producing the leather. The rest of the men are employed in getting the work ready, putting the work away, inspecting, and general day work.

Thus we find that out of 67 1/6 men employed there are 31 1/6 getting the work ready, 21 doing the work, 4 definitely putting it away, and the rest simply assisting and inspecting. Less than one third of the men are actually adding something specific to the final product.

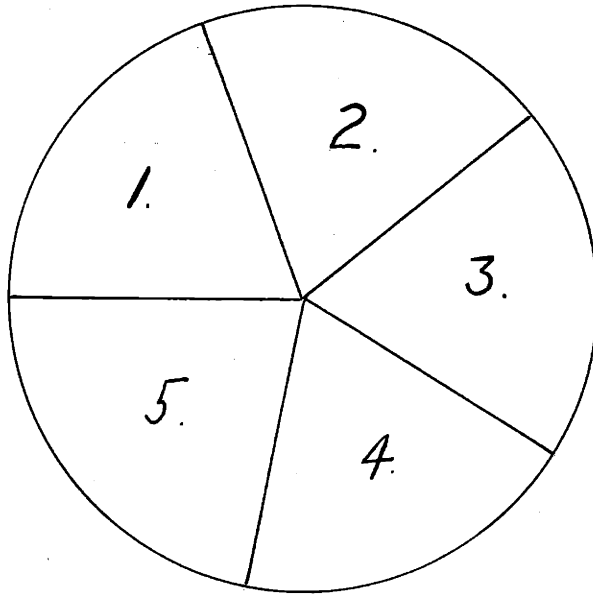


1. Get Ready
2. Do
3. Put away
4. General work

It would seem that the "get ready" portion of the work could well be studied to see where the fault lies. A breakdown here shows that ten men are trimming the skins, 2.5 are sizing, and 2 are stamping. These three groups are more constructive than the rest. The actual trimming is constructive to a certain degree, and the sizing and the stamping are necessary features for the production control.

The men who position the skins for the machine operations represent an advance over the old method whereby the operator positioned the skin himself. It thus appears that this operation is necessary. It is cheaper to pay these men a low rate to position the skins than it is to have the operator do the job himself.

The last item of the "get ready" is the pulling of the skins out of the pits. The facts on this are rather obvious. The skins are in the pits, and they must be removed. It appears then that these men cannot be eliminated.



- 1. Out for hair flesh
- 2. Out of puer
- 3. Out of limes
- 4. Stamp
- 5. Size

Do:

Under the do part of the study, we encounter the fact that each job is a definite necessity. A cursory study shows that each must be done. Therefore we shall leave this until later.

Put Away:

The actual put-away is a small part of the whole. Two men spend a large portion of their time taking skins from the hair fleshers and putting them into the pits to be limed. This is necessary. The other two men included in this put-away operation spend their time pulling skins out of the pickle pits to get them ready to go on to the tan rooms. This also is a necessary job.

Inspection:

The inspecting that is done serves as a very definite

quality check. Since the product is a quality one, the inspection is a definite must.

Others:

The day workers are general help, doing odd jobs that must be done, and the hair man serves a function to be described later.

The Ideal Case

The approach used in this case is to set up what appears to be the ultimate in work simplification and then, after having made this ideal attack, try to apply as many of the points as possible to the Beam House as it exists.

Location:

The first assumption is that a new tannery is being built. This may be considered as an ideal case and it is with this premise that we start. Our initial problem is then one of location.

The location of a tannery is dependent upon many factors. These factors include: labor, water, raw materials, market, transportation, facilities, power, climate, etc. Let us balance these factors and determine a desirable location.

The labor is a very important factor. Unionization has made inroads in the labor supply. The unions which exist at this time are not connected with either the A.F. of L. or the C.I.O., but it is likely that they may be connected in the future. The need for highly skilled men is slight, but a great majority must be semi-skilled. The conditions under which the men work are not ideal, by any means, and this is important in choosing a location.

The hazards of the tannery include slippery floors, with

the attendant danger of falling; machine work, with safety devices often inadequate; work on skins which contain various chemicals that burn, smell, or stain; and a final disagreeable fact that the odor is often very unpleasant. These factors regulate the type of workers, and thus we find that there is a predominance of foreign-born labor. It also appears that this will continue into the future. Thus one "must" is an adequate foreign labor supply.

The distance from the source of the raw materials is also important. These raw materials include the green skins, chemicals, and dyes. The green skins come from three main sources. One large group comes from the meat packers in Chicago, a second large group comes from meat packers on the West Coast, and the rest comes in scattered lots from small packers, abroad and anywhere else that calves are slaughtered. Skins that come to the East Coast come by train from the packers in Chicago and the South, and by boat and truck from the South and West Coast. This nearness to the sea is a factor to be considered. Also proximity to a good port and a railroad terminal is essential.

The chemicals used are numerous. They come from many different sources, and by diverse means. Some things, salt, lime, etc. are bulky and require railroad service. Other things, acid for example, come in special trucks.

The market for calf leather is very diverse. About 95%

of the leather is used for shoes, the rest for pocket books and novelties. The shoe factories are located in the East, South and Middle West. The leather is shipped to these factories by either truck or train.

When we consider both raw materials and the market for the finished goods we find that transportation facilities are very important. The tannery should be located on a railroad line, fairly near a good port, and with good truck facilities. Each of these three types of transportation has a definite place in moving the leather.

There is one thing which definitely limits the location of a tannery. This fact is that a very large amount of water is used in making leather. A great deal of water must be readily available, and this water must not be too warm. The water will stimulate bacteris growth if it is over 80°F, so the water must not be warmer than this. It is possible to control the bacteria by adding chlorine to the water, but this is not desirable, and should not be done regularly.

Some tanneries which are located in the South do work with water which is over 80°F a great deal of the time, but it is difficult to get fine-grained leather when the temperature is too high. The natural result of this is that a tannery must be located in the North.

We thus find that in determining the location of a tannery we are limited by certain factors. We must be in a

northerly climate, we must be near good water facilities both for the water itself and for transportation, we must be near a railroad terminal, we must have good truck facilities, and we want to be near both our raw material sources and our market.

There are only three possible locations which will start to satisfy these requirements. New England, Chicago, and the North West coast, all have certain types of advantages.

New England	2	2	2	1	1	1	1	1
Ill. & Wisconsin	1	1	1	3	3	2	2	2
Northwest U. S.	3	3	3	2	2	3	3	3

Climate
 Truck
 Railroad
 *Water Trans.
 **Water Supply
 Raw Materials
 Market
 Labor

* New England first because it is on the seacoast; skins come by water from West Coast, and also many skins from Europe, Norway and Sweden.

** New England first because it can get raw skins from all sources. West Coast and Illinois & Wisconsin both cheaper for local, but higher for distant goods.

This chart shows the order in which these various districts place relative to each other. It can be seen that comparatively the New England district rates first.

Once New England has been chosen as a desirable location there is a multitude of places which could be considered. We

shall make no attempt to place the tannery specifically. It is enough to say that it appears that New England is the location, and that the region adjacent to any one of the major ports should be ideal. Labor, water, and local considerations must determine this.

Beam House

The actual Beam House of the tannery is the next consideration. There are several major points to be considered in making a Beam House. One factor is that a Beam House is a solid block of steel and concrete and is not flexible. For this reason a layout must be made that will lend itself to new methods and to chemical changes.

A second factor which is very important today is the odor of a Beam House. Not many years ago people were so anxious to advance industrially they were willing to overlook the odors which emanated from a Beam House. This is not true today, and in anything being planned for the future, steps should be taken to eliminate these odors.

The third consideration is the working conditions. The humidity of a Beam House is very high, because of the water in the pits. The floors of the plant are always wet and slippery because of this water, and also because of the lime which is used in the hair removal operation. This lime also has a tendency to burn the workers. The odor might be mentioned again

here, under working conditions, but the workers do not mind this smell, once they have become accustomed to it. An attempt should be made to better these working conditions in any new method or in a new Beam House.

With these considerations in mind, and with the principles of work simplification studies, a new Beam House was designed. The best way to study this new Beam House will be to follow the product through it, noting the changes and explaining the reasons for the changes. Each operation which was considered can then be seen in detail. This new Beam House is shown in Chart # page . The arrows show the progress of a skin from the time of its entry into the hide house to the time of the exit to the tan rooms.

The drawing of the new Beam House shows the general layout. It does not, however, show several of the important features. The building itself is one of the latest type with no windows. It is a simple, boxlike, reinforced concrete structure. The air is all conditioned, and an odor reducer is also connected with the ventilating system to remove odors that are not desirable. The Beam House is lighted with the new industrial fluorescent lights.

The advantages of these features are numerous. The air conditioning serves to keep the temperature and the humidity correct. This means that the working conditions are better. It also means that the leather is all made under similar conditions.

The use of only artificial light means that the light can be correctly arranged, and then since no other light comes in, the artificial lights will be kept clean and working. The combination of natural and artificial light makes a hodge-podge out of the illuminating problem. Properly designed lighting will benefit both conditions and work done, and if done properly the cost should be slight.

The first step to be considered occurs when the skins arrive at the tannery. Under the present arrangement the bundles are taken directly into the refrigerator until ready to be used. The new method would be to have the bundles of skins opened directly upon the skid platforms, in the freight car, and then the platforms would be taken to the scales and weighed. The platforms are then taken to the trimmers and deposited for them. The skins are then trimmed and thrown on piles. These piles are then gone over and sized. The sizing is done onto skid platforms and then the skid platforms are taken down in the lift to the refrigerator. The skins are then stored in the refrigerator according to size.

The result of having the trimming and sizing done at first is that the number of each size of skin is then known. The skins are trimmed before storage, and thus only the actual usable leather is kept under refrigeration. This results in about a twenty per cent reduction in the material refrigerated. It also results in having any quantity of a certain sized skin readily available.

When it is time to get the skins out for the soak they are brought up from the refrigerator and taken to the stampers. Here the skins are stamped with the job number of their pack, made into packs, and then taken to wait for the soak.

Just before closing the tannery for the night the packs are taken to the pits where they will be soaked. The packs have been made up on skid platforms again so they are moved as units to the pits, and left there to await the soak in the morning.

At this point we should explain that there are several things about this Beam House that are very different from all others. This one is constructed on two levels. The hide house, the tops of the pits, and the hair dyer are all on a level. The pits then have a door at the side, on the bottom, allowing the skins to fall out after the water has been drained out. Thus there is a second level, ten feet lower than the first, where all of the machinery is located, and there are "alleys" on this level between the pits to allow workers to empty the pits directly into the trucks which carry the skins.

There is a very good reason for having these two levels. If a careful study is made, it will be seen that the skins are put in and out the pits four times. This means, under the present arrangement, that the skins must be handled almost separately eight times. Four times they must be thrown into pits, and four times they must be pulled out again. With the pits

sunk into the floor, and properly designed, it would be possible to dump a whole truck full at a time. This might be possible at present if it were not for the fact that the pits, as they exist, are not designed properly. If the skins are dumped, they tangle and stick together, and do not get properly paddled.

If the pits then had a door on the bottom side where the skins could be removed, all that would be necessary would be to place a truck under this door and rake the skins into it. In the new Beam House this would be possible.*

The next morning, early, a man comes in and pushes the skins into the pits to soak. He also starts the water running to wash out the skins, and gets the paddles turning to agitate the skins. This washing out continues until time for the hair fleshers to come to work.

This man then shuts off the water and the paddles and allows the soak pits to drain. After draining he opens the door in the back of the pit and pulls the skins out into four-wheeled carts. These are then taken to the hair fleshers. The hair fleshers perform their operation as before, and throw the skins into carts which are designed as shown.**

These carts are then taken to the elevator, raised one flight to the upper level, and then taken to the pit from which

* See Appendix N.

** See Appendix L.

the skins were taken. The carts are then dumped, and the skins are allowed to soak until afternoon when they will be limed.

In the afternoon the lime is brought to the pits and dumped in. The sodium sulphhydrate is also added, and the paddles are turned for twenty minutes. The paddles are then shut off and the skins are allowed to stay in the "lime" for the next four days. The schedule is shown in Appendix K.

When the proper day arrives the pit is drained of the liquid, and then the skins are pulled out through the door in the base into truck carts. These carts are then taken to the unhairing machines.

When the skins arrive at the unhairing machines they are removed from the carts, one at a time, and prepositioned on a barrel. The unhairing operator then takes each skin and removes the hair. Then, instead of simply throwing the skin into another truck, he uses both hands and throws it out flat onto a flat-topped table. (See Appendix M) When about 100 skins have been stacked in this manner, the table is rolled over to the cheeking machines.

When the table arrives at the cheeking machines, the skins are already prepositioned for the cheeking operation. The barreling prepositioning has been eliminated. The cheeker takes the skins, one at a time, and performs his operation. He then throws the skin onto a table which is within easy reach of the lime flesher.

The lime flesher grasps the skin and puts it through the fleshing machine, and then he throws it out flat upon a table similar to that used by the unhairer. He stacks the skins up until there are about 100, at which time the table is rolled to the scudders.

The old method employs a trimming operation after the lime fleshing. Some tanneries do not use this operation and their product does not suffer. Therefore it seems that it can be eliminated. Also, by having the skins stacked after the lime fleshing has been done, the barrelling for the scudders can be eliminated.

The scudding operation is then performed as it was done originally. The skins are thrown into trucks as before and the trucks are weighed, and then taken up in the elevators to be inspected and thrown into the puer pits.

The skins are then washed out and paddled, and then heated up to 95°. The bate is added, and the skins are allowed to rest until the puering has been complete. When it is done the pit is drained, then the skins are washed out. The pit is drained again after the washing, and the skins are pulled out into the pickle pits, directly below.

The acid is added to the pickle pits, and the skins are pickled for several hours. They are then pulled out of the pit and put into trucks to go down to the tan rooms.

Application of New Methods

If we now take the advantages of this new Beam House and try to place them in the Beam House as it exists today, we should be able to make a practical application of work simplification. This, then, is the final step in this presentation. We have set ideal circumstances and found what methods could be used with these conditions. Now let us see what can be done to apply these methods to the existing Beam House.

The plan on page . . . shows the new process flow lines on the Beam House of the American Hide and Leather Company. There are a few changes in the layout, and these will be discussed as they are encountered. It would appear, however, that the introduction of air conditioning and odor control would be advantageous. It also would seem that the new methods of industrial lighting with fluorescent bulbs is desirable. These are changes which can be made without any difficulty and without interrupting production.

The first change made in the new process is to trim and size the skins before storing in the refrigerator. There are several good reasons for the change. It is admitted that fewer skins can be stored per square foot of floor area when the skins are stacked on platform trucks. However, the refrigerator is high enough to allow two layers to be stacked if shelves are built, and an electric truck stacker will make

this stacking an easy operation. (See Appendix O)

If the skins are trimmed and sized first there is a 20% saving in the goods refrigerated. Also it is much easier to control production if the skins are all separated according to size. Any number of each size is readily available, and any change in demand can be met in an instant. Also a much more correct inventory is possible if the actual number of each size is known.*

The next change is that a different type of truck be used by the workers pulling skins out from the soak and from the lime. (See Appendix M) When the skins are pulled out they should be placed flat on a truck, prepositioned for the machine operators. The time for pulling out will be increased, but the total time for pulling out and barreling the skins will be decreased for the handling will be cut down.

This means that the skins pulled out will be prepositioned as they are put onto the trucks, and thus there will be no operation of barreling the skins. This will result in an increase of one man for both the pulling out of soak and the pulling out of the lime. It should, however, eliminate one hair flesher, and speed up the time of the others. It should

* The reader should understand that although skins are bought according to size, there is a certain variation and every skin is not the size that it is bought. That is, if a carload of D's is bought, there may be 10% B's and 10% F's in the lot. Only after sizing can this variation be known.

also eliminate 3 2/3 men from the barreling operation for the unhairers.

After the unhairing the skins should be stacked, as in the ideal case, and the stacks moved to the checkers as before. One man will be necessary on full time to do this operation. After the checking and lime fleshing the skins should be stacked again. The trimmers can be eliminated completely. These stacks can then be pushed to the scudders in their new location.

The scudders have been moved from one side of the Beam House to the other, as shown in the diagram. This results in a shorter and easier distance to move the tables of skins, and it does not affect the distance moved after scudding in the slightest. The result is simply one of exchanging the positions of the scudding machines and the lime storage.

The inspecting which is done as the skins are thrown into the puer can be combined with the trimming operation which has been eliminated. Little trimming needs to be done, so this can be combined easily.

There is nothing which can be done to simplify the puering and pickling operations under the present arrangements. These operations must be continued as they are done now.

Lime Storage

The present arrangement of handling and storing lime is

not too well integrated. At present, when a carload of lime arrives the bags are stacked onto trucks and taken into any convenient space and piled up there. Then, when lime is wanted, it must be taken from these stacks and put onto a truck, and then hauled to the proper pit.

The ideal method would have a conveyer running from the freight car to the lime storage space. The bags could be moved onto the conveyer by one man, and off onto the proper piles by another. The man stacking should pile the bags on platforms in such a way as to allow the whole pile to be moved at one time. Thus, when lime is desired at a pit, all that need be done is to take one platform and to load and deliver it to the pit.

New Method: The lime should be stacked on skid platforms in the railroad car, and then these platforms brought in and stored in the place where the scudders were. The platforms could then be removed when desired as in the ideal case.

Salt and Brine

The brine which is used to make hydrochloric acid for pickling is made quite efficiently. However, the handling of the rock salt is excessive, unnecessary, and generally unhealthy. Let us consider what is done at present.

The salt is bought and delivered in bulk. It comes loose in freight cars. When the salt arrives at the tannery, a crew of men go to work with shovels and wheel barrows. Two

men fill wheel barrows in the freight car while two others wheel the salt into the elevator, up one flight, and out into the salt storage pit. One man is also engaged in running the elevator.

This gets the salt into the pit. Now, to make the brine the salt must be shoveled into a hopper which is generally 6-8 feet above the height of the salt. This means that two men must go into the pit and shovel the salt into the hopper. One man shovels from the pit pile onto a run-way some 3-4 feet above the salt, and the second shovels from the run-way into the hopper. Once the salt is in the hopper, the brine is made automatically.

This brine is stored in a large circular pit, and is drained into the pickle pits as needed through rubber hose.

Ideal Method of Salt Storage: The ideal method of handling the salt necessary to make brine would be to store the salt where it could flow by gravity into the brine mixer. To do this the salt storage must be higher than the mixer. This is done in the ideal Beam House. Also, to eliminate other handling, a conveyer is used to move the salt from the freight car to the storage space. From the storage it flows into the mixer, and then the brine is made and dispensed as before.

New Method of Salt Storage: The present arrangement is such that it is almost impossible to change to the ideal case. However, two things can be done. First, a conveyer can be put in which will move the salt from the freight car into the salt

storage pit. And, secondly, a small conveyer can be used to move the salt from the pit into the brine mixer.

The result of these changes would be to make much easier the salt question. One man would be able to unload a freight car, and one man could load the brine mixer alone. These savings should balance the depreciation charges of the conveyers.

Hair Disposal

The present method of hair removal and disposal is quite effective. Under the arrangement now used the hair is removed from the skins in the unhairing machines. The hair falls down into a conveyer which pulls it into a pit. Water mixes with hair in this pit, and then a bucket conveyer (See Illustration 12) pulls the hair and water into the hair washer.

The hair is washed in the hair washer and comes out of the washer clean and moist. It is then pulled up one flight by a centrifugal pump and fed into the hair dryers. (See Illustrations 13 and 14) The hair passes through the dryer and comes out the end all dried and cleaned. The hair is then thrown into the baler and made into bales. (See Illustrations 15 and 16)

These bales are weighed and their weight marked on them, and then they are stored in a dry place to await favorable prices before shipping.

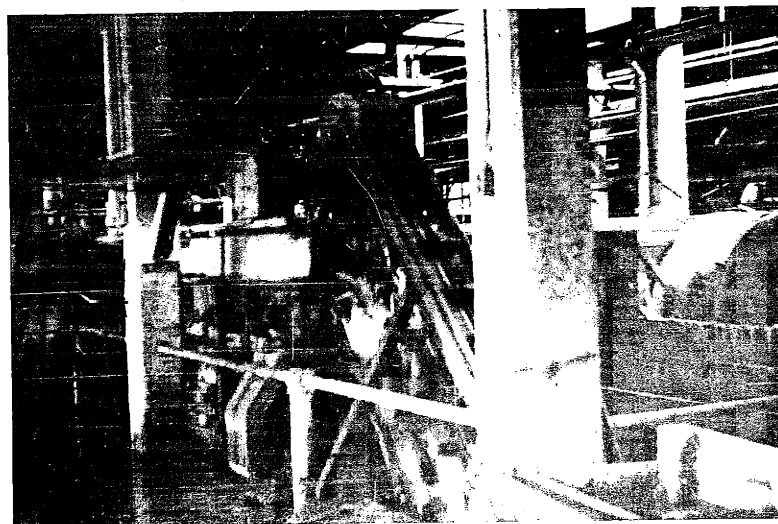
New Hair Disposal: There seems to be very little to

improve in this hair disposal. The present method is very efficient, and only one man is employed. However, there are improvements which should be made, and these will be suggested.

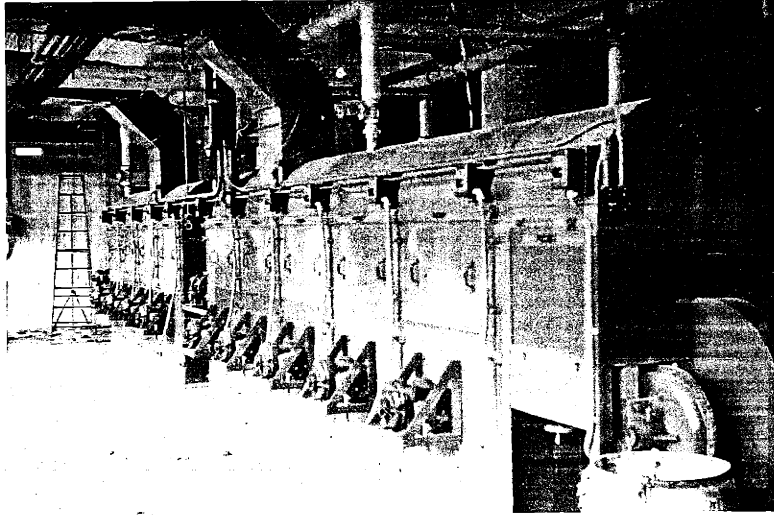
The first improvement would be to place a blower under the end of the hair washer to blow the hair up into the dryer, instead of pulling it up with suction. The suction method works, but it breaks down too easily.

The second change which should be made is to replace the bales with a different type which rises out of the floor. This other type of baler will permit a bale to be made in just 2-3 presses, instead of about 8-10 as is necessary now. It also is much easier to load. The present baler is very difficult to fill, as can be observed in Illustrations 15 and 16.

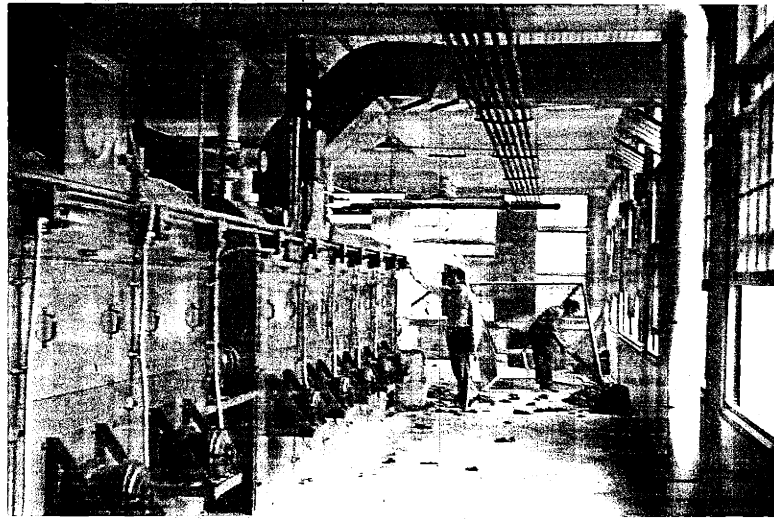
These are two improvements which would add nothing financial to the company, but they would aid in the problem of labor loyalty.



