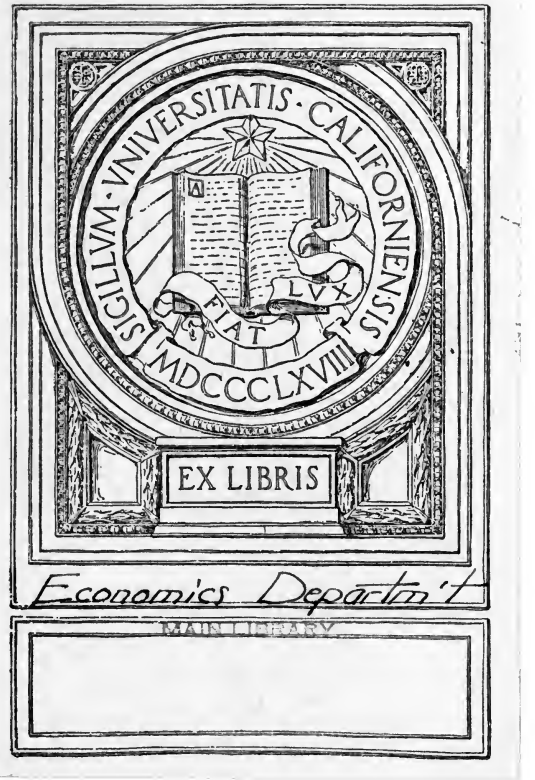

SIGILLVM · VNIVERSITATIS · CALIFORNIENSIS
LVX
FIAT
MDCCCLXVIII
EX LIBRIS
Economics Departm't
MAIN LIBRARY

STORING

ITS ECONOMIC ASPECTS AND PROPER METHODS

STORING

ITS ECONOMIC ASPECTS AND PROPER METHODS

BY

H. B. TWYFORD

OTIS ELEVATOR COMPANY

AUTHOR OF "PURCHASING: ITS ECONOMIC ASPECTS AND PROPER METHODS"

WITH

ILLUSTRATIONS AND FORMS

NEW YORK

D. VAN NOSTRAND COMPANY

25 PARK PLACE

1918

THE·PLIMPTON·PRESS
NORWOOD·MASS·U·S·A

PREFACE

SOME of the most momentous problems before business men to-day calling for solution are those connected with storing raw materials and manufactured articles of every kind. Situations have arisen in the recent strenuous times which have made questions regarding storage the most prominent issue in many commercial transactions. Many fortunes have been made and likewise many lost in storing goods. Any business man who can solve storage problems correctly is assured of success.

Into every form of commercial activity which involves the retention for long or short periods of materials and supplies is penetrating the new importance of storing. It is not a new problem, but it has attained a new importance and unobtrusively, perhaps, but none the less surely, it is rapidly and forcefully compelling attention. To some extent this is due to more intensive methods of figuring costs in so far as they affect storage problems. These costs have a vital, and oftentimes a determining, influence on the other aspects of storing which are associated with supply and demand.

To store or not to store has got to be settled on a more scientific basis, and this will be the remedy for some of the irregularities in supply and demand. Irregularity in the supply of material is not always owing to actual shortage or surplus, but to hesitancy

to store by some concerns and a tendency to excessive storage by others. These conditions are caused by inability to solve properly the storage question. Mere price fluctuations do not create shortages, except as they may be allowed to influence one's buying and storing policy. The question is deeper than just one of price, lack of labor, car shortages, freight embargoes, and other factors, but all these have brought storage problems more prominently to the front.

Every business needs a certain amount of raw material, or manufactured articles, or supplies. For successful operation there must be sufficiency, and there must not be lack. Every dollar's worth of goods carried in stock beyond the sufficiency point creates an expense beyond the needs of the business, and to that extent decreases the profits. Insufficiency endangers the smooth working of a manufacturing plant, which might be compelled to close down, or temporarily suspend the operation of its production department, thereby entailing severe losses. And a supply house unable to furnish from stock articles which it is supposed to carry suffers losses both tangible and intangible.

Too often the storekeeper is looked upon as a man whose duties are exclusively physical. He is not supposed to have a thinking job. The position of storekeeper needs better recognition; it needs recognition on a somewhat different basis to that which is usually accorded it. Sufficient consideration has not been given to the potentialties of the keeper of the stores. He is in complete control of a very large proportion of the wealth of many concerns. If he is

not in complete control, it is because of lack of ability and vision on his part, or because he is not given a standing commensurate with that to which he is entitled.