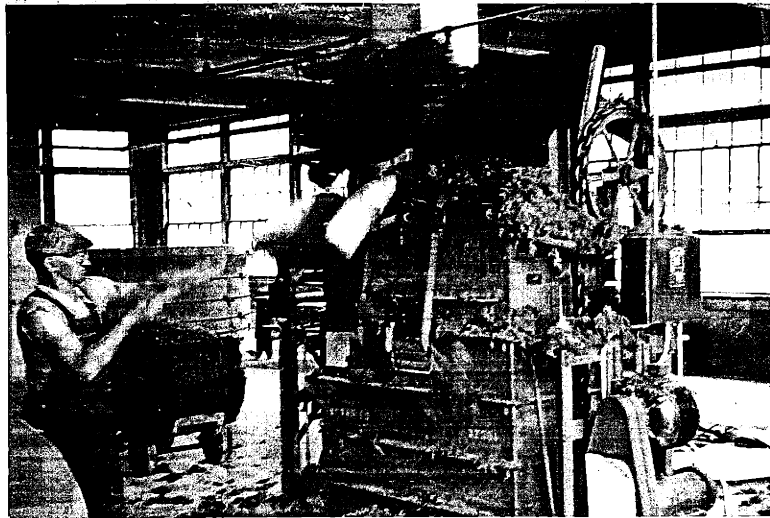
12. Convey for Hair into Washer



13. Hair Dryer



14. Hair Dryer



15. Hair Baling



16. Hair Baling

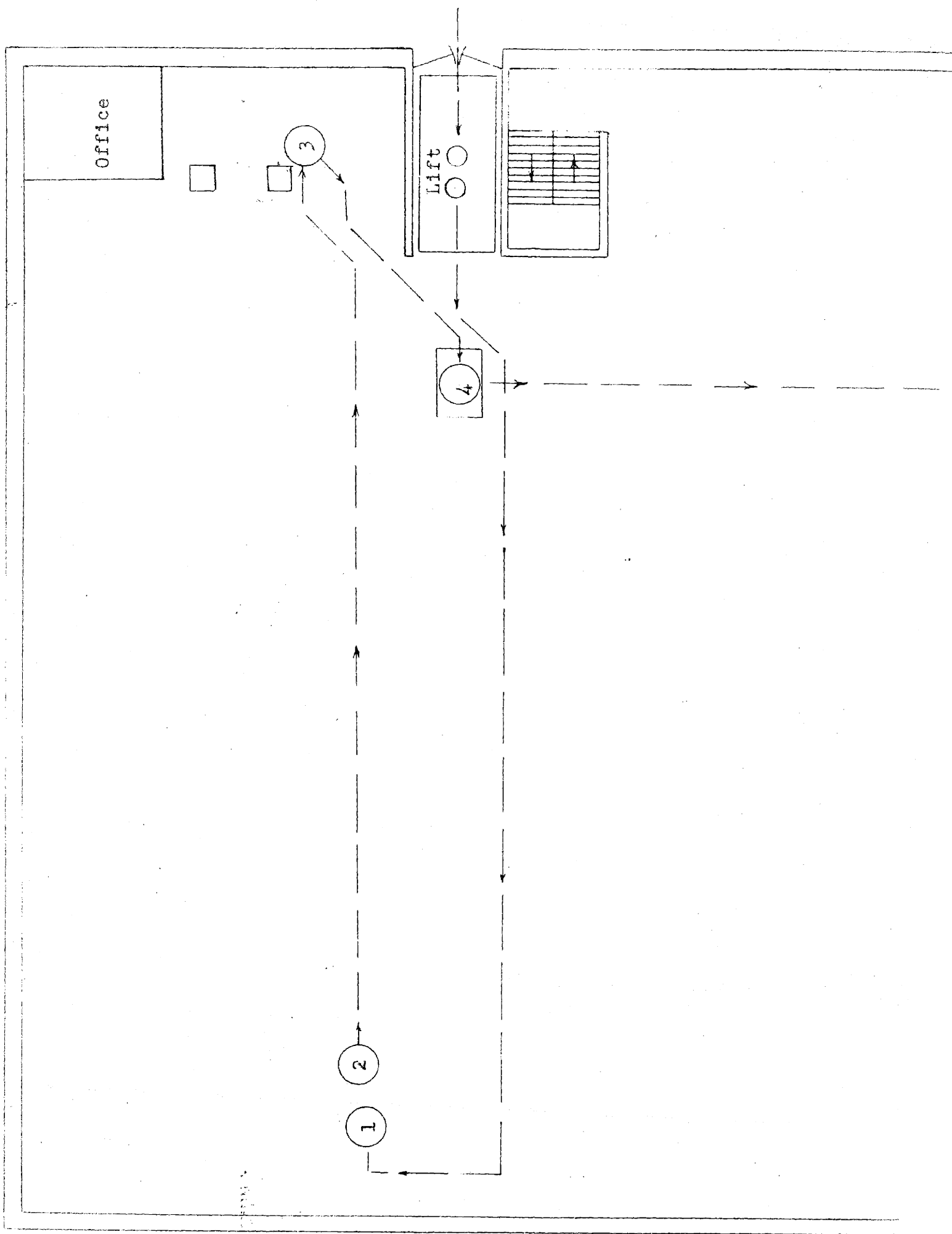
Conclusions and Recommendations

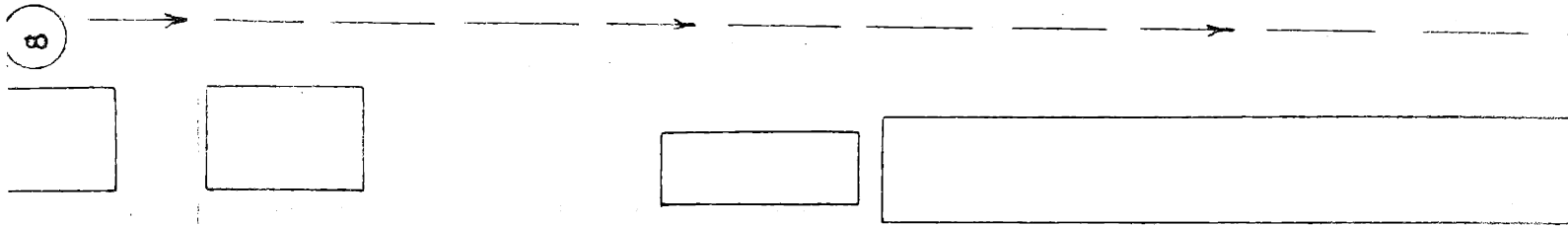
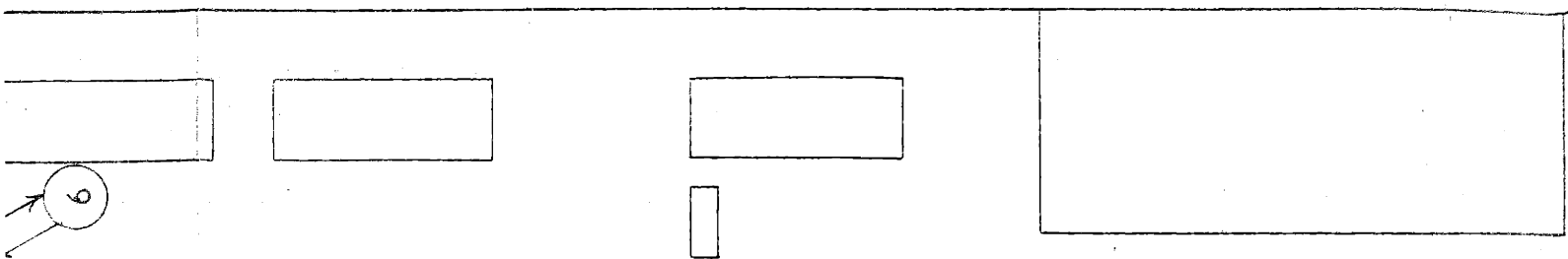
1. Rearrange hide house so that skins will be trimmed and sized before storage. (Two levels in refrigerator for storage - (a) Better production control, (b) Lower refrigerator costs)
2. Stack skins in specific manner when removing from pits. This eliminates all barrel men.
3. Stack skins in specific manner after machine operations.
4. Move scudders to opposite side of Beam House.
5. Stack lime on skid platforms by amounts needed for pits.
6. Put in conveyer for salt.
7. Change hair disposal as suggested.
8. Air condition the Beam House.
9. Install fluorescent lights in Beam House.

Appendices

Appendix A

Present Layout





98	99	100	101	102	103	104	105
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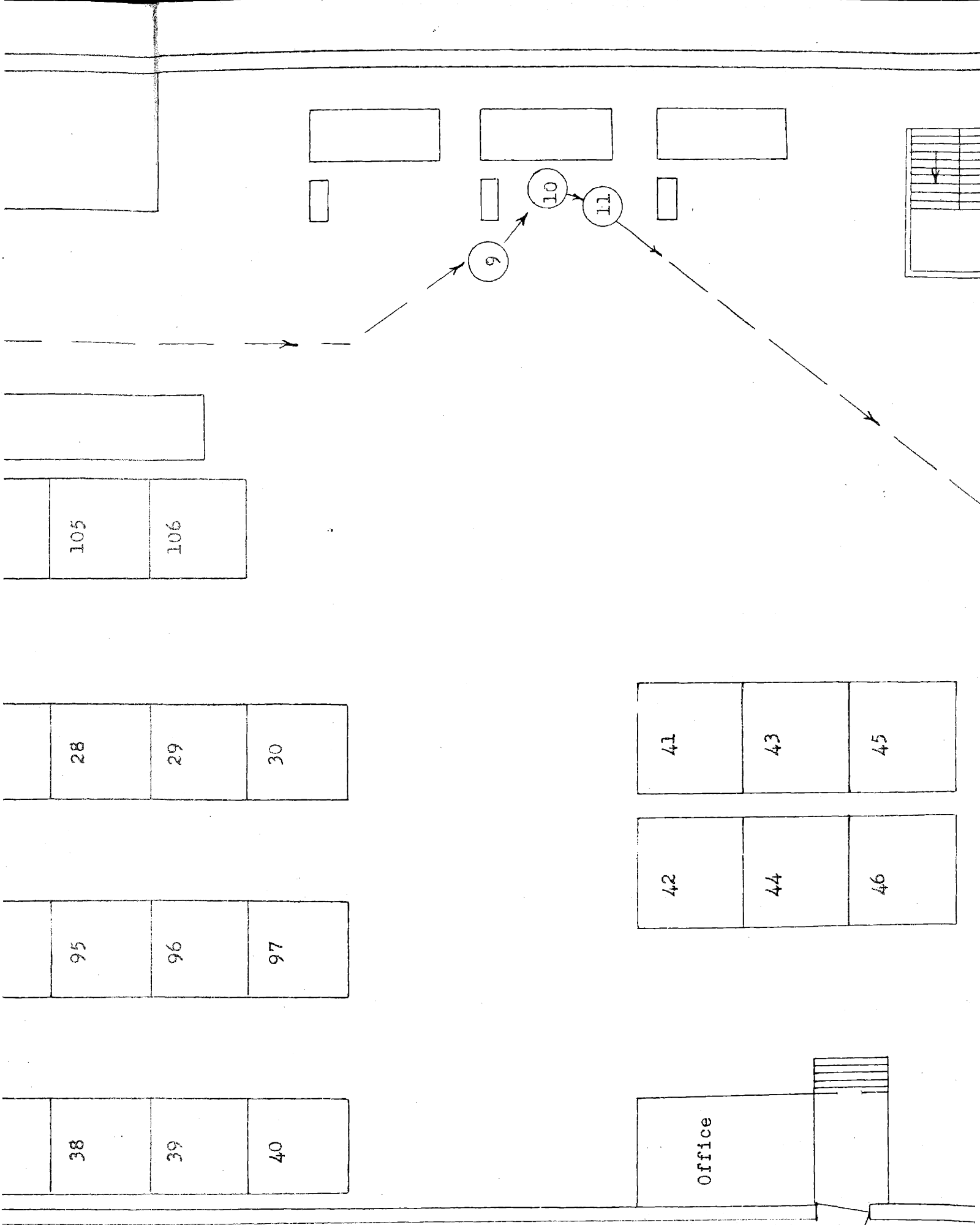
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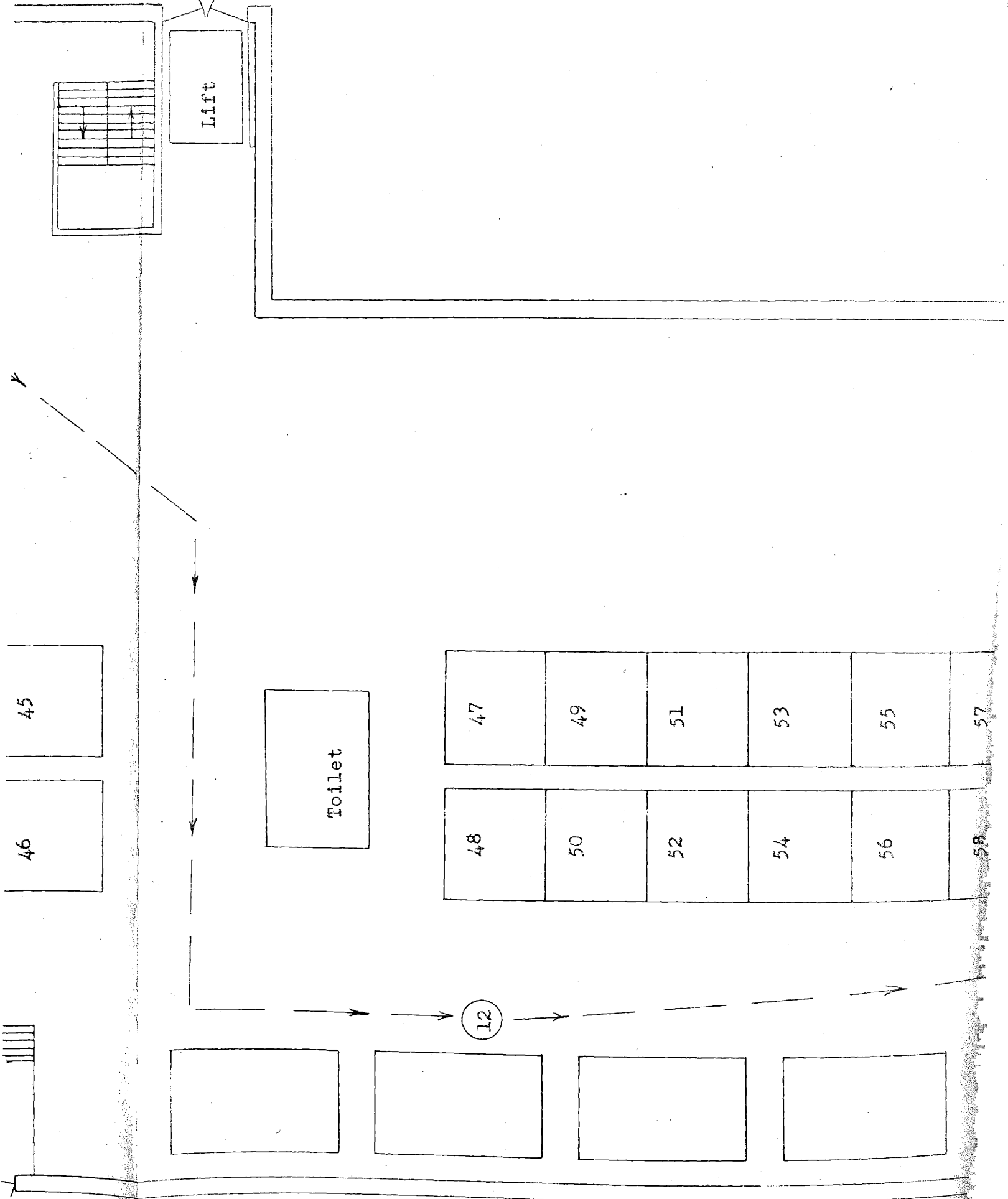
89	90	91	92	93	94	95
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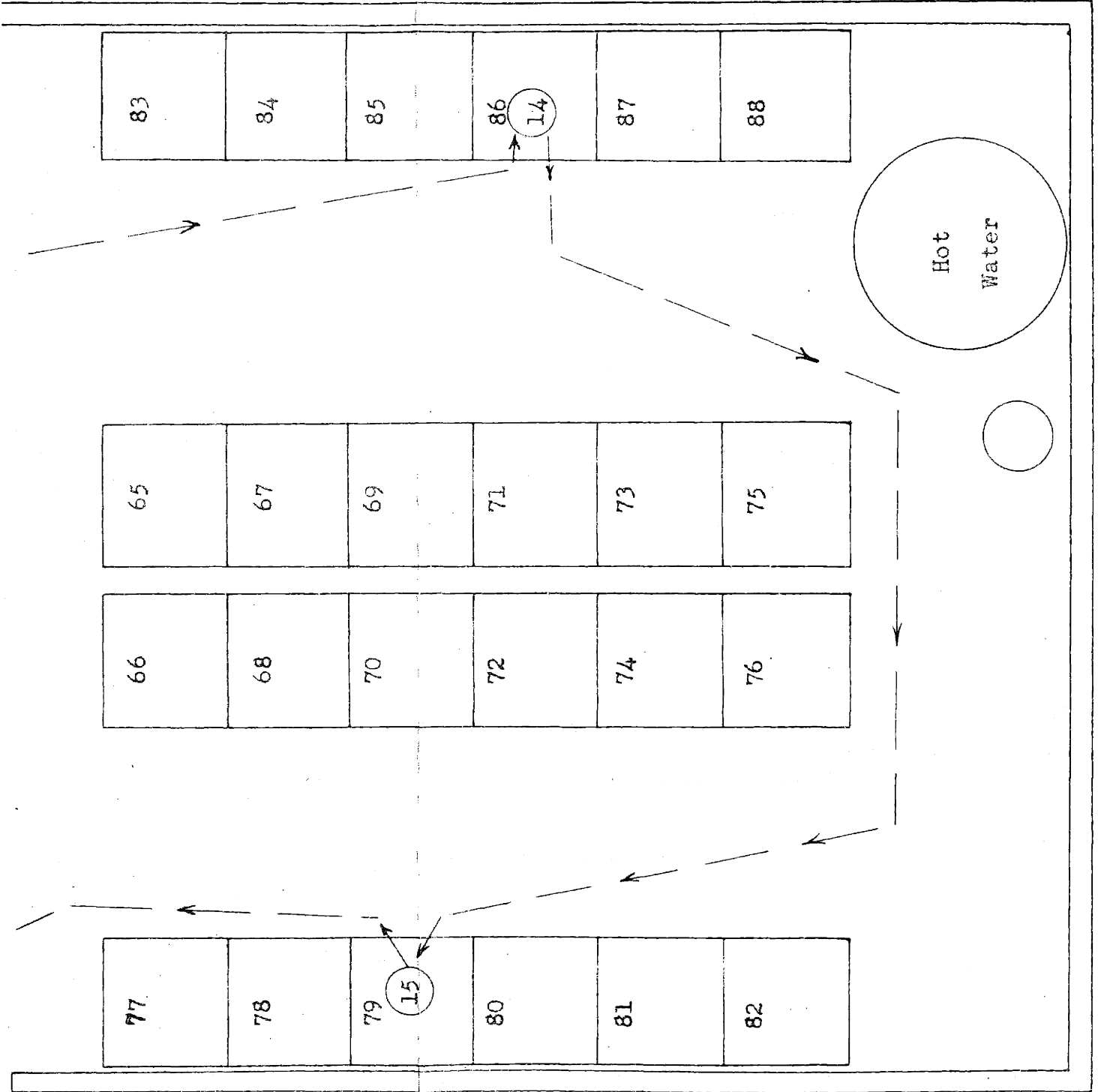
31	32	33	34	35	36	37	38
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20	19	18	17	16
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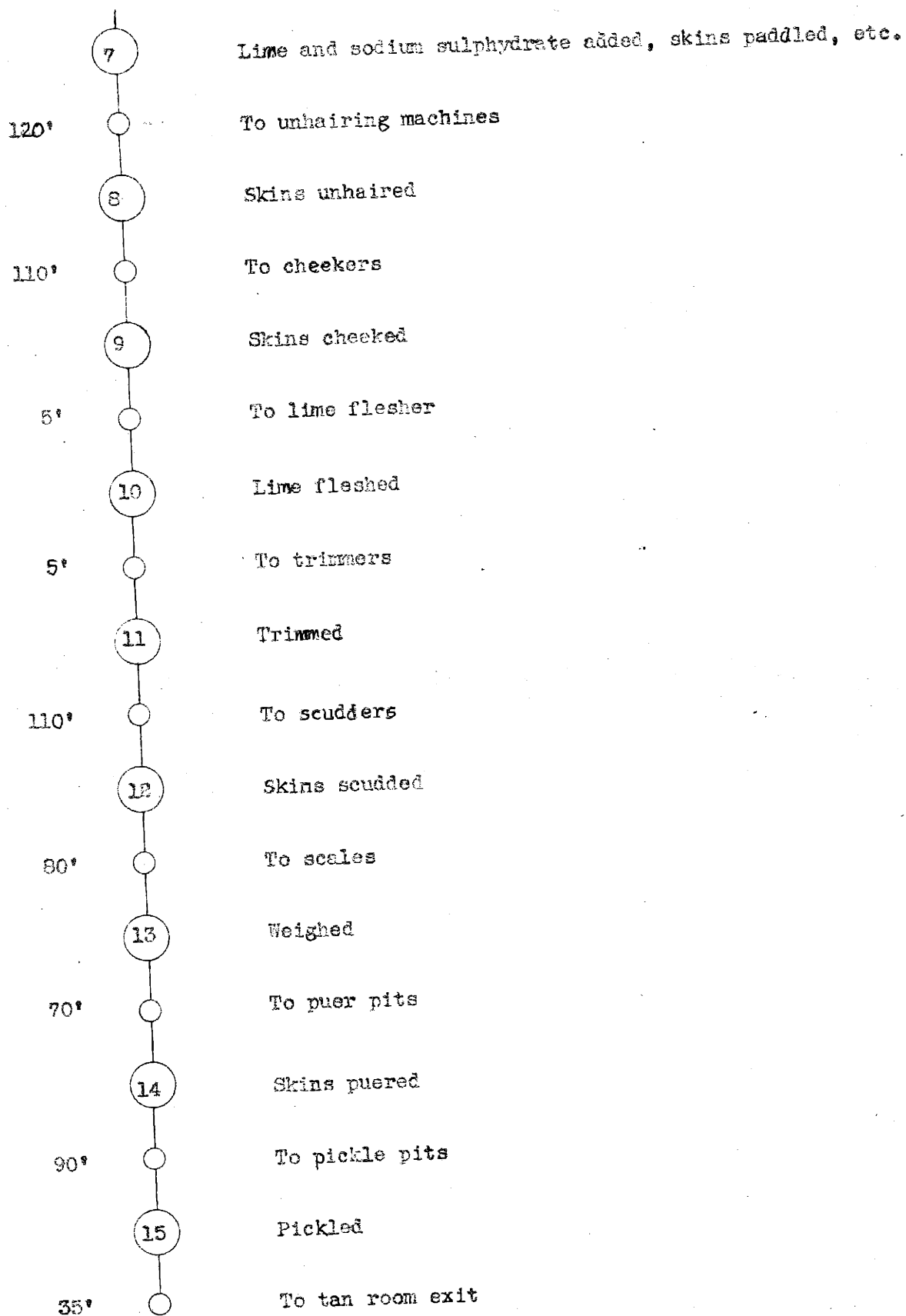


Appendix B

Present Method (chart)

PRESENT METHOD (Chart)

Dist.	Sym.	Operation
30'	○	To elevator
	○ ↓	To refrigerator
	○ ↑	To hide house floor
80'	○	To trimming stacks
	①	Trimmed
5'	○	To sizing stacks
5'	②	Skins sized
35'	○	To stamping machines
	③	Stamped
25'	○	To scale
	④	Weighed
40'	○	To await soak
	▽	Waiting for soak
110'	○	To pits
	⑤	Into pits for soak
120'	○	To hair fleshing machines
	⑥	Hair fleshed
120'	○	To pits




















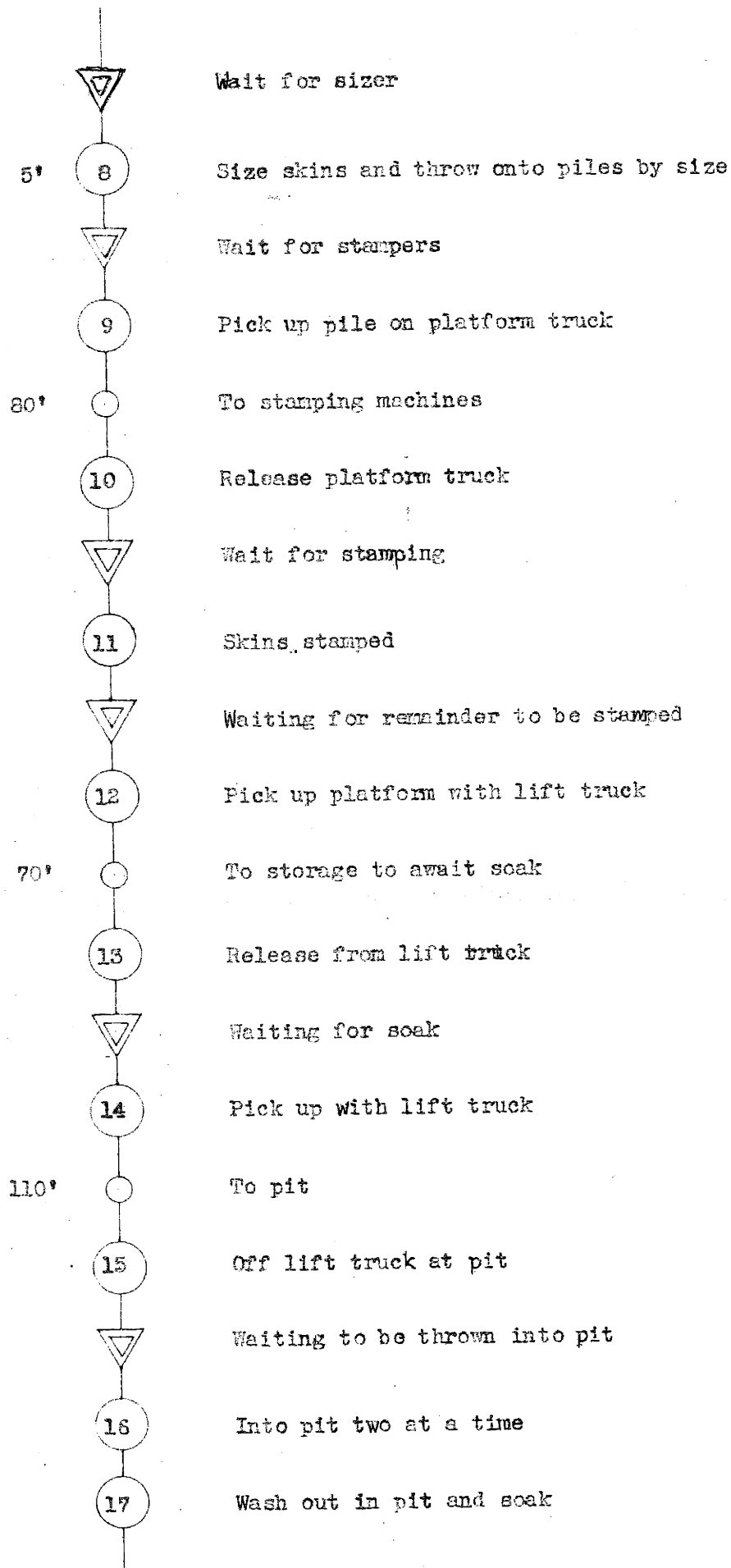
Total distance ----- 1245'

Appendix C

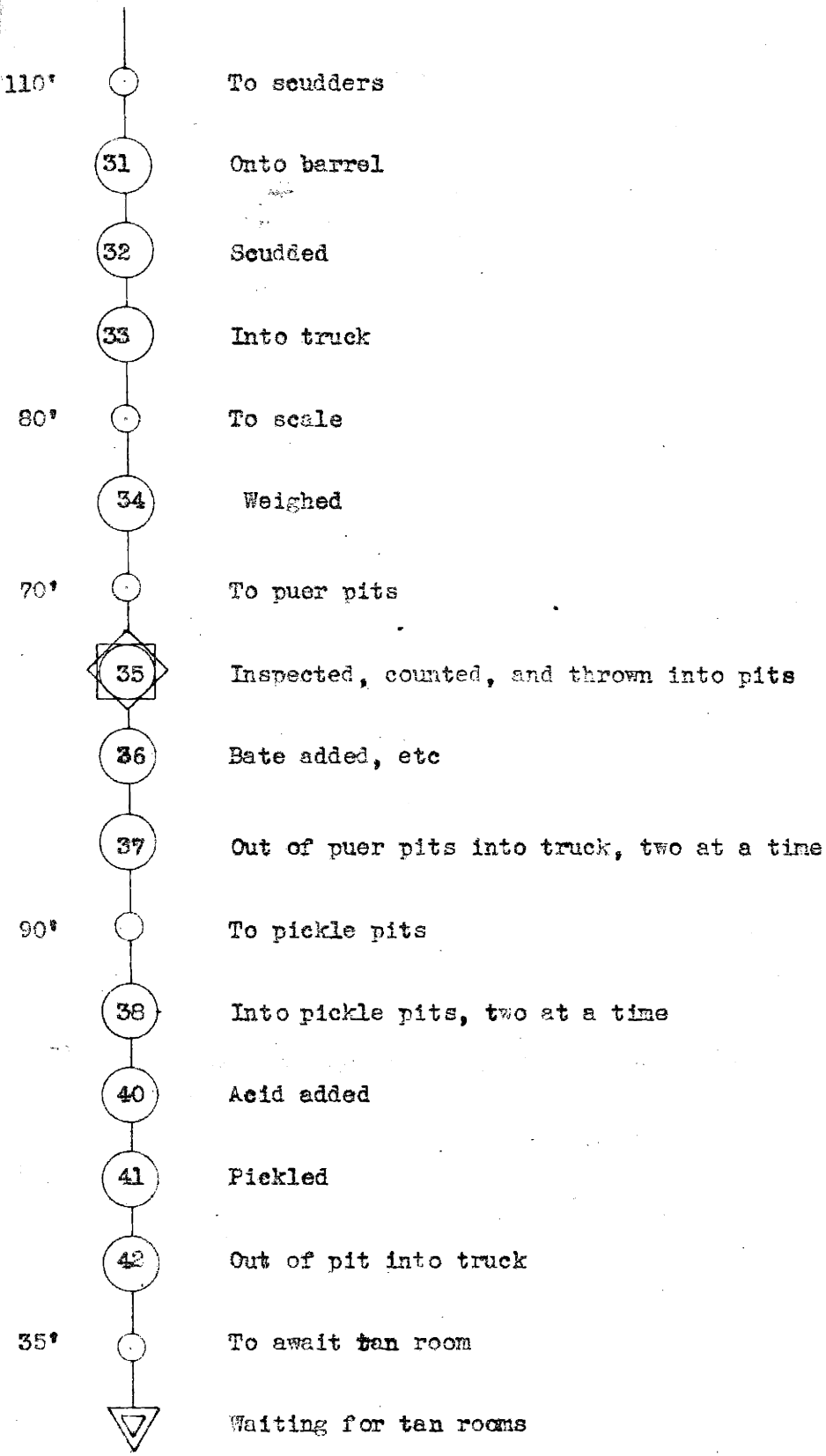
Present Method (detailed)

PRESENT METHOD

Dist.	Sym.	Operation
		In Railroad Car
		Unload from RR car on to flat truck one bundle at a time
30'		To elevator
		To refrigerator
30'		To stacks in refrigerator
		Unload from flat truck onto piles in refrigerator one pack at a time
		In refrigerator awaiting use
		In refrigerator awaiting use
		From stacks onto flat truck one bundle at a time
30'		To elevator
		To Hide House floor
80'		To back of Hide House
		Open bundle onto pile
		Wait for trimmer
		Pull skin onto trimming table
		Trim skin
5'		Throw skin onto pile



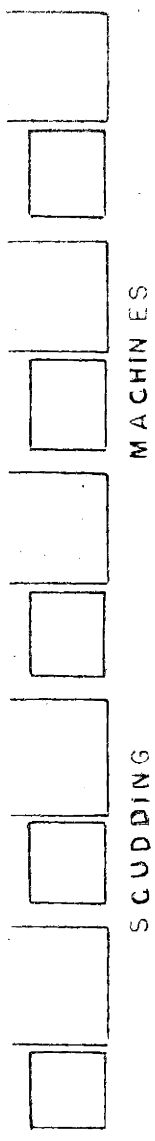
	18	Out of pit into truck, one at a time
120'		To hairfleshers
	19	Hair fleshed
120'		Back to same pit
	20	Into pit two at a time
	21	Line and sodium sulphhydrate added, paddled, etc.
	22	Out of line and into truck, one at a time
120'		To unhairer
	23	Onto barrel
	24	Unhaired
	25	Into truck
110'		To checkers
	26	Onto barrel
	27	Checked
5'		To lime flesher
	28	Line fleshed
5'		To trimmer
	29	Trimmed
	30	Into truck



Total Distance -----1305 Feet

Appendix D

Ideal Layout

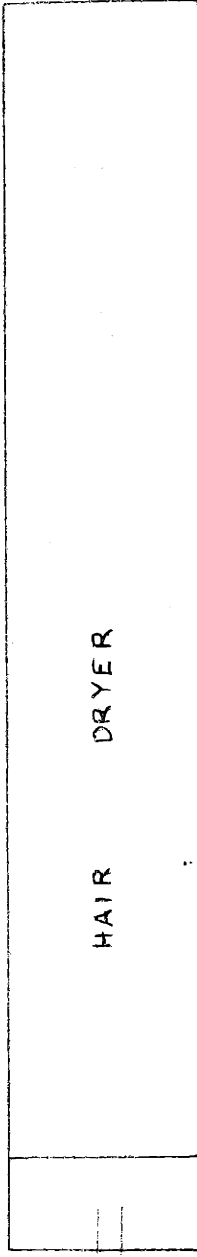


MACHINES

SCUDDING

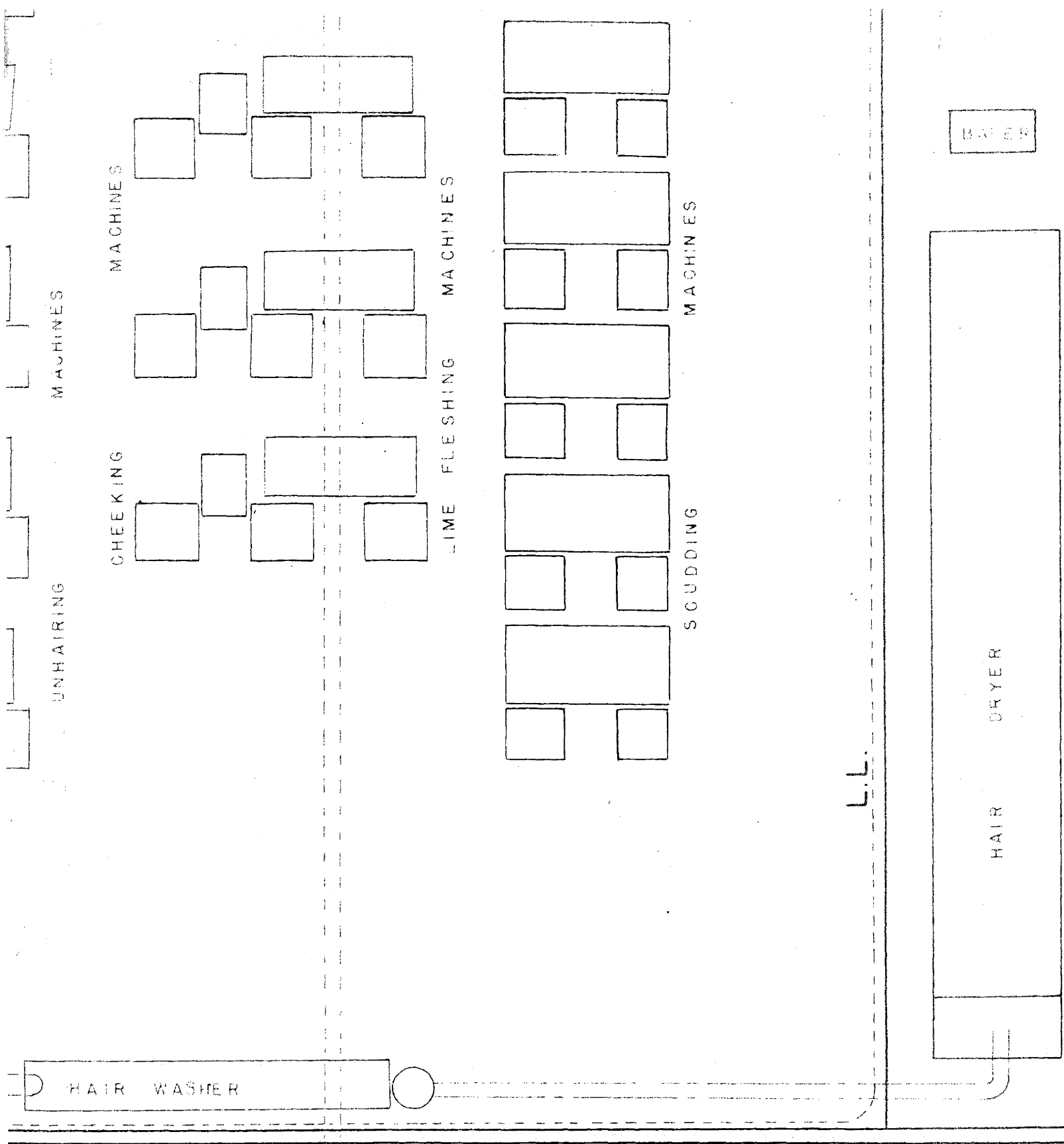
L.L.

BALER



HAIR DRYER

M.I.T. THESIS
F.C. GAME DEC. 27, 1940



MACHINES

UNHAIRING

MACHINES

CHEEKING

MACHINES

LIME FLESHING

MACHINES

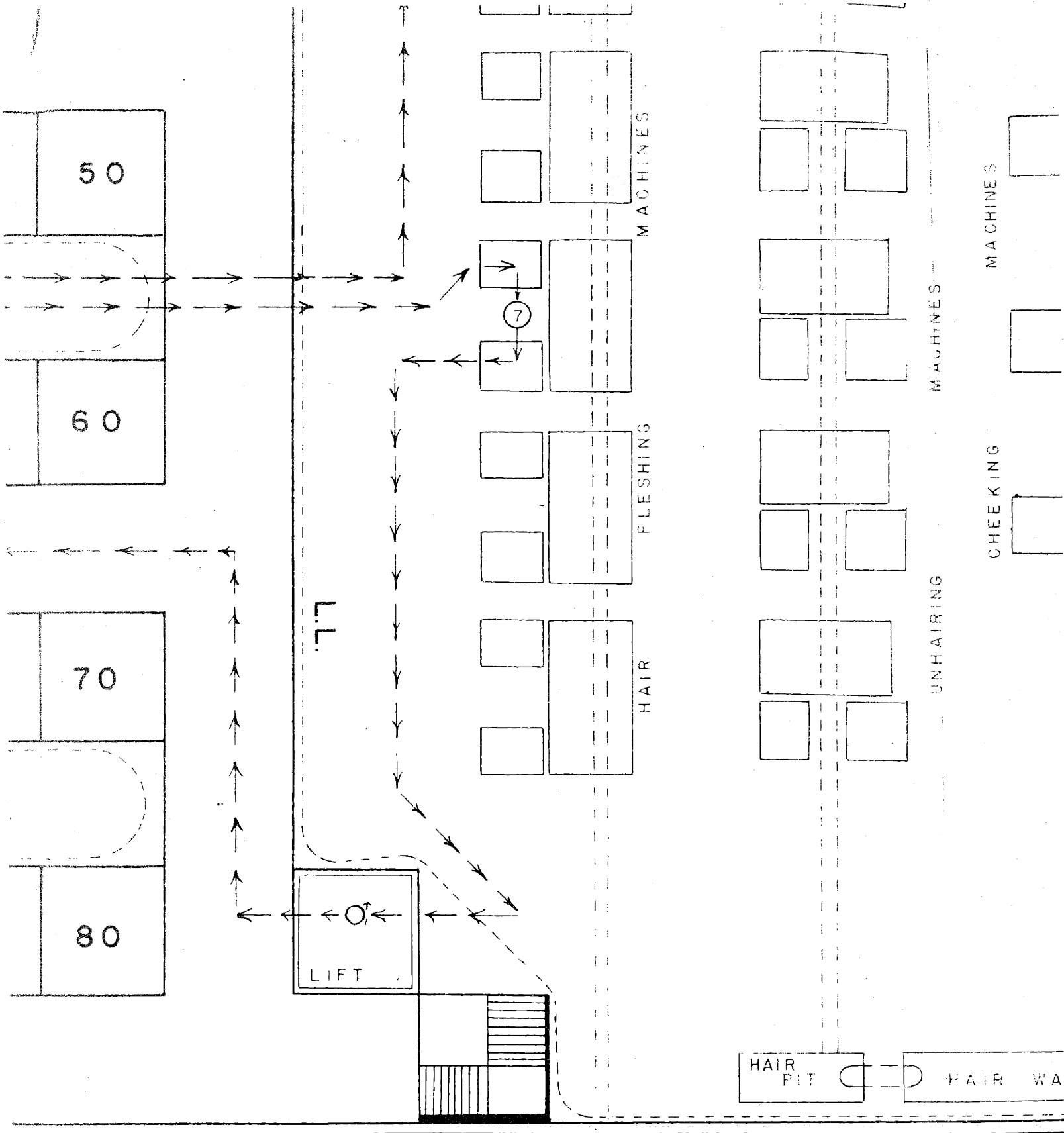
SCUDDING

HAIR WASHER

HAIR DRYER

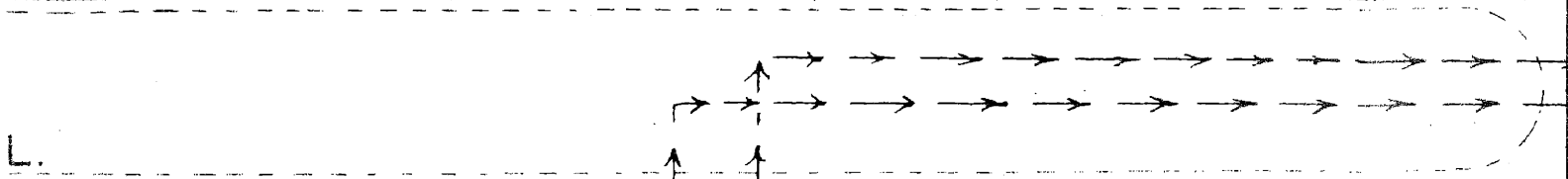
WATER

L.L.