Everything held in storage is a form of wealth. If it were not there would be no logical reason for storing it. Raw materials and manufactured goods are wealth in its best and truest sense, because they are the product of, and represent the industry of, a nation or community. Money, stocks, bonds, and other forms of wealth may not always do this. All wealth is, or should be, actively utilized to produce other forms of wealth. Inactive or quiescent periods are unavoidable with the property under consideration. It takes also the form of bulk; it needs space and storage capacity; it must be guarded, protected and controlled. Records of quantities and values must be kept. It is some of the problems connected with these questions that I have attempted to elucidate in the following pages.

H. B. Twyford

New York City

FOREWORD

Acknowledgment is tendered to the undermentioned concerns who furnished the material from which the illustrations of storeroom equipment and appliances were made.

Barrett-Cravens Co.	Multi-truck.
The Berger Manufacturing Co.	Shelving and racks.
Columbus Lift Truck Co.	Lift truck.
Elliott Fisher Co.	Bookkeeping machines.
Mathews Gravity Carrier Co.	Conveyors.
The National Scale Co.	Counting machines and scales.
The New Britain Machine Co.	Racks and tote boxes.
The Plimpton Press	Elevating truck.
C. J. Root Co.	The Root counter.
The Standard Scale Co.	Counting machines and scales.

Acknowledgment is also tendered to Otis Elevator Co., H. W. Johns Manville Co., Warner Sugar Refining Co., and Jeffrey Manufacturing Co. for permission to reproduce storeroom forms. The reader should bear in mind, however, that the discussion is confined to generalities and does not describe specifically the routine followed by any of the concerns mentioned.

CONTENTS

Chapter IV

SPECIFICATIONS, DEFINITIONS, AND STANDARDIZATION

Chapter V

LOCATION AND EQUIPMENT OF STOREROOM

Chapter VI

APPLIANCES FOR USE IN THE STOREROOM

Chapter VII

MANUAL OPERATIONS

Chapter VIII

CLERICAL WORK — INVENTORIES

Chapter IX

THE STORES DEPARTMENT

Chapter X

RECEIVING MATERIAL

Chapter XI

INSPECTING AND PLACING MATERIAL IN STOREROOM

Chapter XII

DELIVERIES FROM STOREROOM

LIST OF CHARTS, DIAGRAMS AND FORMS

STORING

CHAPTER I

General Considerations

Wealth in Storage

THE implication to be drawn from the fact that an article or commodity is being stored is that the thing in storage has some value. If this were not the case there would be no logical reason for storing it. Therefore everything which is held or retained for long or short periods is a form of wealth, and economic reasons demand that all wealth be properly guarded, controlled, and recorded.

The earth itself is one vast storehouse of untold riches, great quantities of which are being taken out; still larger quantities are undiscovered, and very large quantities are discovered but undeveloped.

All forms of wealth, if properly utilized, produce, or are used in producing, other forms of wealth. For example, water stored in a reservoir is essential to the existence of the people and preserves the health of those in the communities it serves, thus adding to the wealth of the nation as represented by the health of the population. Wealth in the shape of grain is stored in elevators, and coin and bullion in the vaults of banks, but discussion of the questions

regarding the storage of these things does not come within the scope of what is contemplated in the present work.

Commercial Storage

The problems it is proposed to discuss are those connected with commodities, materials, and articles acquired for the purpose of operating any commercial undertaking, and are consumed in the process, such as coal, lubricating oils, stationery, etc.; or which are acquired for the purpose of reselling under one of the following classifications.

1. In the same condition as purchased.
2. As a component part of an assembled machine or article.
3. After manipulation by some manufacturing process which converts the material into the finished product of the factory through which it passes.

Storage problems such as those indicated are not new, but they have attained a new importance because of the closer control which is being exercised over all forms of wealth, because of the desire for the better ordination of the economic features connected with the conservation, handling, and distribution of wealth, and because of the growing demand which exists for a wider knowledge of the factors which have an influence on wealth in its idle or quiescent periods.

Purpose of Storing

To obtain the greatest benefits from any form of wealth it must be kept in a state of activity, and if a supply in unbroken continuity could be secured of

all goods, articles, and materials required by the operations of business, little or no storing would be necessary and an ideal condition would exist, because the wealth of the country would be incessantly at work or in a state of activity, with no idle periods.