DOTTED LINE MARKED "L.L." ENCLOSE AREA 10 FEET LOWER THAN REST

43	44	45	46	47	48	49	50
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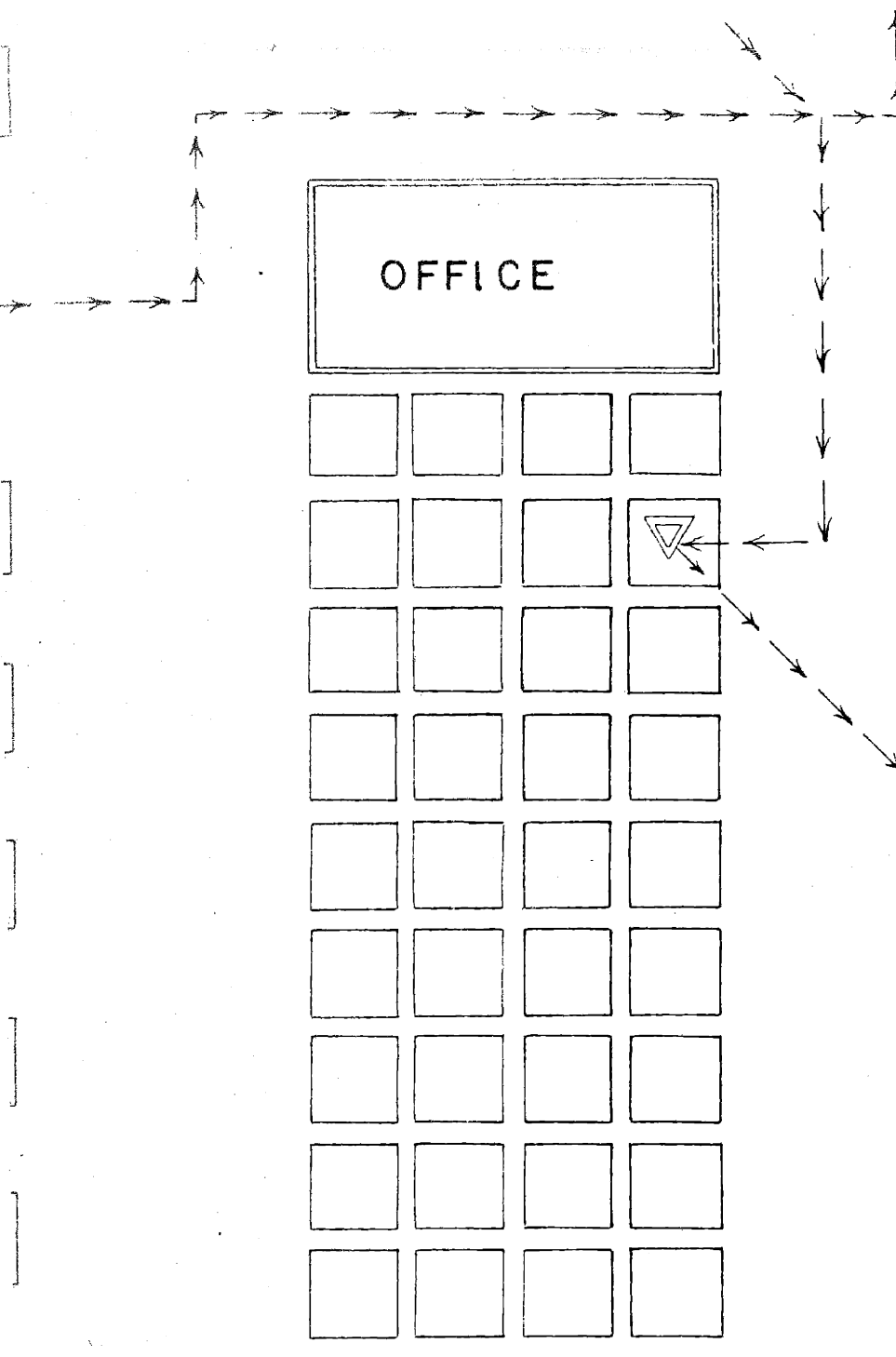
53	54	55	6	8	57	58	59	60
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63	64	65	66	67	68	69	70
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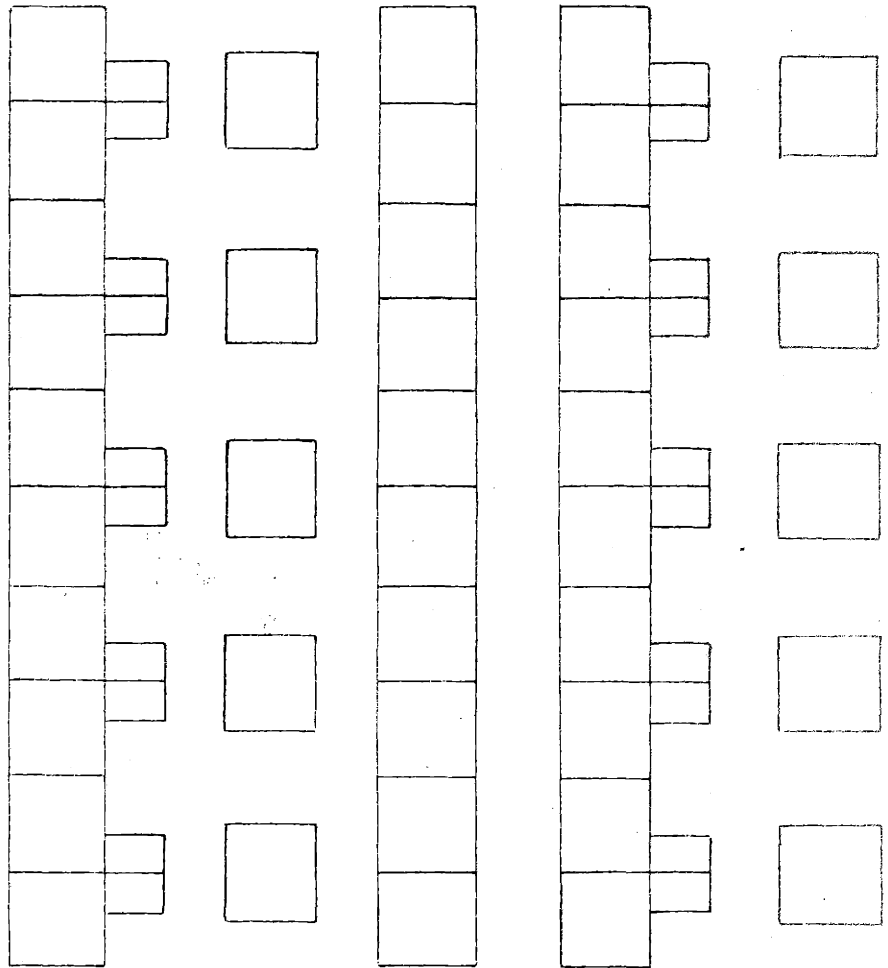
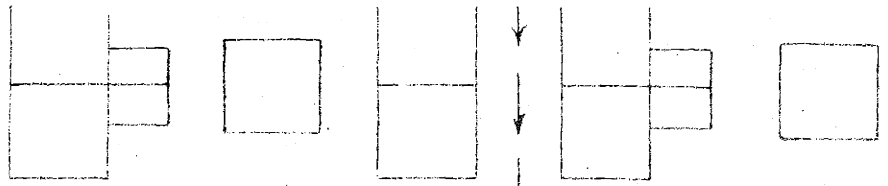


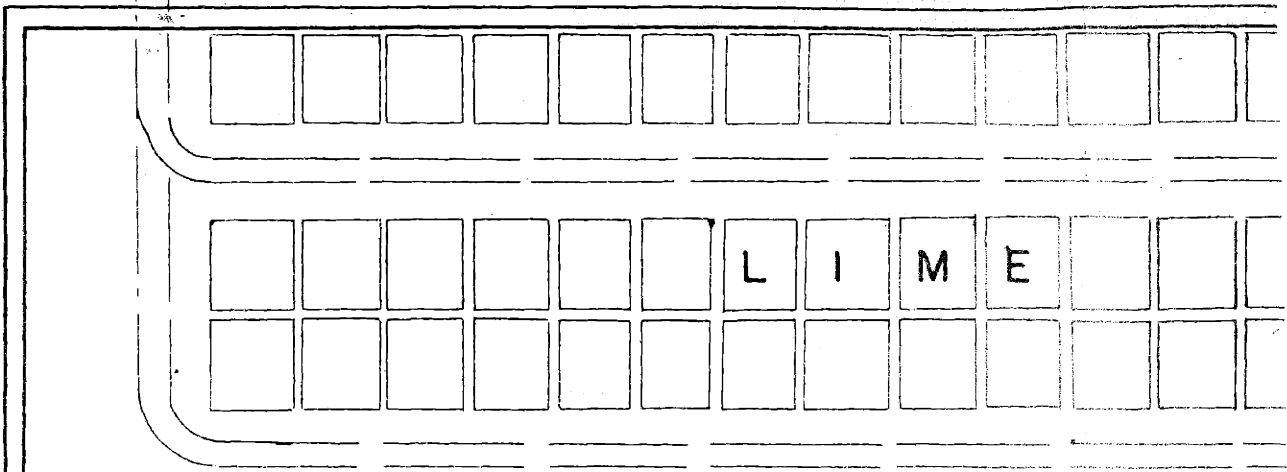
73	74	75	76	77	78	79	80
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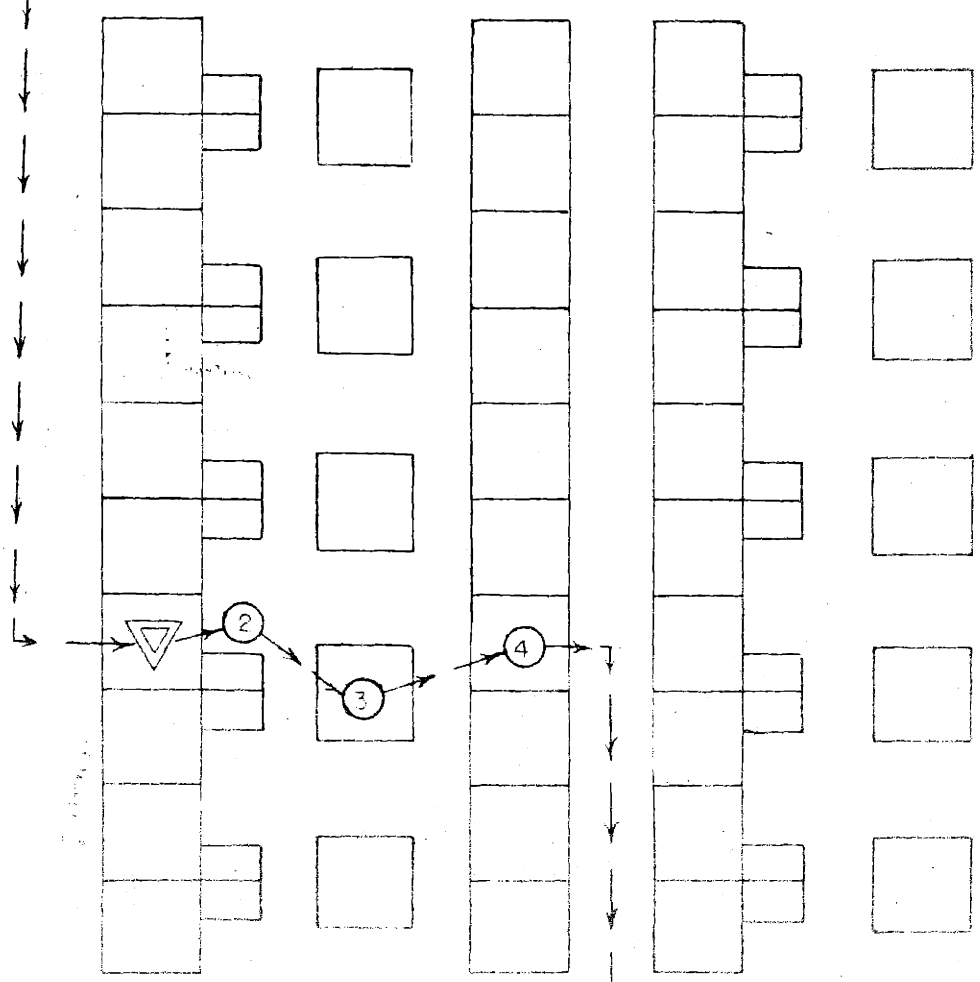
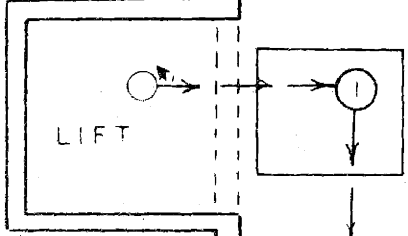
41	42	43
L.L.		
51	52	53

61	62	63
L.L.		
71	72	73





S T O R A G E



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M	E										
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R	A	G	E								
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1	2
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L.L	
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11	12
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21	22
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L.L	
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31	32
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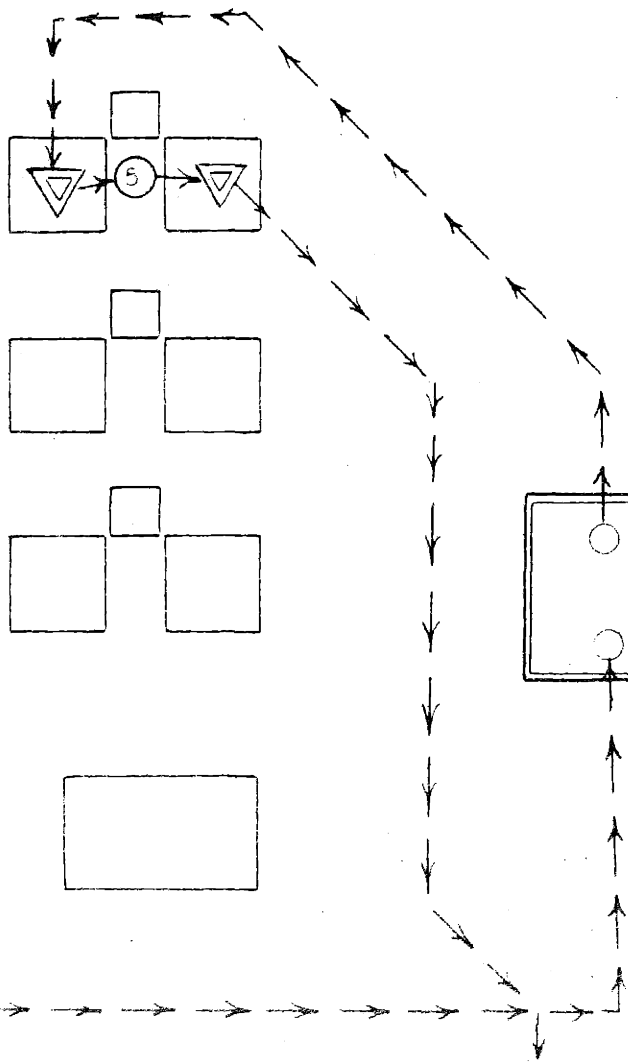
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○
○

IMPROVED BEAM HOUSE

2	3	4	5	6	7	8	9	
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L.L.

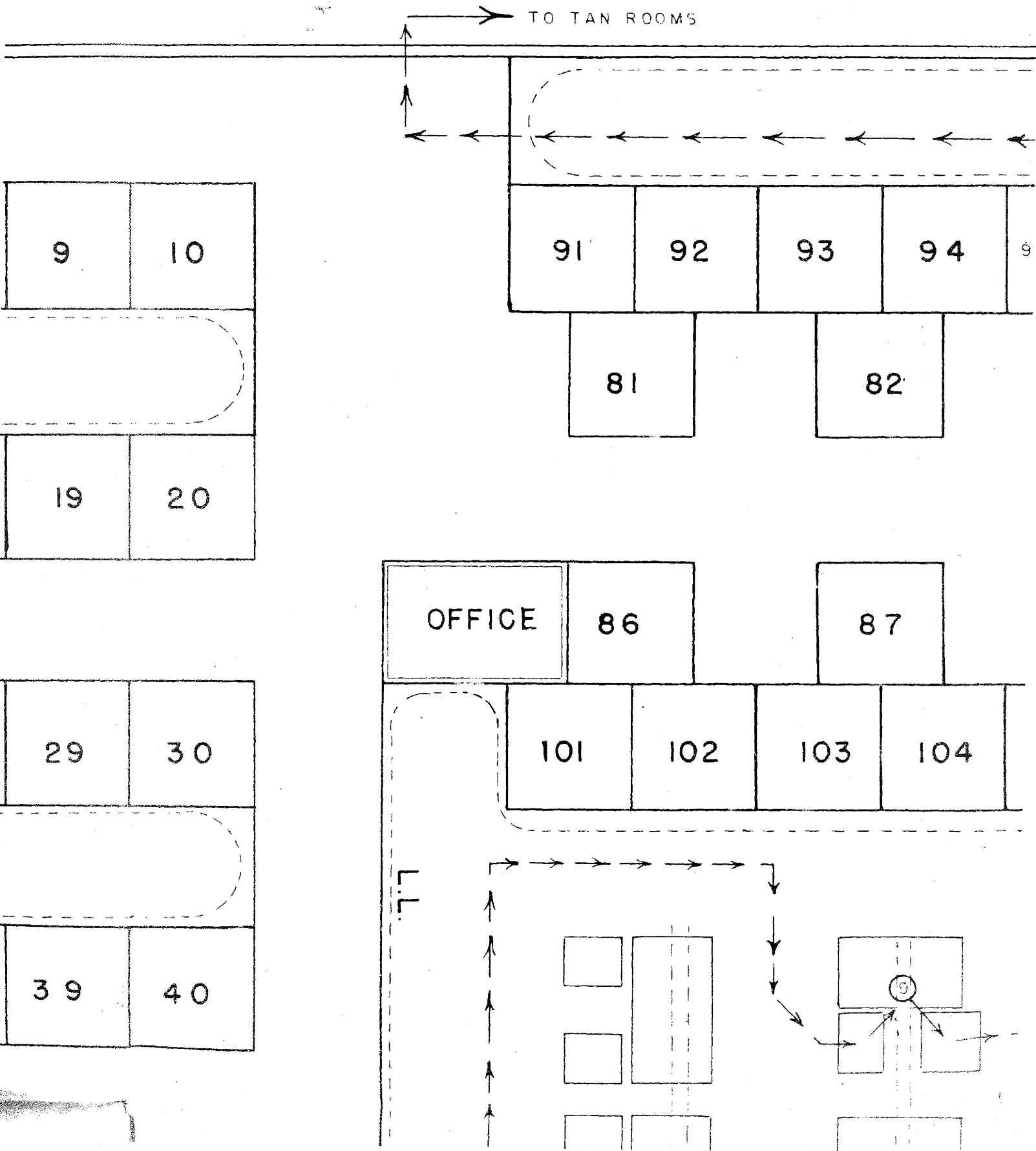
12	13	14	15	16	17	18	19	
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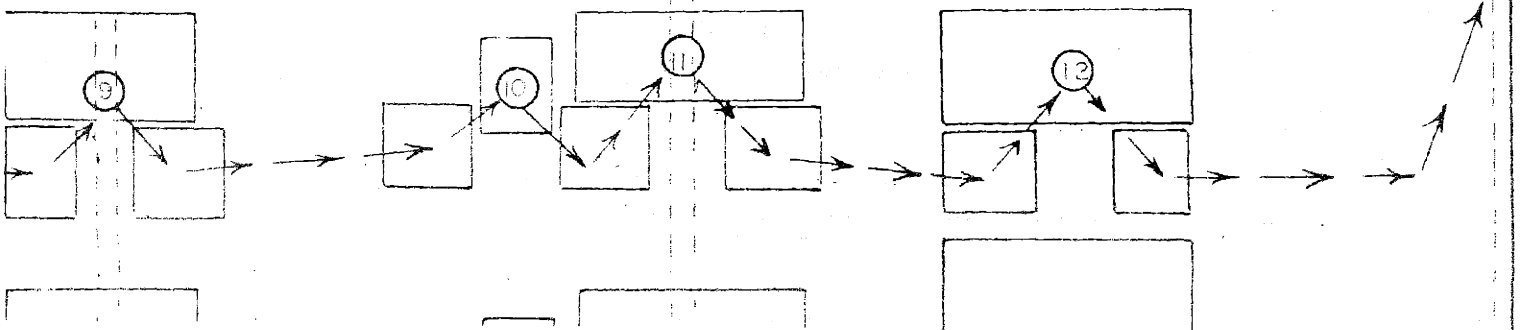
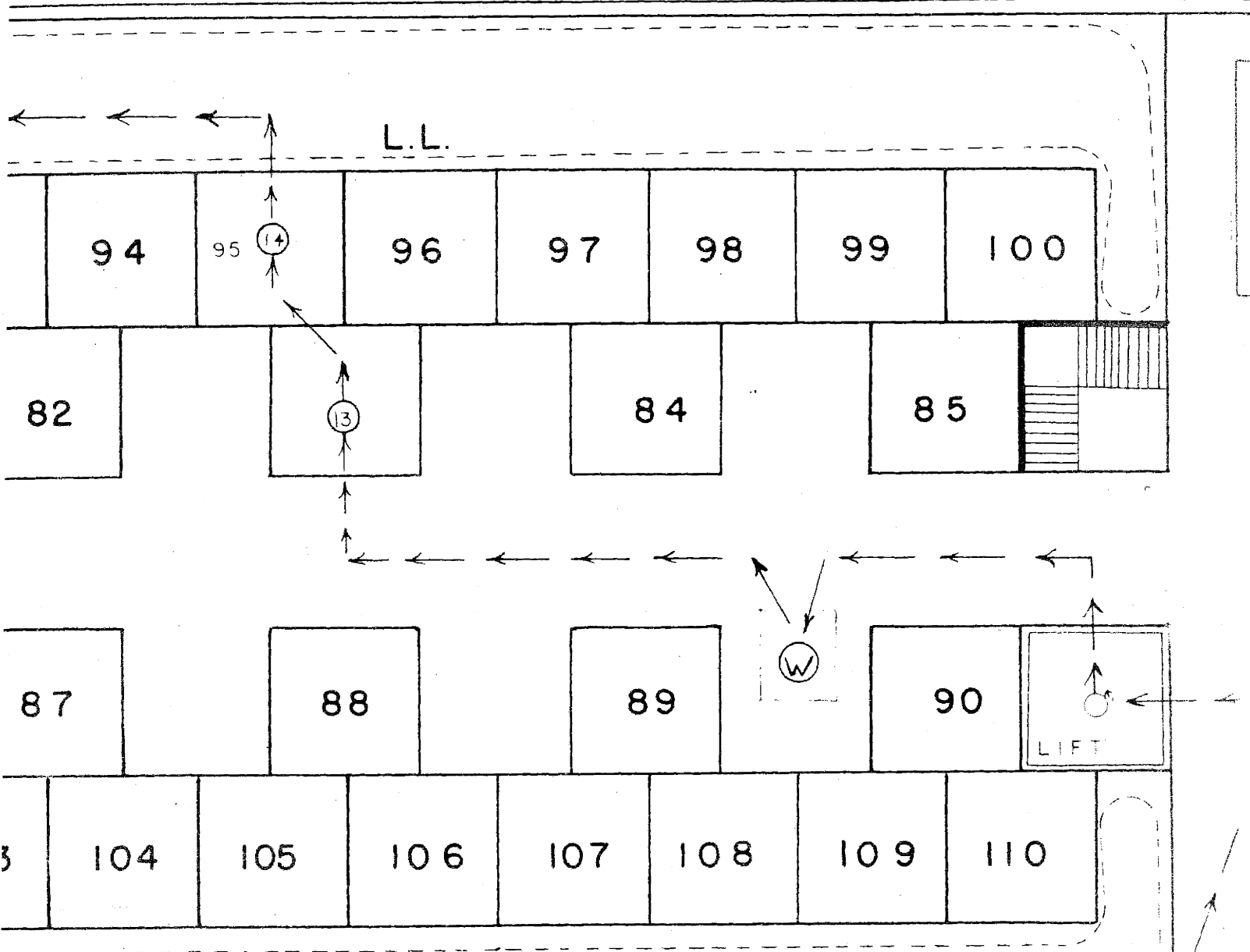
22	23	24	25	26	27	28	29	
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L.L.

32	33	34	35	36	37	38	39	
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SE



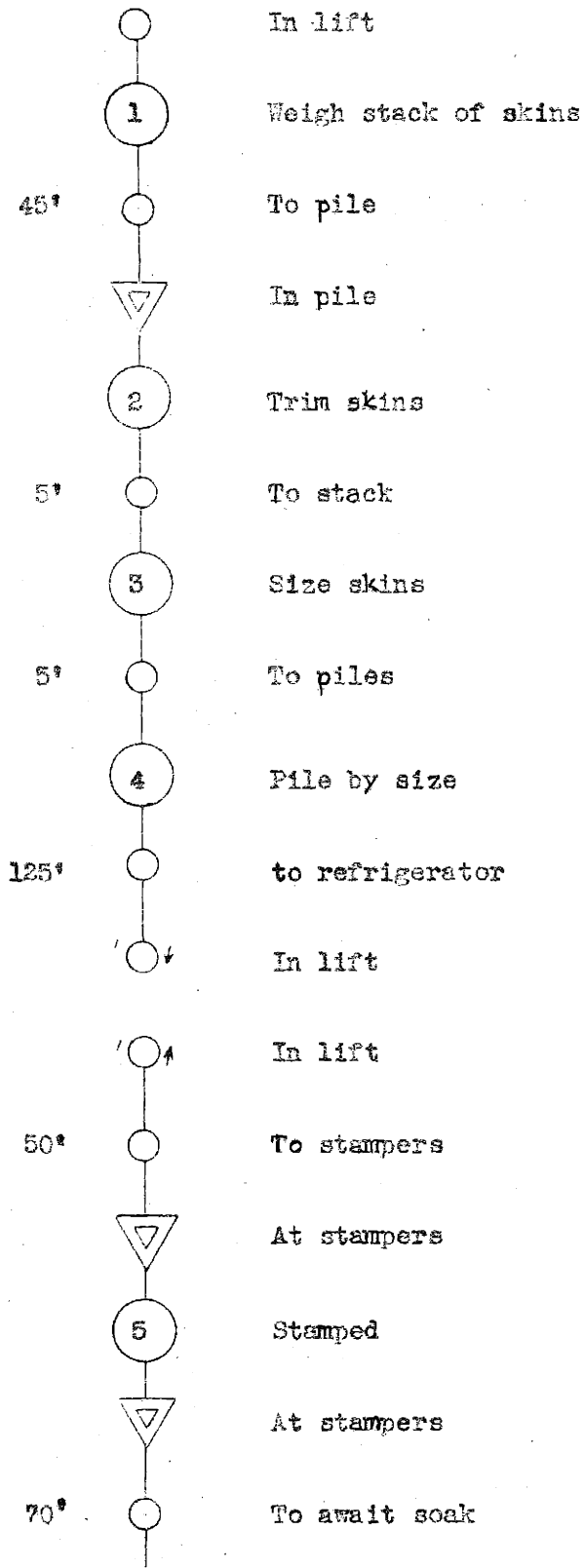


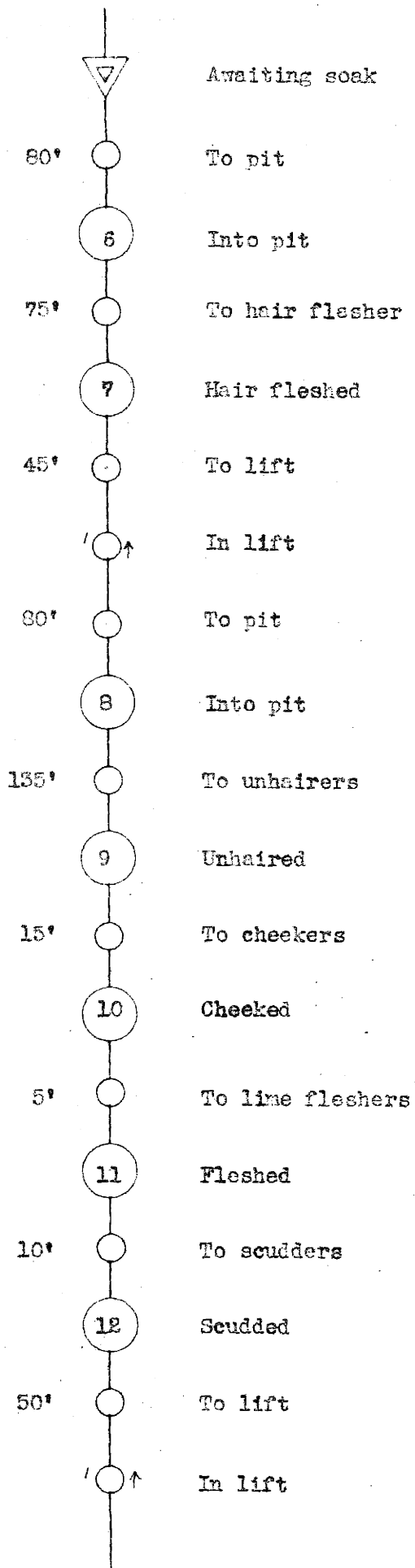
Appendix E

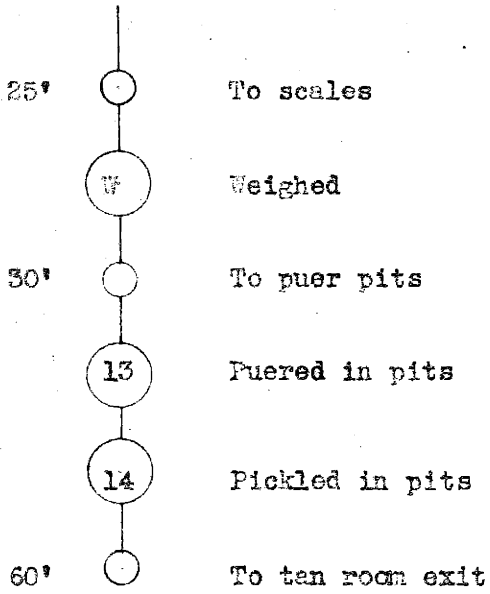
Ideal Method (chart)

IMPROVED METHOD (Ideal)

Dist. Sym. Operation







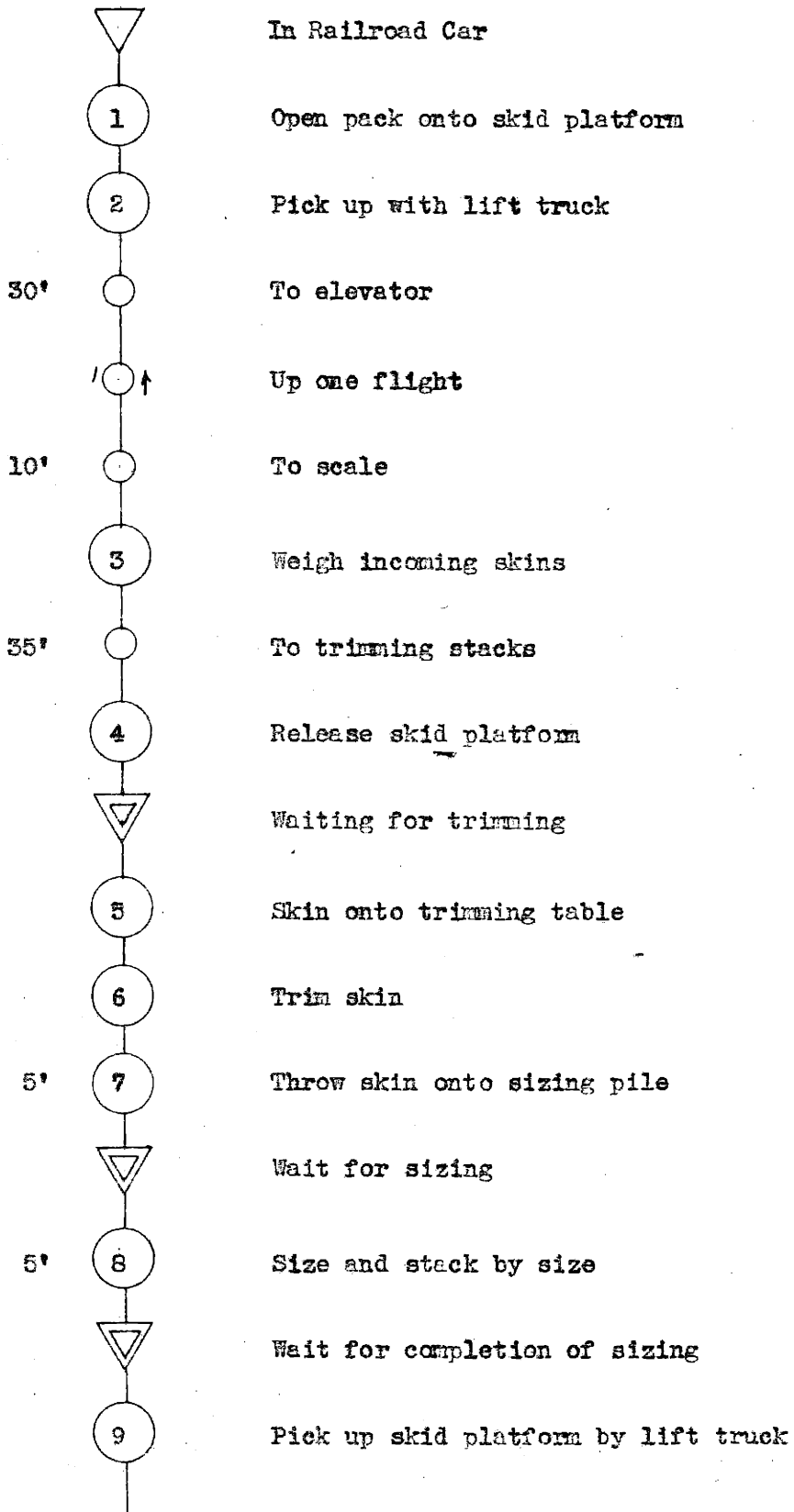
Total Distance Traveled ----- 910 Feet

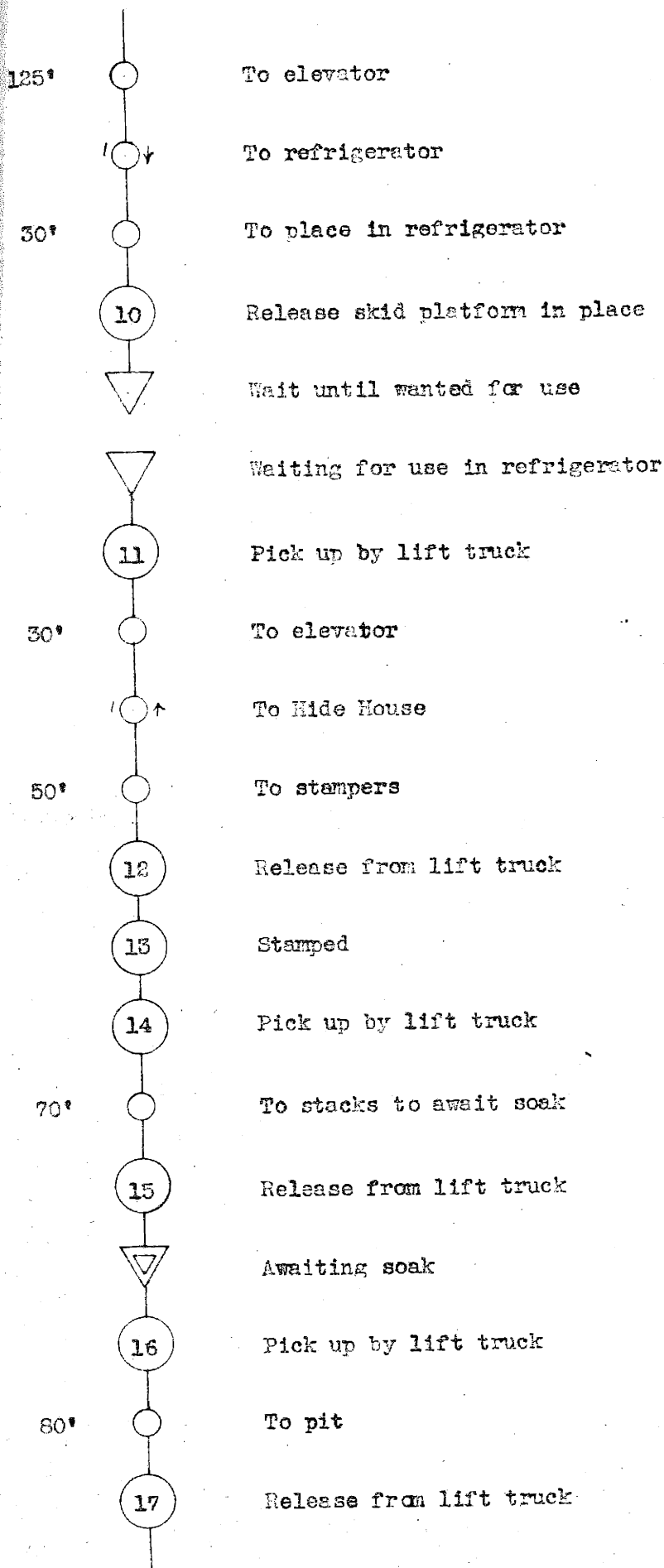
Appendix F

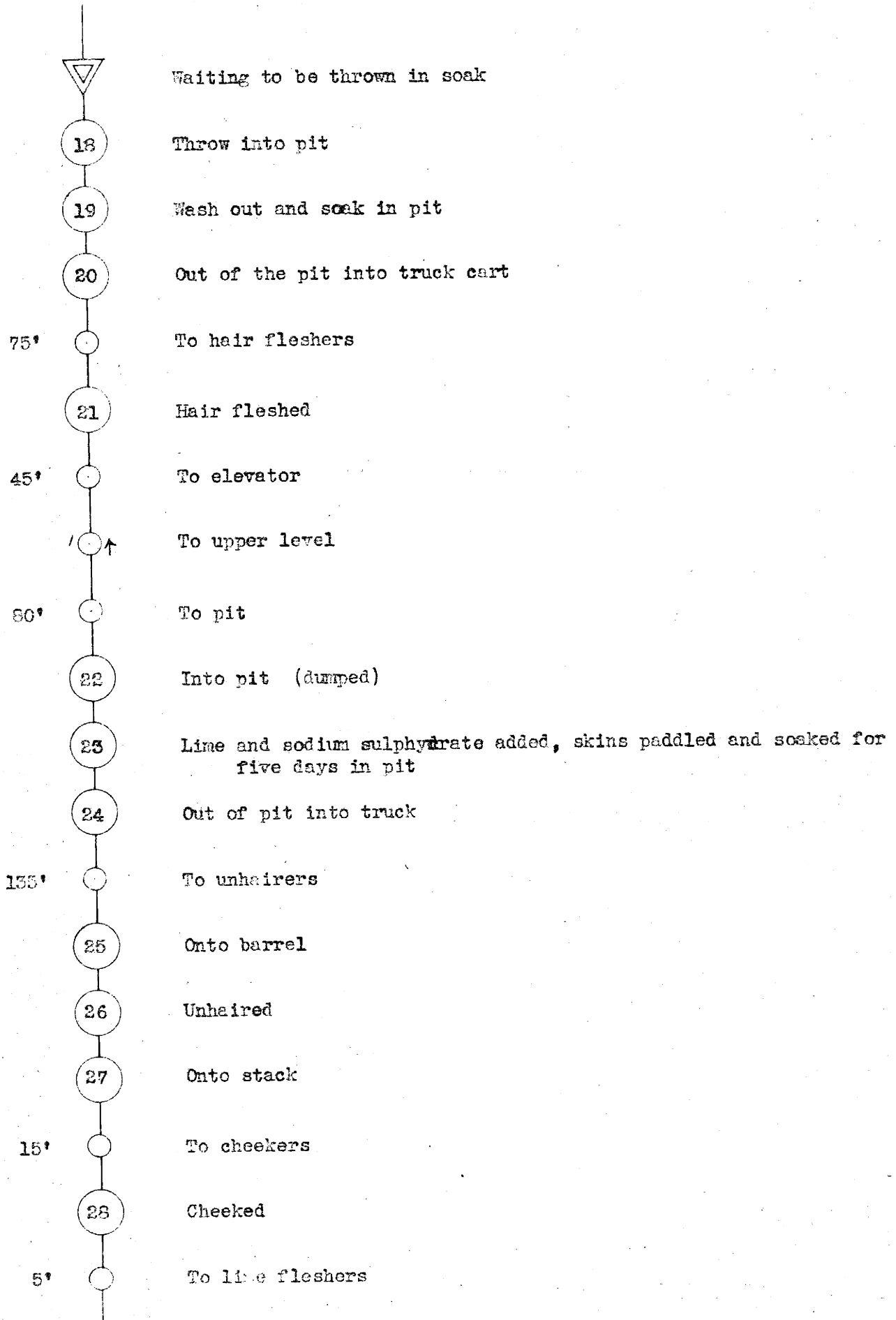
Ideal Method (detailed)

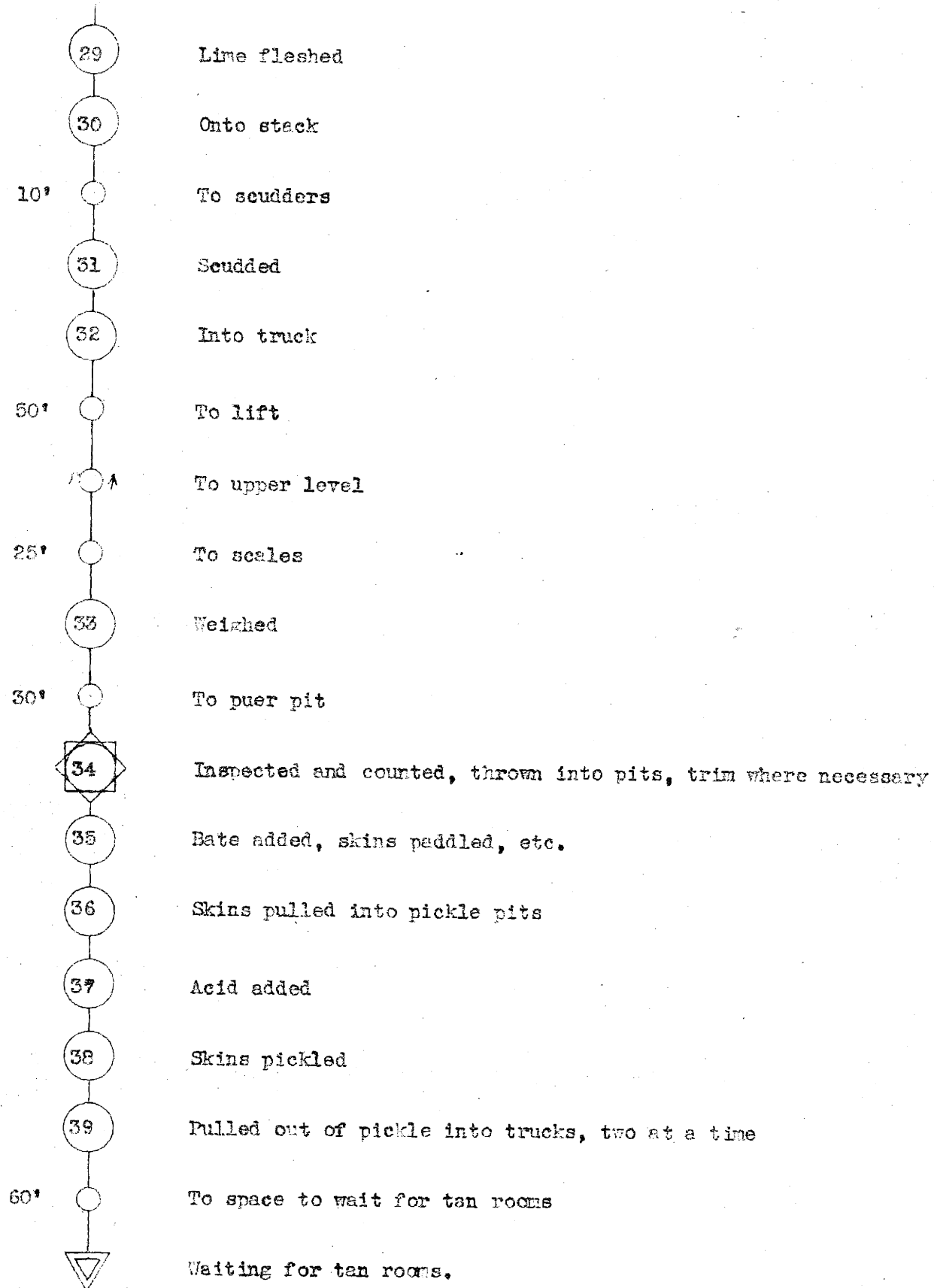
Dist. Sym.