Owing to irregularity in the output of commodities and manufactured articles, and to the fact that they are used or consumed in localities at varying distances from the point of origin, with the attendant uncertainties and delays in transportation, it becomes necessary to accumulate stocks of materials and articles. These stocks may be held where produced, or at or near the point of consumption.

Having these stocks available facilitates the distribution of articles in daily demand and enables commercial operations and manufacturing to be carried on without undue delays and interruptions. A manufacturer, for instance, can maintain a uniform rate of production in spite of fluctuations in demand, if he stores his surplus output during the dull seasons. Working under these conditions he can operate his factory on a more economical basis than if he were operating it for certain periods at twenty per cent of its capacity, at other times at sixty per cent, and possibly during periods of unusual stress working overtime.

Another object in storing goods, merchandise, and commodities is that it is sometimes possible to purchase these things when they are not needed for immediate consumption at very favorable prices or prices lower than normal. It then becomes necessary to hold them until such times as they are needed for manufacturing purposes or a resale is effected.

Disadvantages of Storing

In the preceding paragraphs good reasons have been briefly stated in favor of storing, but there are equally good and cogent reasons against storing, and these reasons are at times so strong as to completely outweigh the advantages.

To place any article in a storeroom means space must be provided for it and space costs money. The goods must be insured, they must be protected, they must be handled at least twice, once in going in and again in going out of the storeroom. They may be of a perishable or semi-perishable nature and are liable to physical deterioration. They are liable to depreciation in market value. The money invested in them is in a state of obsolescence after they are paid for and during the period they are at rest in the storeroom, and loss of interest is incurred on the money invested.

Balancing Storage Considerations

The crux of the storage problem lies in the consideration of the advantages and disadvantages. Any business man finding the correct solution and acting on it is assured of success. Many business failures can be attributed to overstocking and loose storage methods, while many concerns have successfully passed through crises and critical periods because of their efficient storage policy. Foresightedness, good judgment, and proper calculation of all the features outlined and many more are essential to successful storing. Without these the consequences may be disastrous.

The significance of the question whether to store or not to store has been compelling attention largely