Operations





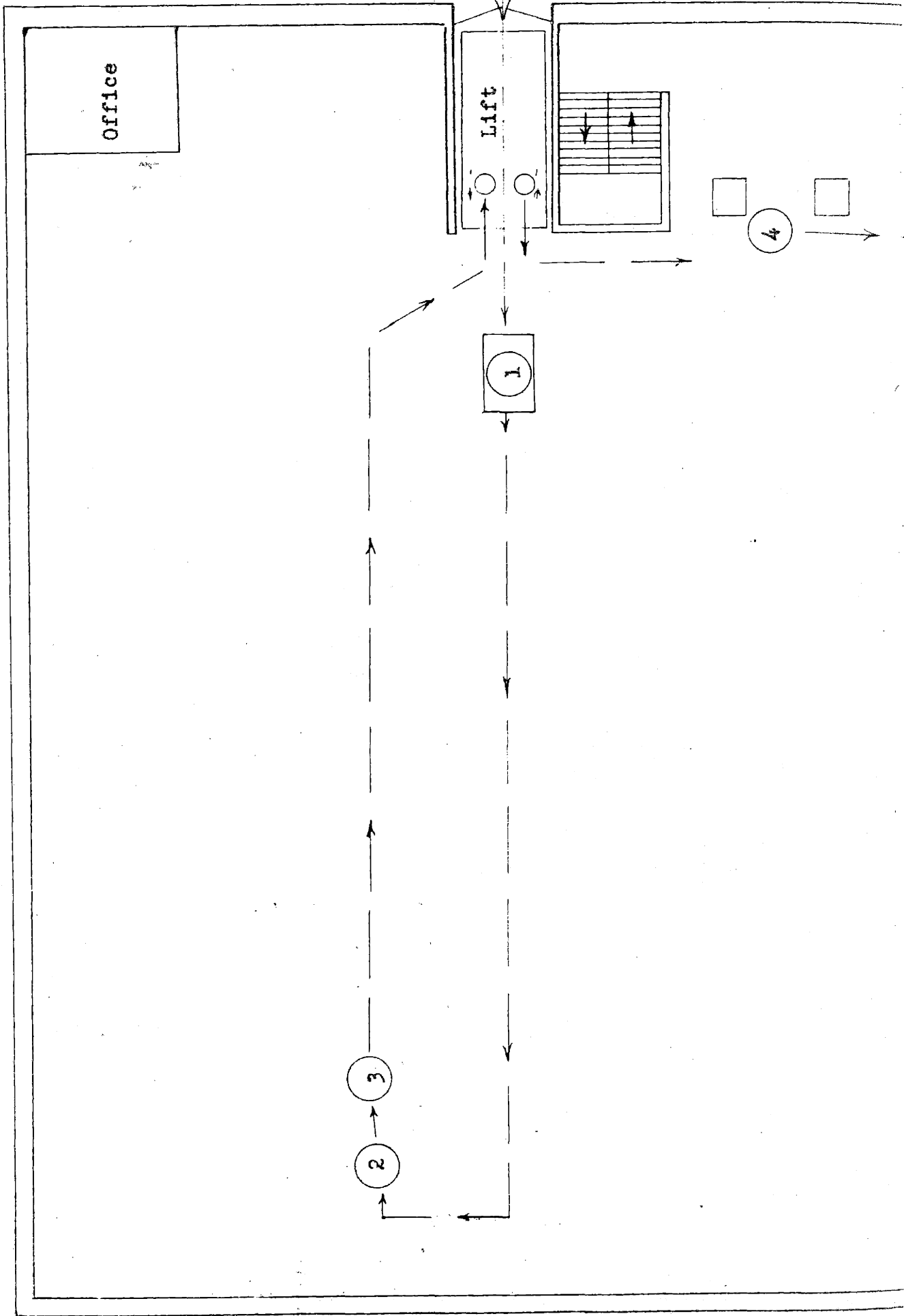


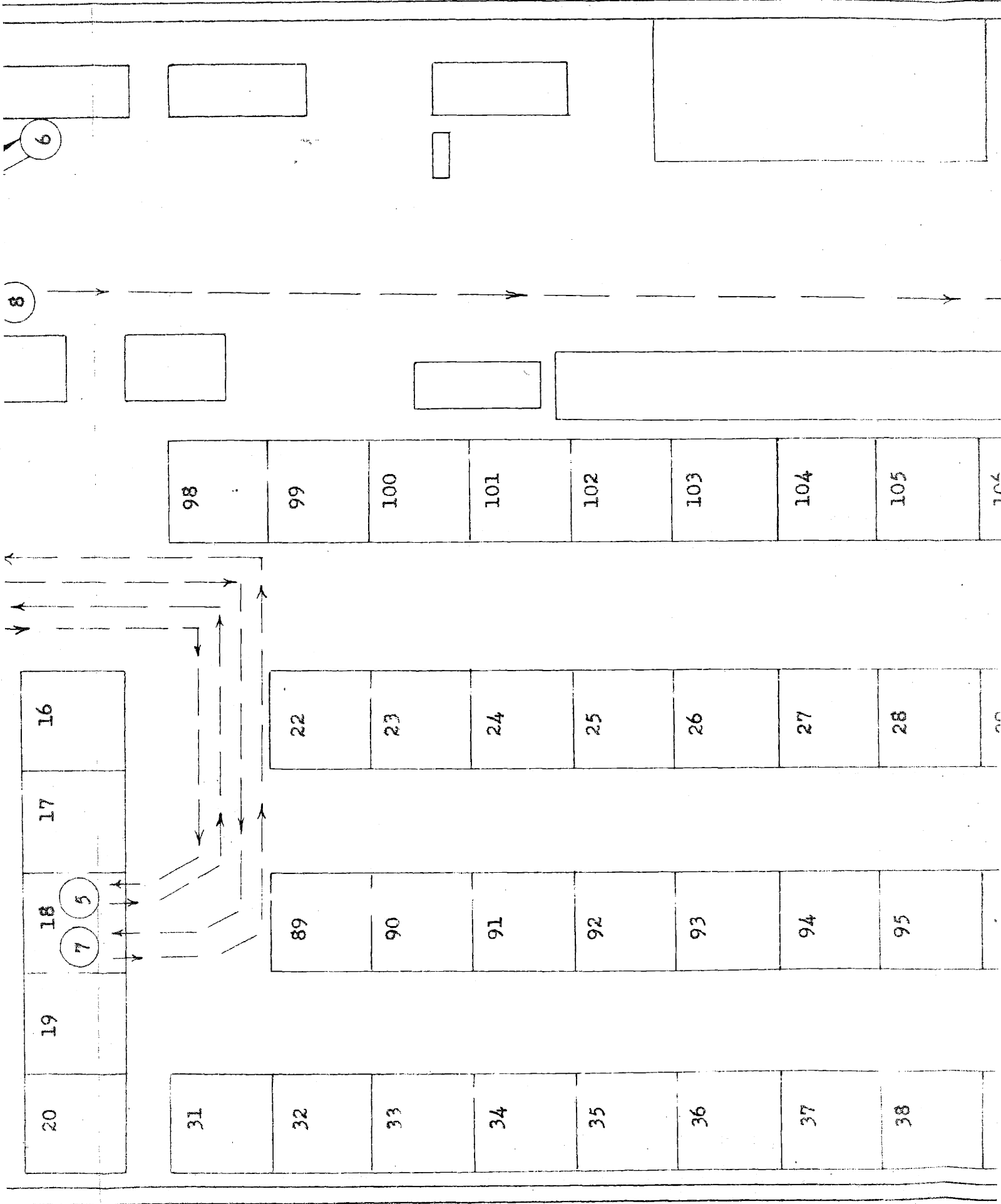


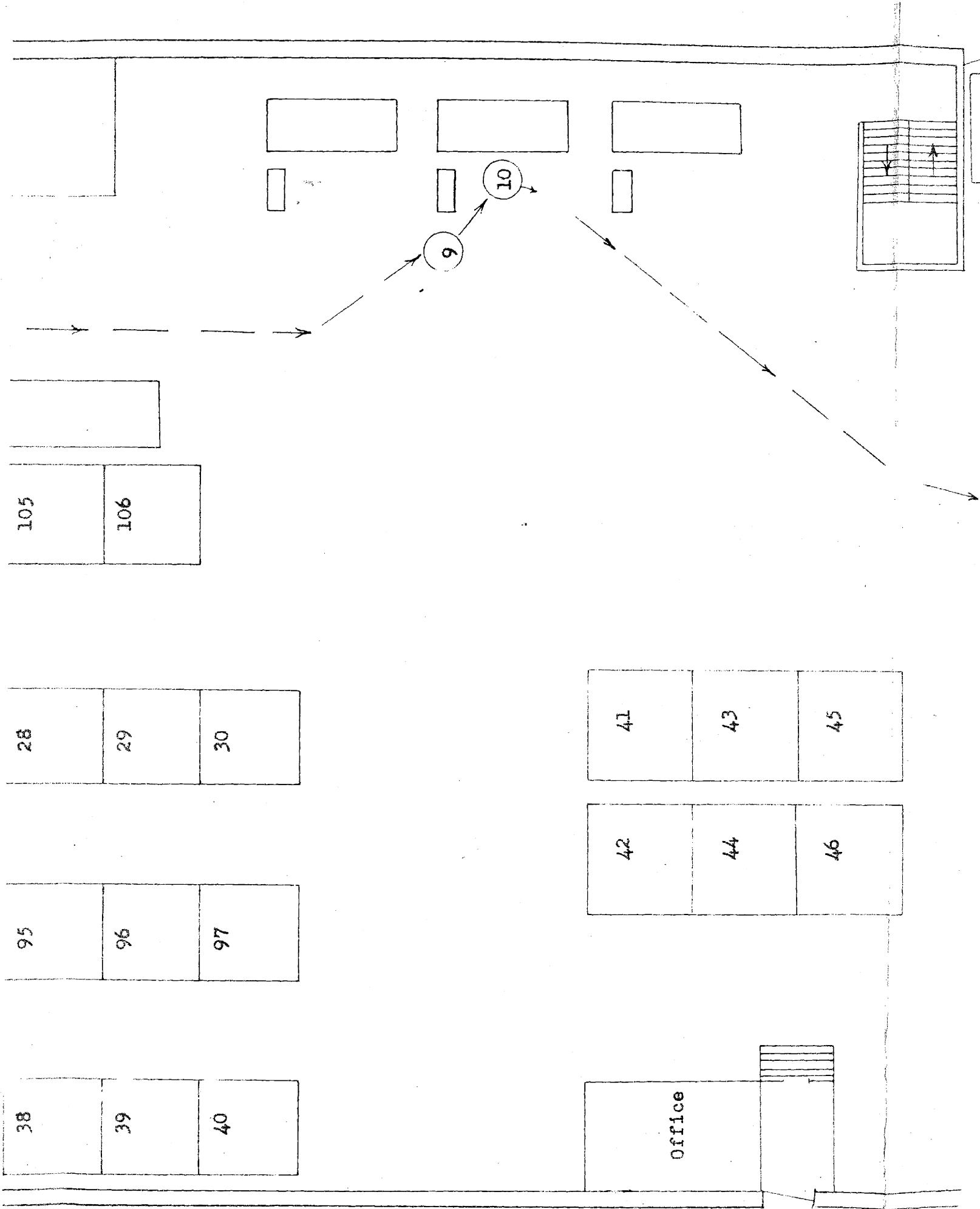
Total Distance traveled ----- 1000 Feet

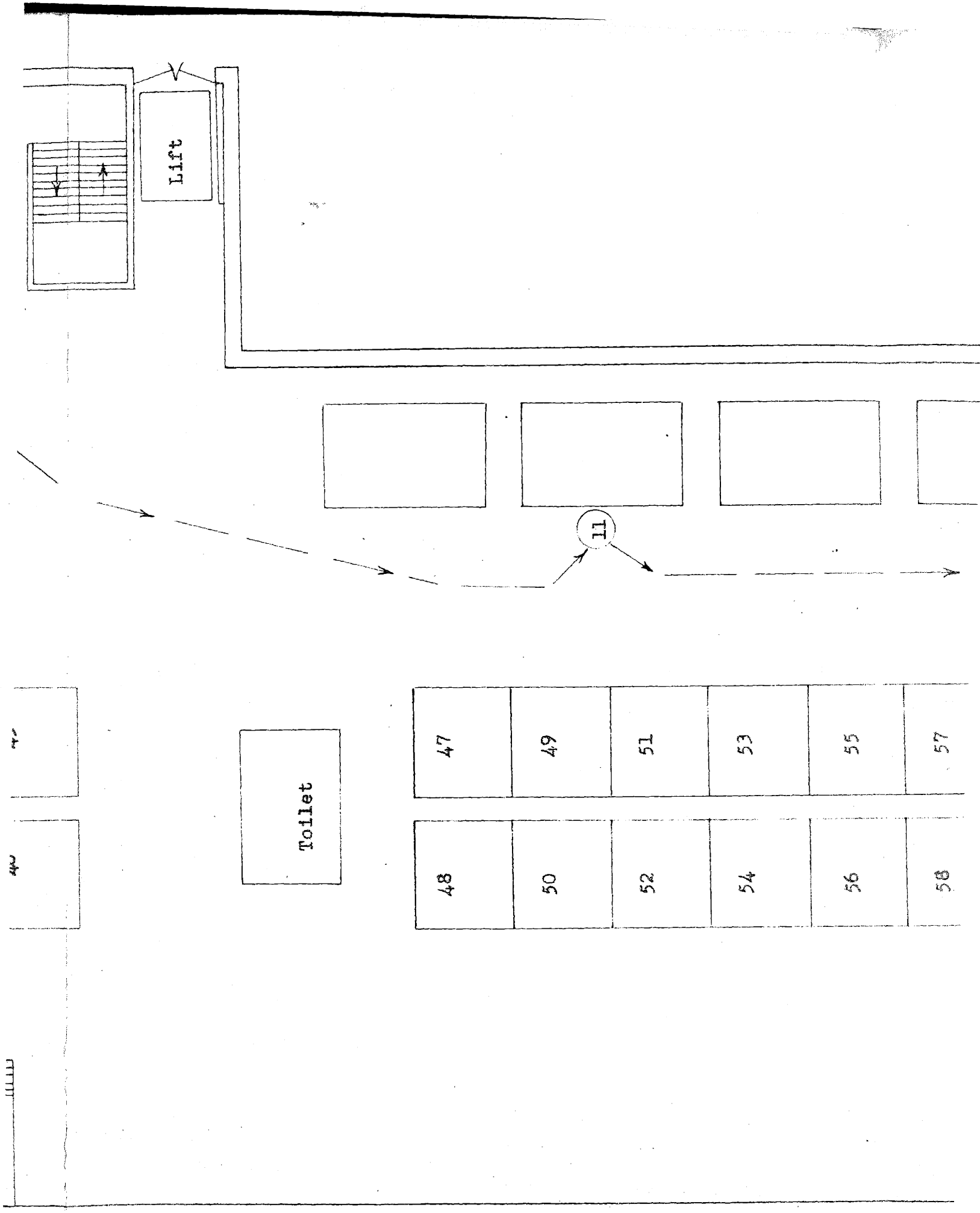
Appendix G

New Layout









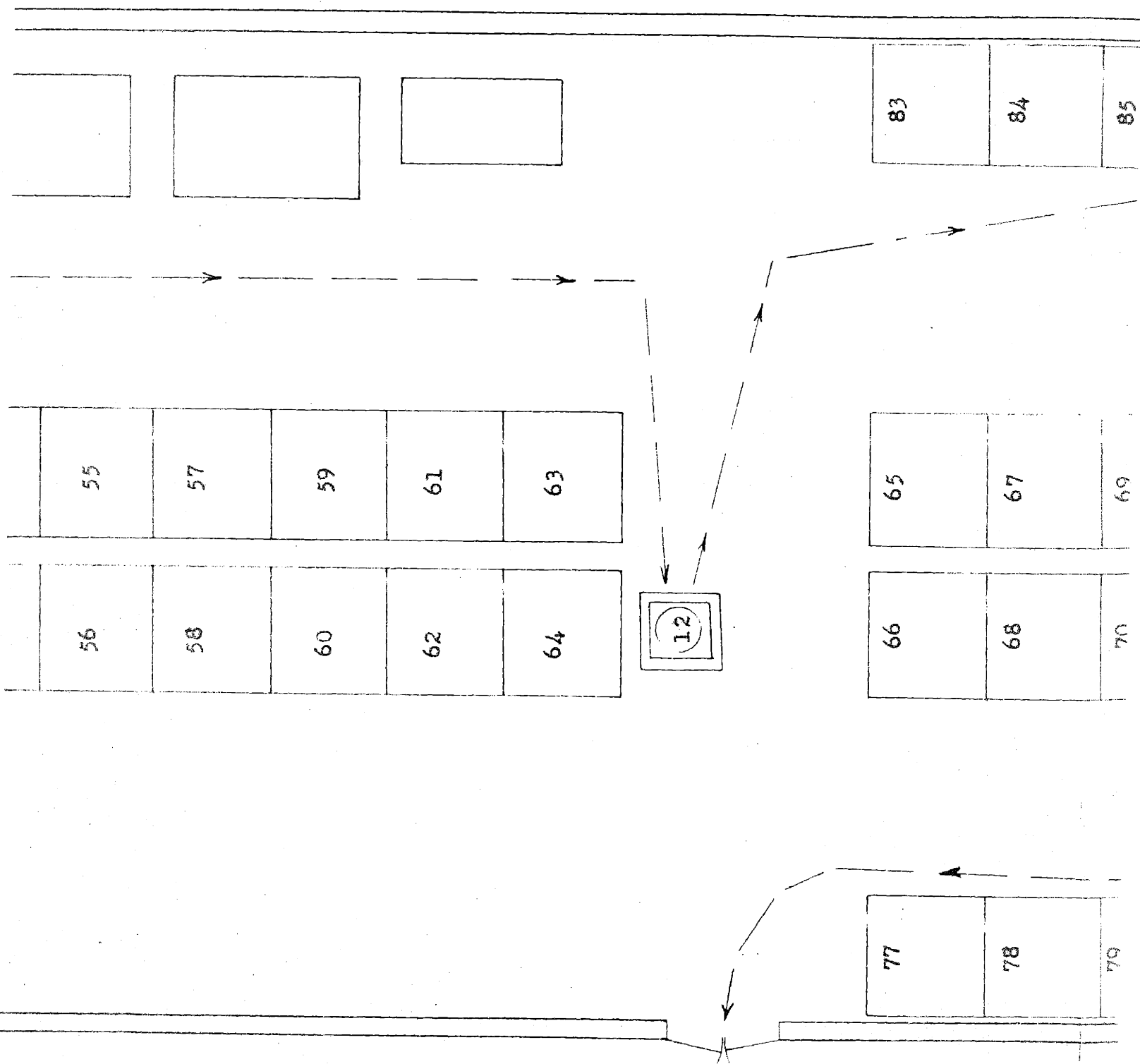
Lift

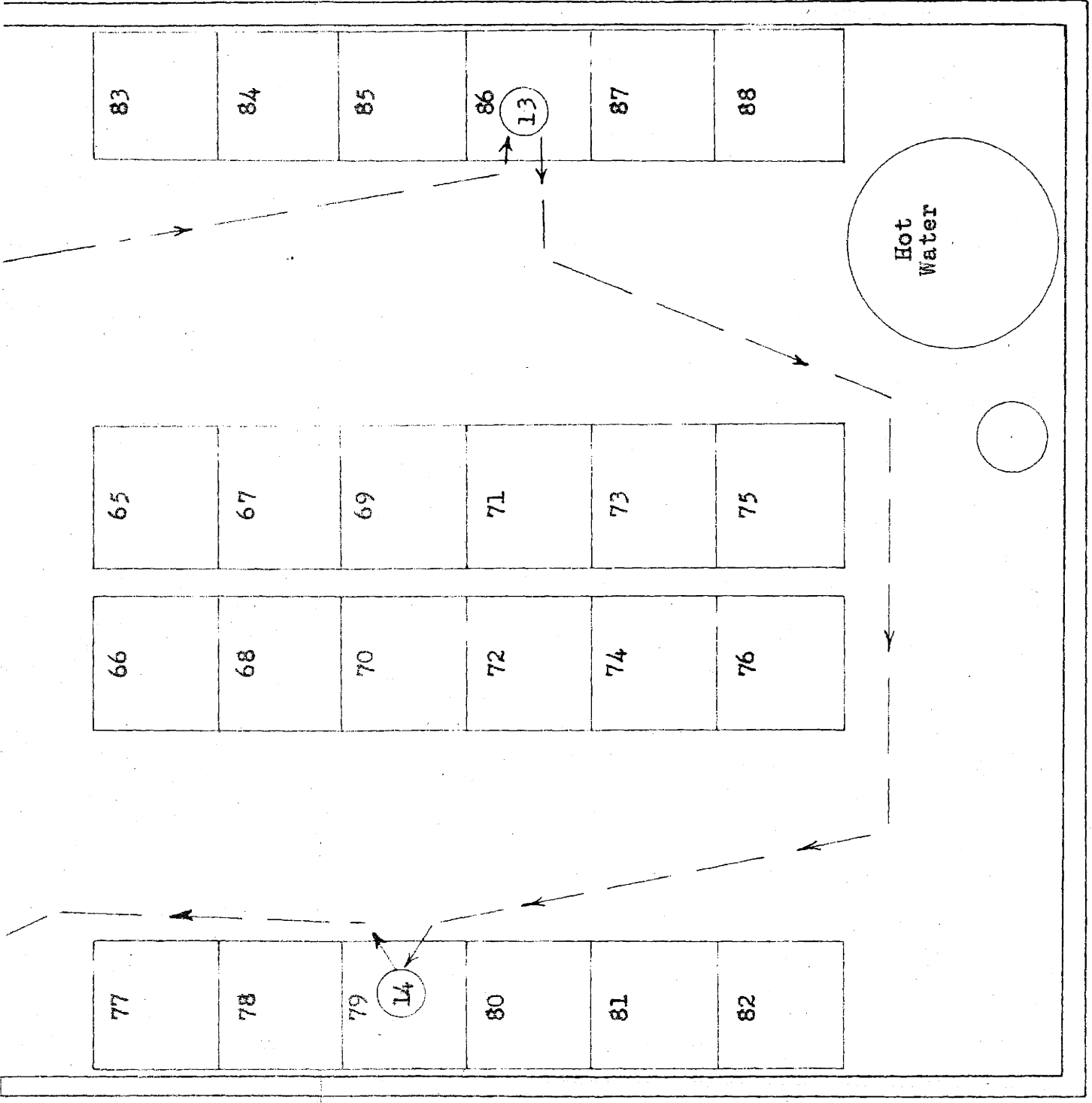
Toilet

11

47	49	51	53	55	57
48	50	52	54	56	58

49	48
----	----

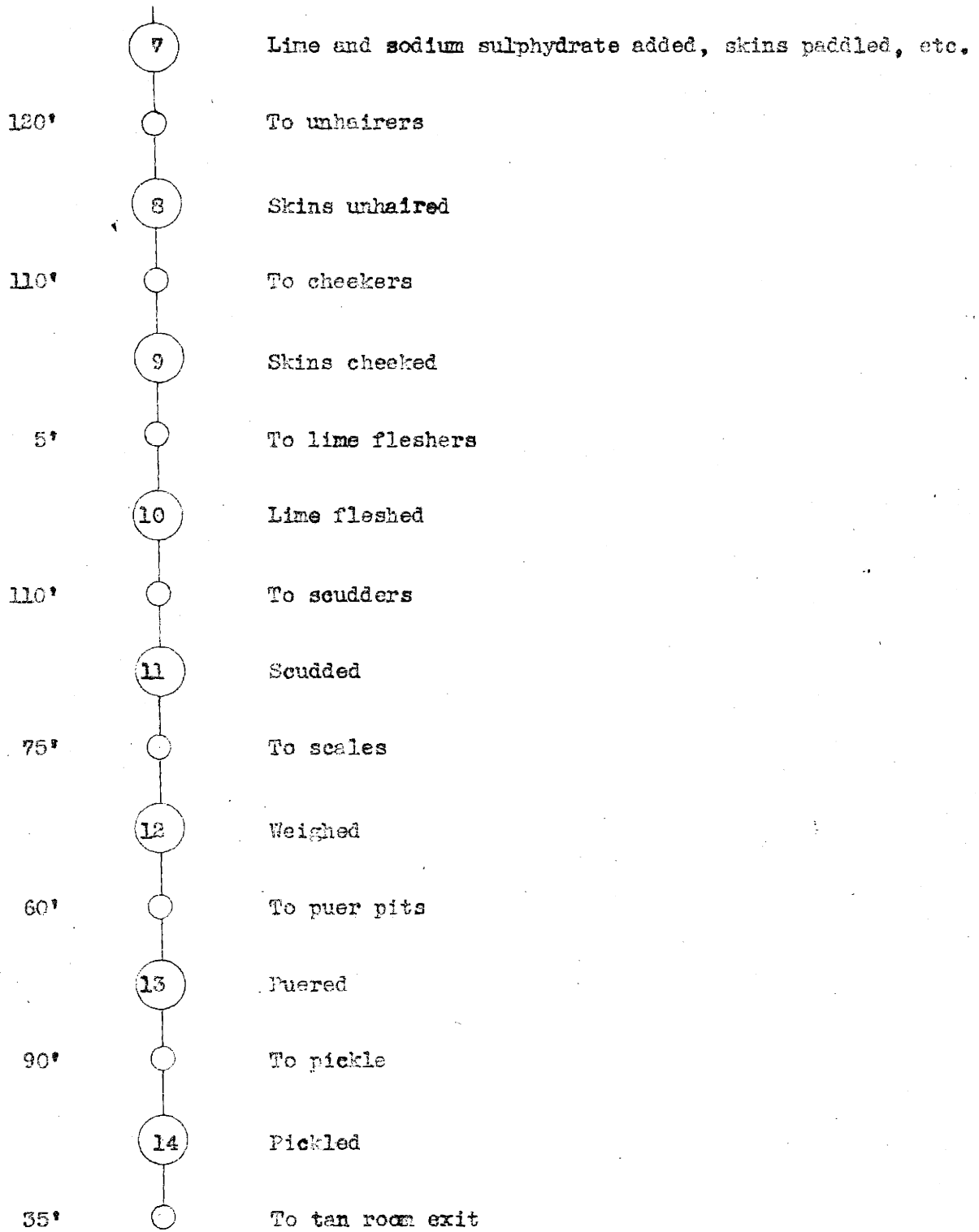




Appendix H

New Method (chart)

Dist.	Sym.	Operation
50'	○	To scale
	①	Weigh
65'	○	To trimming piles
	②	Skins trimmed
5'	○	To sizing piles
5'	③	Skins sized
65'	○	To elevator
	○ ↓	To refrigerator
	○ ↑	To hide house floor
20'	○	To stampers
	④	Skins stamped
25'	○	To await soak
	▽	Awaiting soak
110'	○	To soak pit
	⑤	In soak pit
120'	○	To hair flesher
	⑥	Skins hair fleshed
120'	○	Back to pit

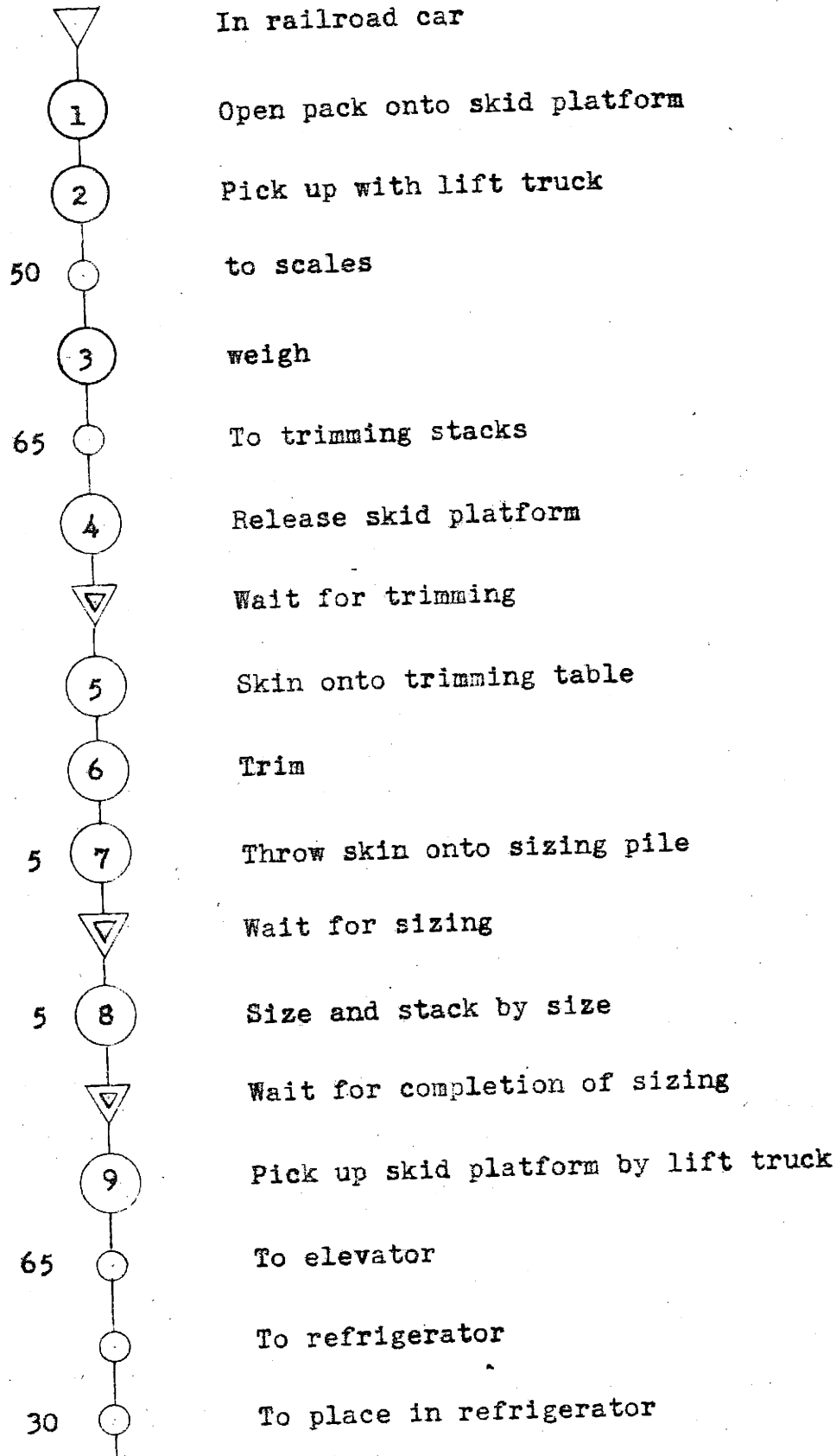


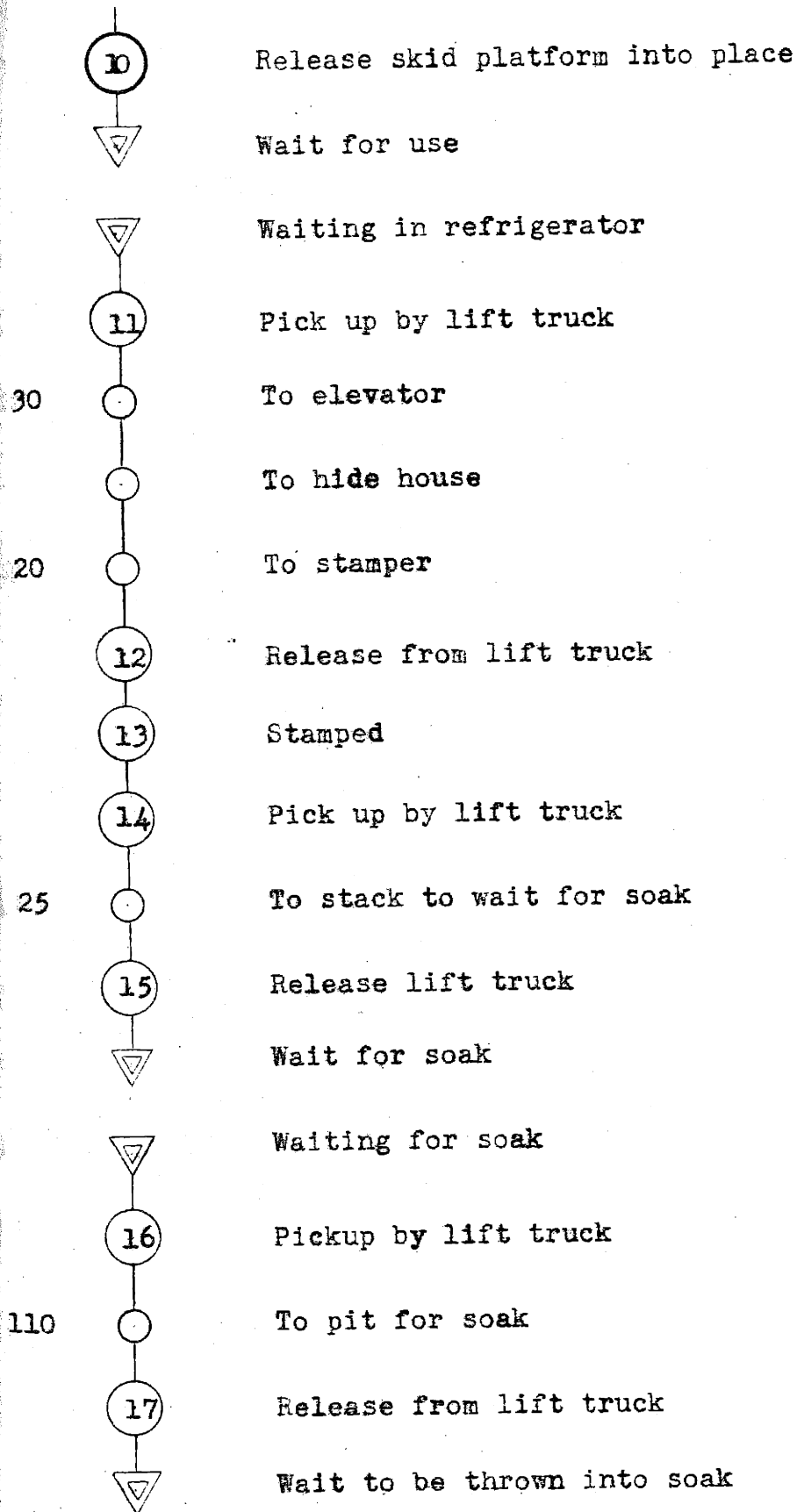
Total 1190 Feet

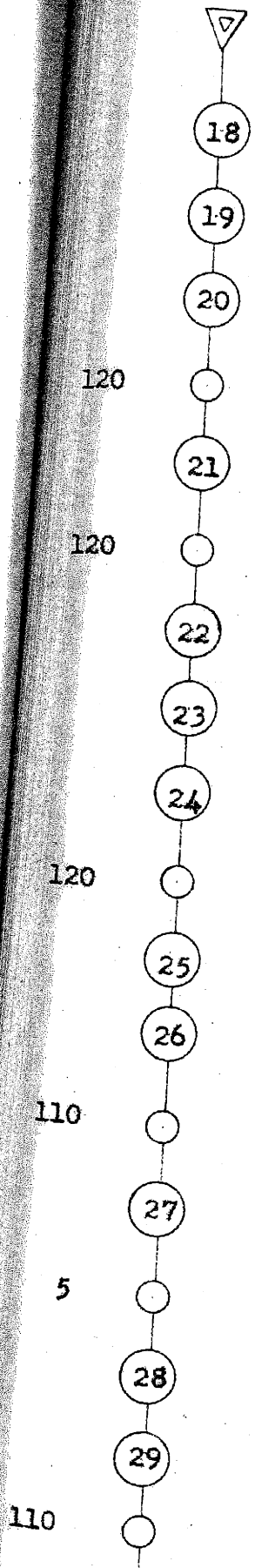
Appendix I

New Method (detailed)

New Method (Detail)







Waiting to be thrown into sock

Throw in soak 2 at a time

Wash out in pit

Pull out of pit 1 at a time, position on table truck

To hair fleshers

Hair fleshed

To pit

Throw into pit 2 at a time

Lime and sodium sulphhydrate added, skins paddled etc. for five days

Out of pit and onto table truck 1 at a time

To Unhairer

Unhaired

Onto stack

To cheeker

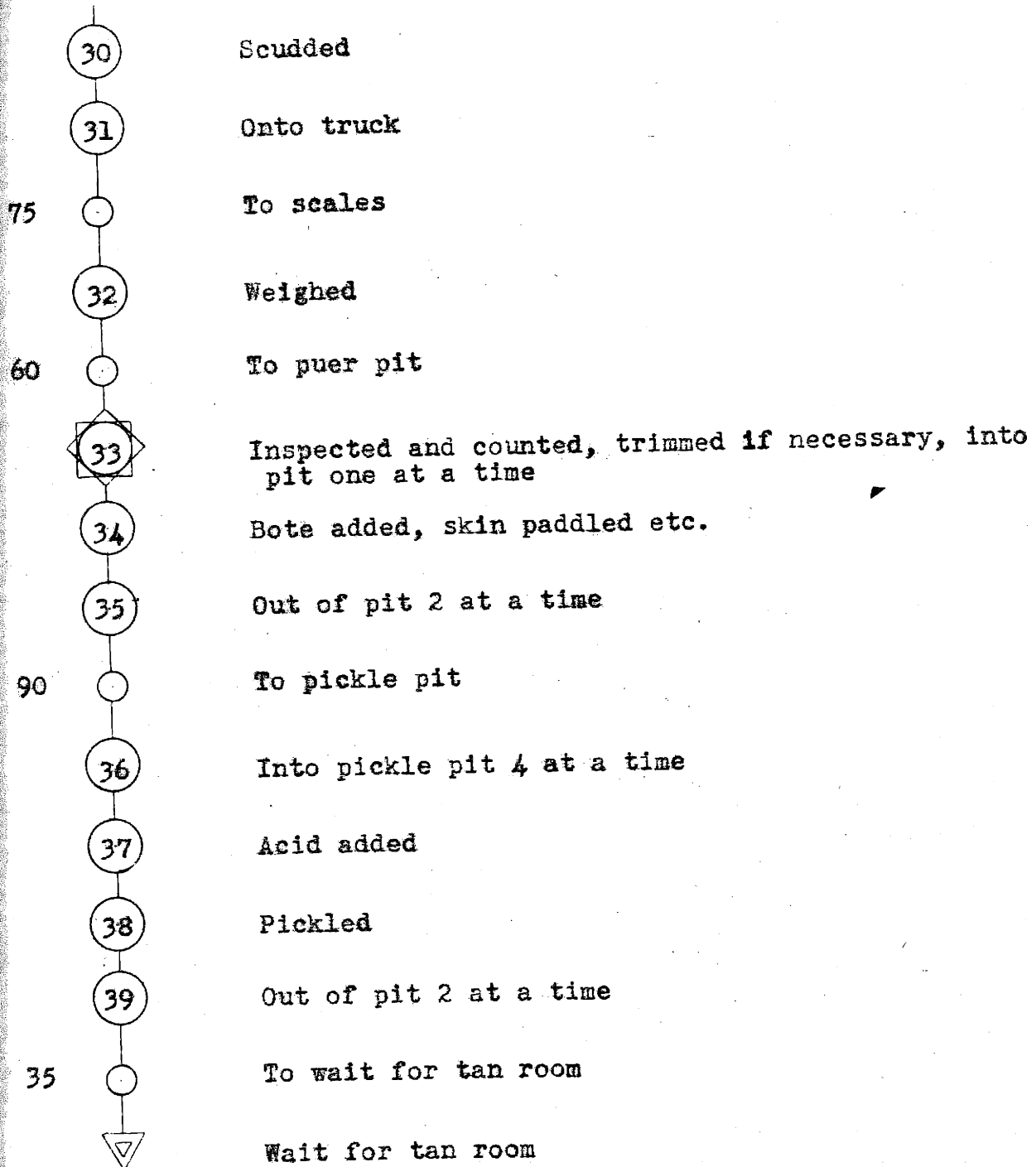
Cheeked

To lime flesher

Lime fleshed

Onto stack

To scudder



39 operations

1350 feet

Appendix J

Sample Day and Week

Sample Day

	<u>Size</u>	<u>#</u>	<u>Green Weight</u>	<u>White Weight</u>	<u>Acid</u>
1	Ho	390	3600	3776	55
2	Ho	390	3600	3643	60
3	Ho	390	3600	3971	60
4	Ho	383	3601	3302	60
5	Fo	487	3604	3358	60
6	Fo	408	3605	2912	50
7	Fo	508	3601	3693	50
8	Fo	499	3600	3355	50
9	Fo	471	3604	3352	60
10	Do	670	3731	3392	55
11	Do	670	3731	3414	55
12	Do	670	3731	3201	55
13	Do	670	3731	3374	50
14	Do	670	3731	3301	50
15	Bo	964	4083	3825	55

8180 skins

Sample Week

H's - 20189 - 100945 ft²/wk.
 F's - 28476 - 142380 ft²/wk.
 D's - 30150 - 150750 ft²/wk.
 B's - 6328 - 31640 ft²/wk.

425,715 ft²/wk.

Average 10,40867 ft²/skin

Appendix K

Week's Schedule under Present Process

A Work Week

1. Tuesday Soak at temperature of 65-70 degrees F.
Wash one hour, and then hairfleshed and
back in soak. Limes.
2. Wednesday In lime.*
3. Thursday In lime.*
4. Friday In lime.*
5. Saturday In lime.*
6. Sunday In lime.*
7. Monday Unhaired, checked, fleshed, trimmed, scudded,
inspected, puered**, pickled.
8. Tuesday Down to tan rooms.

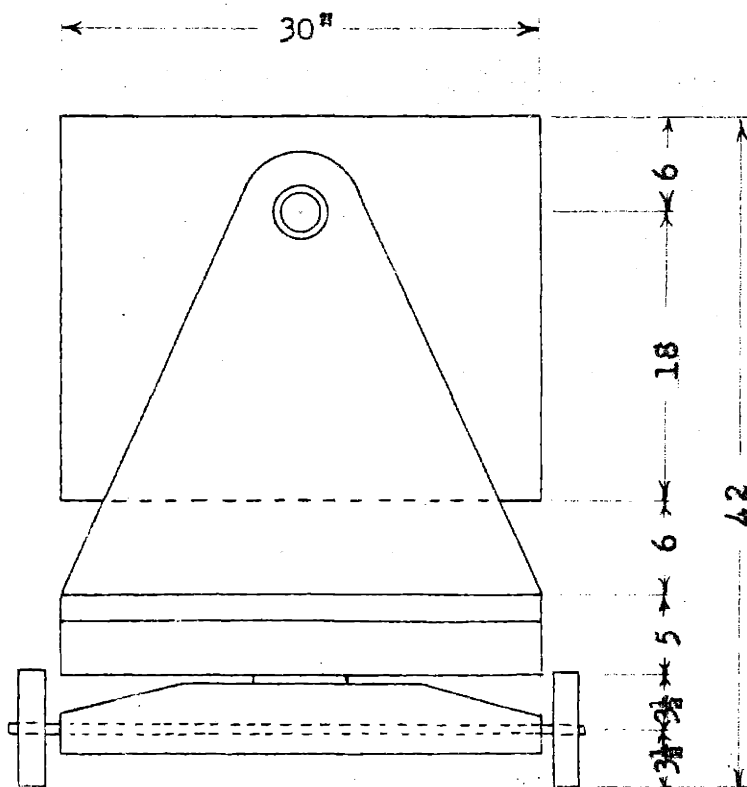
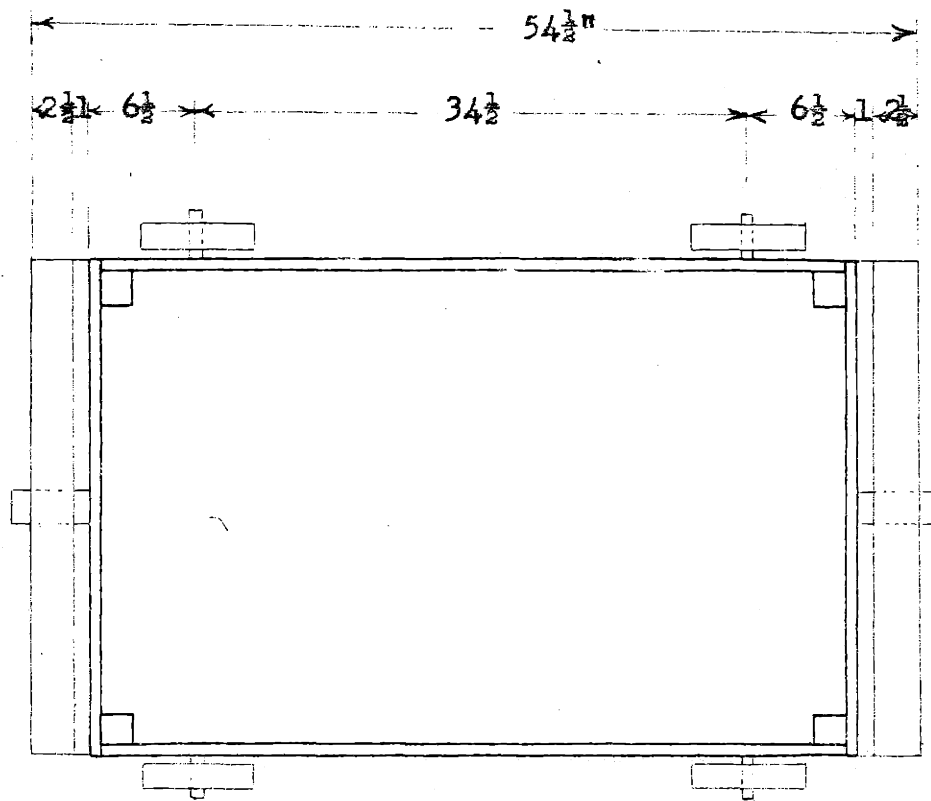
* The temperature must be kept up in these pits to a fairly constant level. This requires watching in the morning and at night.

** The puering needs to have twenty minutes washout under this arrangement to wash out some of the lime.

Appendix I

Dump Truck

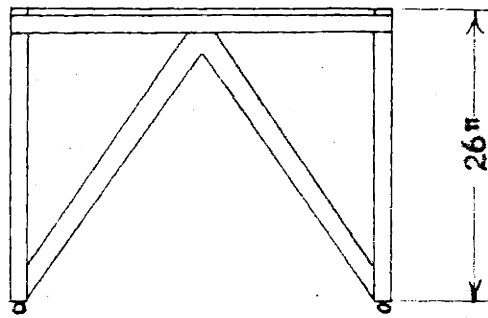
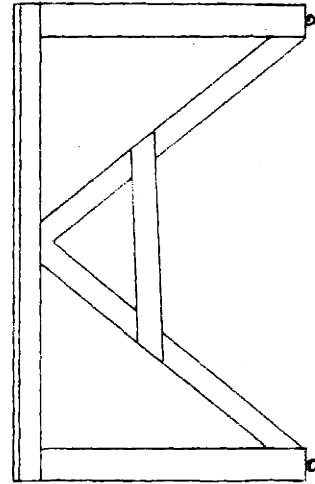
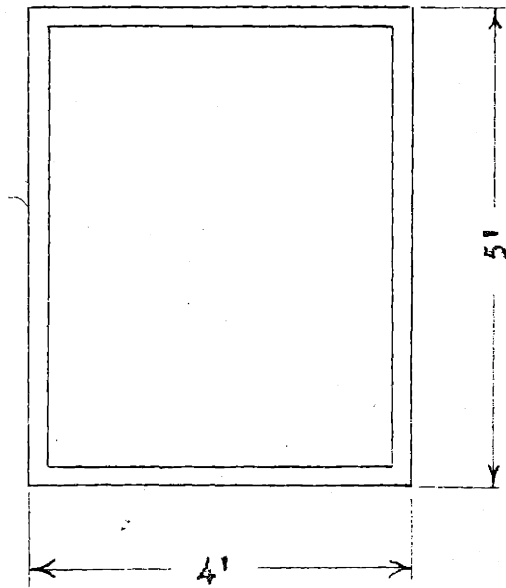
Dumping Truck



Appendix M

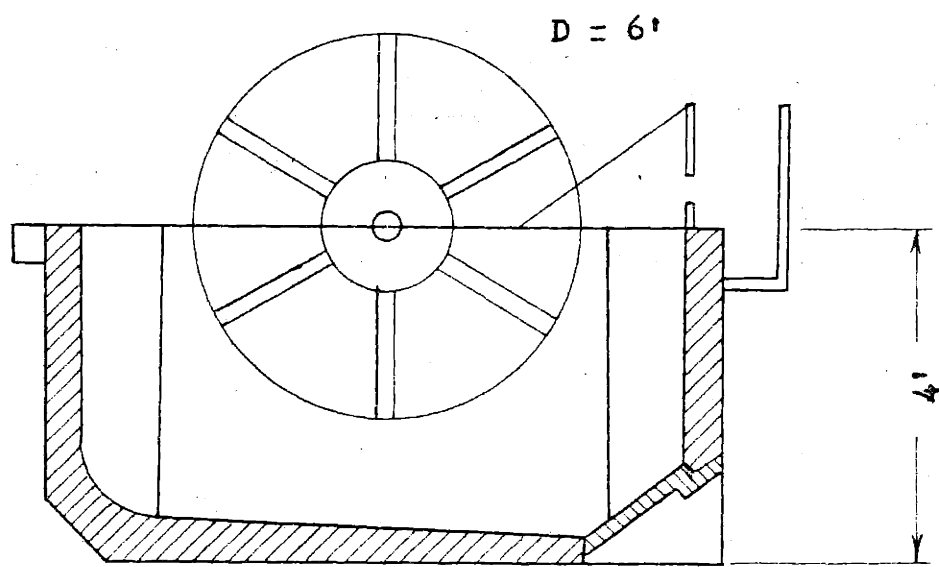
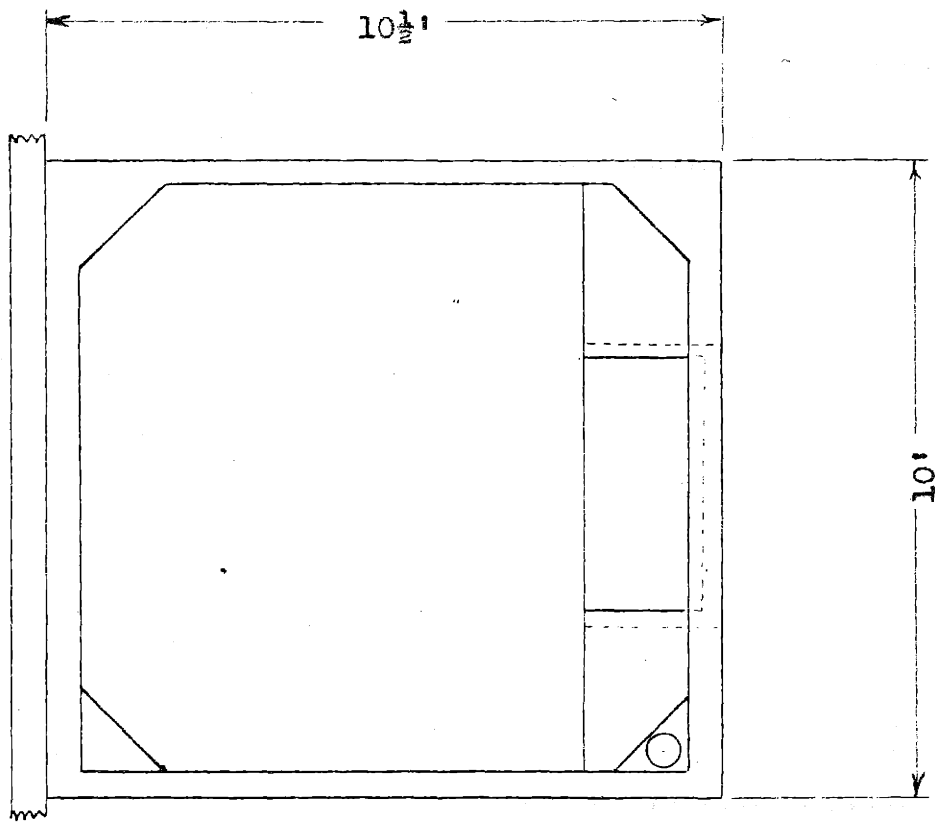
Flat Topped Truck