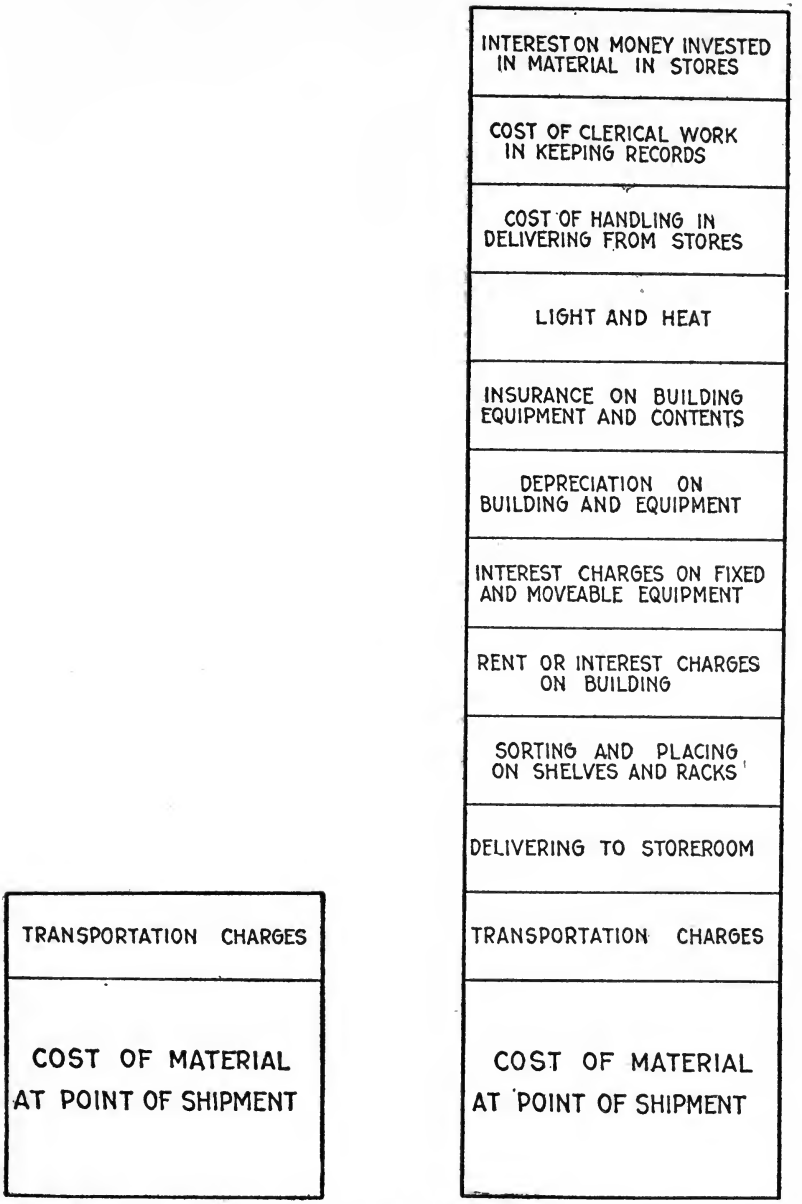


FIGURE No. 1—The cost of an article which passes directly from the supplier to the user is covered by the first column but if it is placed in the stores its ultimate cost to the user is increased by the items listed in the second column.

because of better methods of figuring costs and a better realization of these costs, especially in connection with storage. Unobtrusively but none the less surely this issue is forcing attention to all the problems associated with it. The subject is of vital interest to every manufacturer, every jobber, every supply house, in fact to every business concern buying goods and retaining them for long or short periods.

Situations have arisen in the recent strenuous times which have made storage questions the most prominent issue in many commercial transactions. It is only necessary to peruse the daily papers, trade publications, and technical press, to realize the importance of this. Under-production, shortages, freight embargoes, and other unusual conditions occur and reoccur with such frequency as to be almost normal. Buyers who may have been anticipating their actual needs by one month have been compelled to look ahead three months, six months, and even twelve months or longer. Storage considerations have an important bearing on these purchases.

Many buyers who have been depending on getting their supplies direct from the mills have had to fill their requirements from supply houses and local stocks. In all such cases they must pay the storage costs and the expenses of handling incurred by the dealer, and it is essential for the buyer to know something of these costs for him to properly determine the economy of a purchase.

Relation between Buying and Storing

Buying and storing, although distinct and separate functions in any business, are closely related in all

those cases where the goods do not immediately pass out of the possession of the purchaser.

Determination of questions regarding storage are frequently controlled by conditions in the buying market. Conversely questions regarding purchasing are frequently determined by storage conditions. It will be necessary, therefore, in discussing the economic aspects of storing to refer to purchasing and market conditions.

CHAPTER II

Economic Questions Connected with Storage

Distinction between Storing Material for Manufacturing and for other Purposes

THE classifications mentioned in the last chapter have varying problems and need separate treatment, but apart from the strictly economic and commercial features there is not so much difference as to warrant separate discussion. In later chapters such matters as conveying, transporting, handling, and storing goods and materials will be discussed collectively in spite of certain distinctions between the various classifications and perhaps some minor differences and distinctions in the manual and clerical work connected with the operation of a storeroom.

Primarily all business operations are conducted for profit, but in buying and storing goods the question of profit cannot be considered in the same manner. For instance, goods which are bought and stored for resale in the same condition as purchased are procured exclusively for the purpose of making a profit when the selling transaction is completed. Between this class of goods and material which is procured for manufacturing purposes there is the great fundamental difference that the latter class are dependent on the skill of the workmen and the manufacturing art to

convert them into a product which can be disposed of at a profit.

The profits of most manufacturing plants are dependent on the continuous and unbroken operation of their production departments, and the successful operation of these departments means that they must be supplied with raw material without cessation. Therefore it must be procured and stored in the requisite quantities to insure this. Sufficient quantities must always be on hand and ample storage space must be provided. The cost of the material may be high and questions regarding the actual price paid may have to give way to the imperative necessity of maintaining a certain minimum quantity in the stores.

These considerations do not apply in storing goods for resale purposes. If a buyer cannot see a sure profit he has the option of staying out of the market and allowing his warehouse to remain empty or he has the alternative of filling his storage space with speculative purchases. Whichever course he pursues he must take certain factors into consideration. If his storage space is vacant there are some overhead expenses being incurred such as rent, building insurance, etc. On the other hand, if his storage space is fully occupied, there are additional overhead expenses, such as insurance on the goods, protection against loss by theft, protection against depreciation and loss of interest on the money invested.