Stacking Table - Flat Truck



Appendix N

Proper Pit Design



Correct Pit Design

Appendix O

Stacker

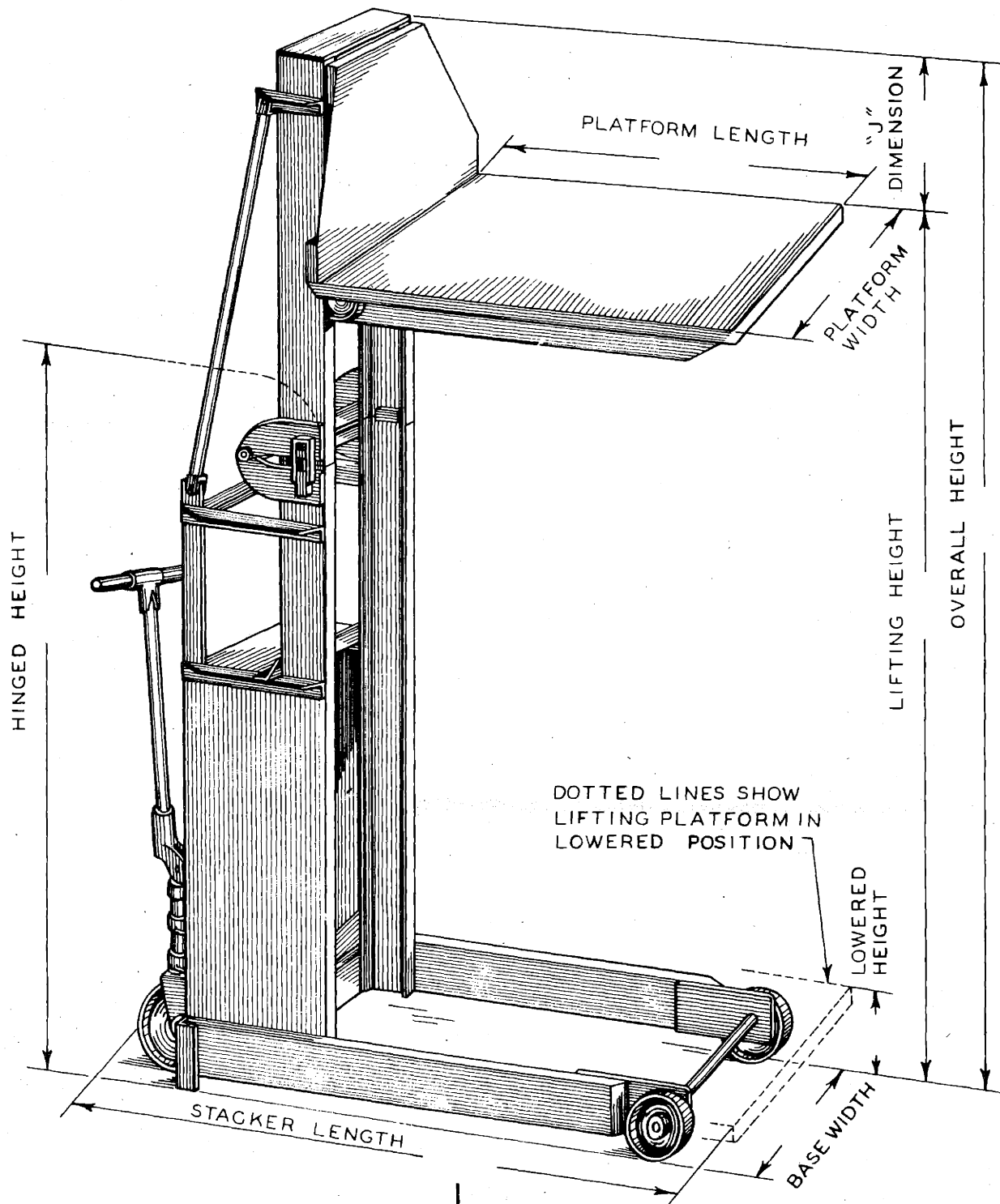
Stacker Specifications

<u>Capacity</u>	1000 #
<u>Type</u>	HB Spacemaster
<u>Lifting Height</u>	5' 9"
<u>J Dimension</u>	2' 2"
<u>Overall Height</u>	7' 11"
<u>Platform Size</u>	48" x 30"
<u>Lifting Speed</u>	1 $\frac{1}{2}$ " / rev. of crank
<u>Control</u>	Decelerator
<u>Running Gear</u>	Autosteer
	6" Rear Wheels 8" Front (Steel)
<u>Minimum List Price</u>	\$869.00
Less Discount (47%)	<u>409.00</u>
	\$460.00
<u>If power wanted</u>	$\frac{1}{2}$ HP 220 - 3ph - 60 cycle 291
	Lift Speed 12 ft./min.

Stacker Dimension Sheet

Circular No. 509

-88-



CAPACITY: 1000 lbs.
 LIFTING SPEED: 12 ft./min.
 MOTOR AND CURRENT CHARACTERISTICS:
 $\frac{1}{2}$ H.P. 220 - 3ph - 60 cycle

SPECIAL EQUIPMENT: _____
 Autosteer 6" rear wheels
 Steel wheels 8" front wheels
 No hinge

NOTE: This sketch is to indicate dimensions only. No control parts or other attachments are shown.

LEWIS-SHEPARD SALES CORP.

3806

125 Walnut St.

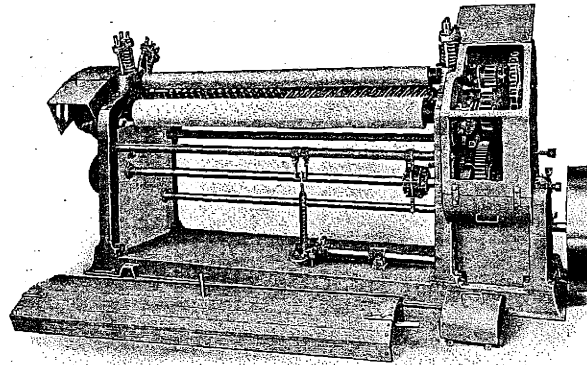
Watertown, Mass.

Appendix P

Unhairer

No. 20 Machine

Unhairer



The Turner Tanning Machinery Company

MAIN OFFICE AND WORKS:

PEABODY, MASS., U. S. A.

— BRANCH OFFICES: —

NEWARK

PHILADELPHIA

MILWAUKEE

— FOREIGN BRANCHES: —

LEICESTER, ENGLAND

PARIS, FRANCE

TURIN, ITALY

FRANKFORT-A-MAIN, GERMANY

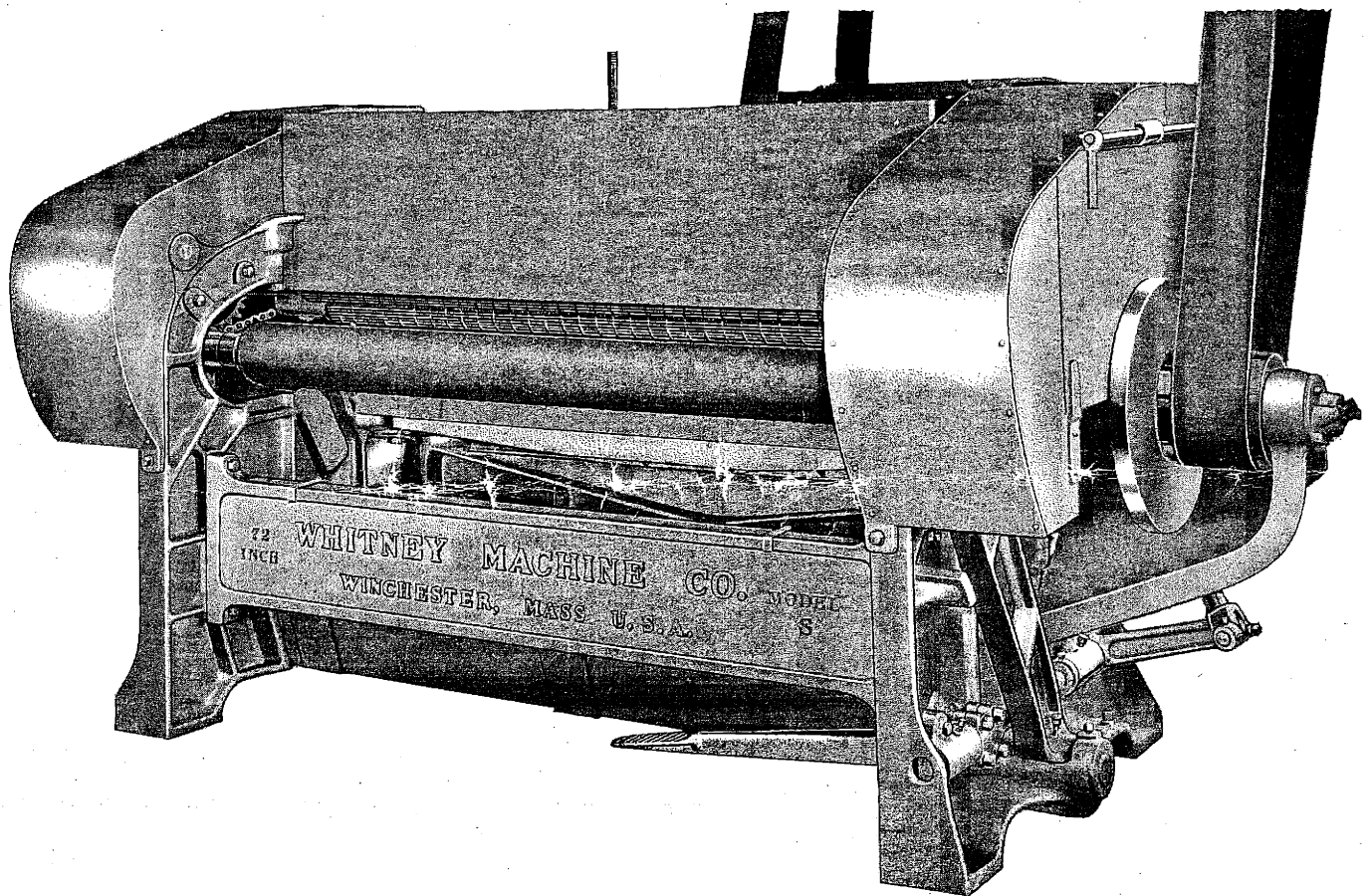
VIENNA, AUSTRIA

Appendix Q

Flesher

Whitney Model "S" Fleshing Machine

Built in Three Sizes—64", 72", 82"



WHITNEY MACHINE COMPANY

Established 1844

WINCHESTER, MASSACHUSETTS, U. S. A.

AGENCIES

PAGE & MORRISON, 436 Jackson Street, San Francisco, California
HARDIE TRADING PTY., Ltd., Melbourne and Adelaide, Australia

W. & C. PANTIN, 147 Upper Thames Street, London, England
JAMES HARDIE TRADING CO., Ltd., Sydney, Australia

DUFF MURRAY & CO., Port Elizabeth, South Africa

Model "S" Fleshing Machine

Built in Three Sizes — 64", 72", 82"

THE MODEL "S" FLESHING MACHINE is the result of our experience of more than half a century, over twenty-five years of which have been devoted to the building of tannery machines exclusively. Its simplicity of construction gives it an even higher mechanical efficiency than any other Whitney model, and assures a lower cost of upkeep.

SPECIAL ADVANTAGES

To the tanner who buys machinery for real and continued service rather than because of low first cost, a machine so plainly superior in design, workmanship, and materials is strongly recommended.

Because of this all-round superiority we are able to guarantee that the purchaser of MODEL "S" will find no machine to compare with it.

1. In quality of work.
2. In quantity of output.
3. In economy of operation.
4. In ease of operation.
5. In freedom from necessity of repairs and other mechanical troubles.

The simplified mechanism of this machine, with the location of its working parts under cover in the top of the machine *away from water and dirt*, makes for long life. In addition, all rolls are run in bronze boxes, and all the bearings have been made larger and better. A large number of Bunting bronze bushings are used.

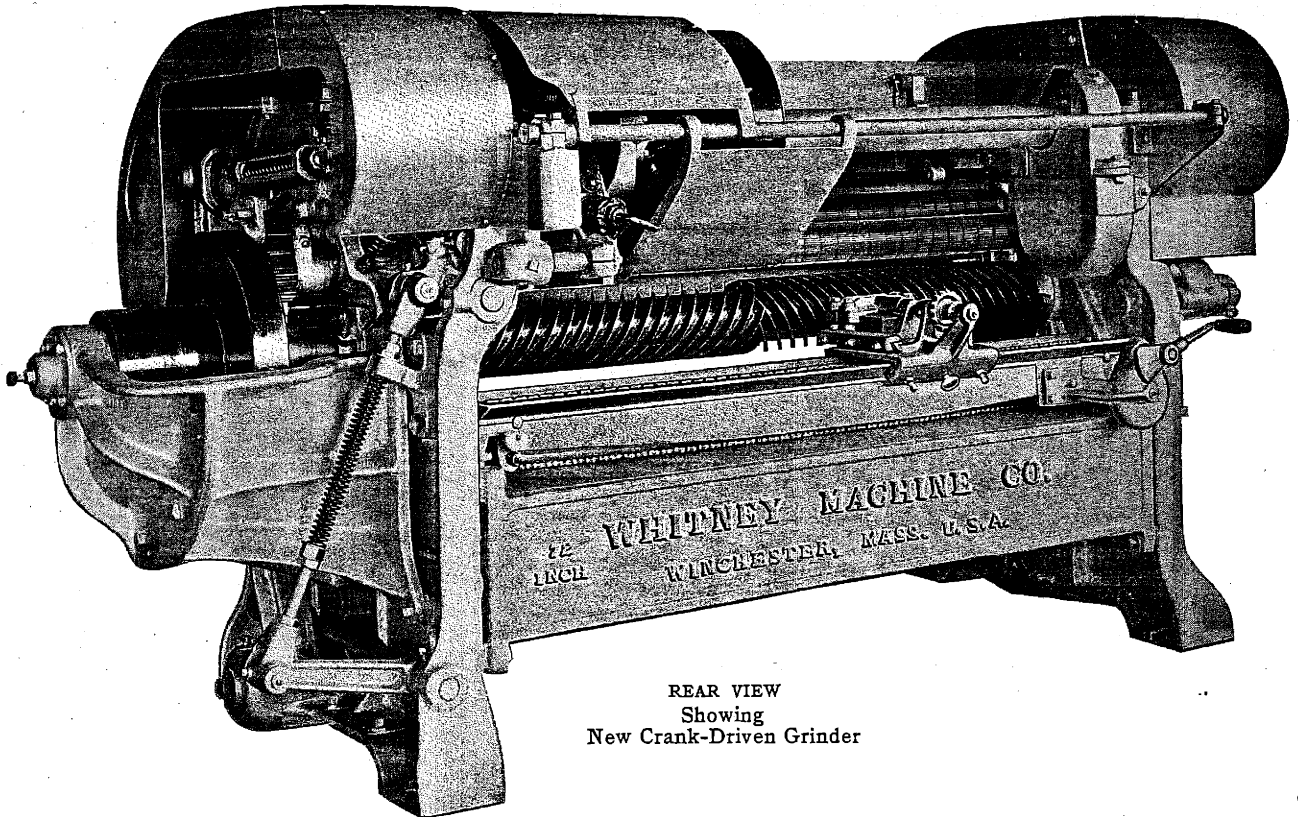
HYATT HIGH-DUTY ROLLER BEARINGS

The cylinder or knife roll runs on three large *Hyatt high-duty roller bearings* with adjustable end-thrust bearings in moisture-proof housings. This saves power, maintains alignment, and assures freedom from vibration. There is no wear on cylinder shafts, no necessity for rebabbiting, and no end play. Self-aligning babbitted bearings are furnished if specified, but we strongly recommend these roller bearings, as eight years' use has proved their especial desirability as used in our machines.

THE UP-TO-DATE CLUTCH MECHANISM

We call your particular attention to the **clutch mechanism** of Model "S." Conveniently located breast high, and entirely enclosed under the top cover at the back of the machine, is an 18" friction clutch of a type used for over fifty years in our shops, which has lately been further improved and brought thoroughly up to date. This clutch is the sturdiest, the simplest, and the most easily understood and adjusted that could be imagined. Pressure on the starting treadle causes two asbestos-covered shoes, which have 54 square inches of bearing, to grip the inner surface of an 18-inch clutch pulley, turning the crank-shaft through four large cut reducing gears until the rolls are closed or opened, when a simple cam on the crank-shaft releases the clutch, the crank-shaft being locked in position by a large asbestos-lined brake.

New Crank-Driven Grinder. This device assures perfectly sharpened fleshing cylinder, better fleshing, and longer life of blades. With earlier forms of emery brick grinders the operator had to walk back and forth the length of the cylinder, pushing the carriage by hand, and frequently adjusting the contact of brick with blades. Now he simply sets the bricks to a contact, turns the crank until carriage moves to opposite end of cylinder, and



REAR VIEW
Showing
New Crank-Driven Grinder

then cranks it back again to first position, all with but little effort and without change of position. The brick contact is maintained automatically.

Mechanically it is simple and long lived. The carriage is extra wide, to carry two bricks, and gives greater bearing surface on bar. Travel is caused by hardened roller steel chain running on brass sprockets driven by hand crank through a gear reduction of 4 to 1.

The best fleshing cylinder that can be made will be ground out of round and balance in a few days by careless grinding with an ordinary grinder, but our new grinder will keep it sharp and true until worn completely down.

SIMPLICITY OF ADJUSTMENTS

All adjustments are so simple that any unskilled mechanic can understand them at a glance. Brake adjustment is the only timing adjustment ever necessary, and is easily and quickly made by hand, without tools.

PERFECT FEEDING

The cylinder, bed roll, and two feed rolls are so designed and placed as to produce the best possible quality of fleshing, the stock feeding evenly without slipping or damage to the grain.

A LARGE OUTPUT OF HIGH-CLASS WORK

The MODEL "S" Fleshing Machine is especially adapted to work skins, kips, and sides out of soak, lime, or sulphide.

Owing to our new construction and the use of friction clutch and brake, this machine can be run at very high speed, with a correspondingly high output. One leading calfskin tannery now running seven Model "S" machines reports fleshing from 2,200 to 3,600 calfskins in seven hours on each machine, according to the size of the skins. Twelve hundred light sides is an easy day's work for a Model "S."

We invite correspondence regarding this new and exceptionally efficient machine.

WHITNEY MACHINE COMPANY.

SPECIFICATIONS

SIZE	WEIGHT with Countershaft	WEIGHT without Countershaft	FLOOR SPACE	Distances between Bolt Holes in feet	Weight Boxed for Export without Countershaft	Approximate Cubic Feet Boxed
64 in.	6,250 lbs.	5,800 lbs.	8 ft. 10 in. x 5 ft.	6 ft. 4 $\frac{3}{8}$ in. x 3 ft.	7,000 lbs.	305
72 in.	6,850 lbs.	6,400 lbs.	9 ft. 6 in. x 5 ft.	6 ft. 11 $\frac{3}{4}$ in. x 3 ft.	7,750 lbs.	320
82 in.	7,650 lbs.	7,200 lbs.	10 ft. 4 in. x 5 ft.	7 ft. 10 $\frac{1}{4}$ in. x 3 ft.	8,600 lbs.	340

We have every facility for handling foreign business. Machines very carefully packed and boxed for export to insure safe delivery to any part of the world.

We also carry stock of machines and parts in San Francisco, London, Sydney, Melbourne and Port Elizabeth.

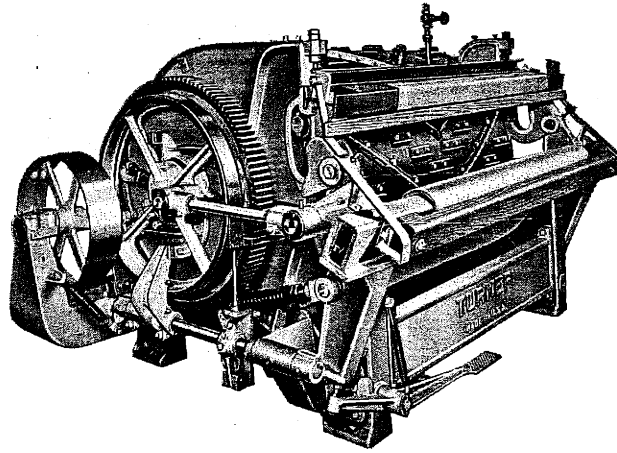
CABLE ADDRESS: "WHITMACO"
 CODES USED: Tanners' Council Code
 Western Union Five Letter Edition
 Lieber's
 A B C, 5th Edition
 Bentley's

WHITNEY MACHINE COMPANY

WINCHESTER, MASSACHUSETTS, U. S. A.

Appendix R

Scudder



Small W (SJS) Beaming Machine

Adapting the well known "W" system of flexible apron and bladed drum, making a simple and sturdy machine for skins only.

GROSS WEIGHT BOXED	8800 lbs.
NET WEIGHT	8000 lbs.
CUBIC MEAS. BOXED	8 tons
FLOOR SPACE	10'-2" x 6'-6"
HEIGHT	5'-3"
PULLEYS ON COUNTERSHAFT	16 x 6
SPEED OF SAME	300 r.p.m.
HORSE POWER	10
PULLEY ON MACHINE	24 x 6
PULLEY ON MACHINE	speed 200 r.p.m.
SPEED OF DRUM	26 r.p.m.
WIDTH OF DRUM	64"
CAPACITY	Approximately 200 Calfskins per hour

The Turner Tanning Machinery Co.
Peabody, Mass., U. S. A.

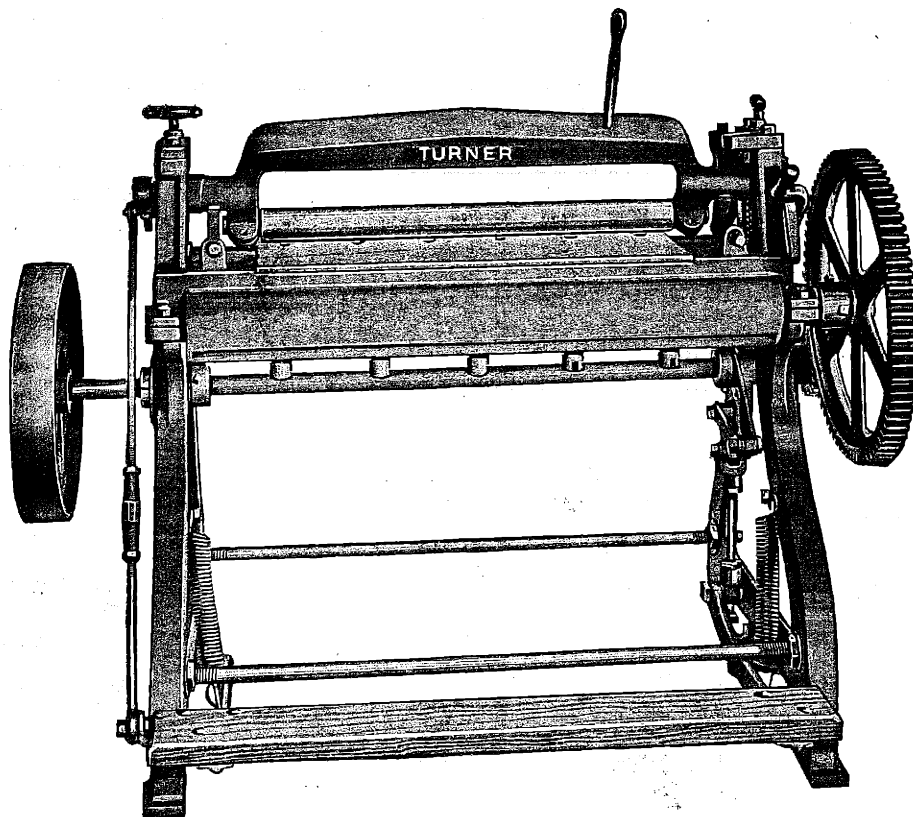
Philadelphia, Pa.

Milwaukee, Wis.

Newark, N. J.

Appendix S

Cheeker



Cheeking Machine

THE TURNER TANNING MACHINERY CO.
PEABODY, MASS., U. S. A.