There are the main differences between storing material for resale purposes and manufacturing purposes, and these facts should be borne in mind throughout the discussion of storage problems.

The Speculative Element in Storing

There is not always a well-defined object in storing material. It may be bought and carried purely as a speculation, but even so the speculator cannot ignore or evade the carrying and storage charges. A manufacturer or a jobber may speculate in purchasing and storing goods and at the same time have a good prospect or one more or less remote of using them in the production department or reselling them.

It will be seen that there are many phases of the question as to why storage is resorted to and why it is necessary, but none of these affect the economic problems which are insistent factors, whether the storage is purely speculative, whether it is the result of well-ripened and balanced judgment, or whether it is caused by the necessity of maintaining a sufficiency of raw material for manufacturing purposes.

Storage Investments

All manufactured or semi-manufactured goods and all raw material are a form of wealth. It is wealth in its best and truest sense, because it is the product of and represents the industry of a nation or community. Money, stocks, bonds, and other forms of wealth may not always do this.

The property under consideration takes the form of bulk; it needs space and storage capacity. It must be guarded, protected, and controlled. Records of quantities and values must be kept. All of these features necessitate an expense outlay. Therefore the ownership of this form of wealth carries with it the responsibility of obtaining an increased price

for it when ownership is transferred to cover the expenses referred to or a loss will be incurred.

Changes in Values during Storage Periods

Changes may occur in the monetary value of goods in storage through market fluctuations. An appreciation in the price is naturally very desirable, and as already stated storage is often resorted to for the purpose of holding certain goods until the advanced price can be secured. Conversely, there may be depreciation in values, but good judgment and foresightedness can largely prevent this.

It is a common fallacy that all goods in storage are depreciating in value, because of the items of expense already referred to. This is far from being the case. The expense of storing adds to the cost of goods; it does not depreciate values. The causes which make for degradation in values while material is at rest in the stores are depreciation in market prices and physical deterioration from natural causes or from carelessness in handling.

Storage Costs

In computing the cost of any article which is in storage every item of expense must in the last analysis be absorbed into the total. The primary object in all commercial transactions being to keep the cost of goods as low as possible, it becomes apparent that storage problems are of considerable importance.

There can never be any fixed rules as to actual storage costs, but there are always certain factors which must be taken into consideration in determining the costs. The costs themselves will vary tremen-

dously and will be governed very largely by the nature of the goods, the location of the storehouse, the length of the quiescent period, the difficulties of handling, the necessity of protection from physical injury, and many other causes.

There is first the permanent investment in buildings to be taken into consideration, or if space is rented for storage purposes the rent is the first item to appear in storage costs. This item is subject to extreme variations because the character of material low in intrinsic value may require large areas, whereas valuable material may often be stored in small spaces. Location has an important bearing on this question, and it assumes some magnitude if it is in an expensive section of a city or in a congested district. Such a condition might make prohibitive the use of large areas, or it might render necessary the location of the stores in some less expensive section.

Other factors are brought to the front in deciding the question of space. If it is curtailed to a point where it leads to a congested condition in the storeroom, many inconveniences and delays will occur in handling the stock. It will mean that frequently material must be handled two or three times where only once would be necessary if space were ample. The lack of space and additional handling may cause physical damage to the stock. Only one result is possible from insufficient storage facilities and that is extra expense and added costs.

The capital outlay on a storeroom includes an investment in equipment. This equipment will vary almost as much as the building, the variations being governed by the character of the goods being stored.

Both fixed and movable equipment is necessary and consists of racks, bins, apparatus for weighing, measuring, moving, handling, etc. All these must be provided as conditions demand.

Although no two warehouses or storerooms may be similar in size, location, or equipment, still there are well-defined rules for determining the overhead charges comprised in the capital outlay. In calculating storage costs this investment must be taken into consideration, with the attendant interest charges, depreciation, etc. These items are susceptible of accurate determination.

A factor, however, which cannot always be accurately determined or at least would sometimes need elaborate accounting calculations to arrive at a correct figure, is the interest charge on the money invested in the goods, materials, and supplies in the stores. The credit periods arranged by buyers vary greatly, and in some cases goods might be paid for before entering the stores, while in other cases they may have passed out of the stores before any money is actually disbursed in payment.

In a manufacturing plant raw material storage ceases as soon as it passes out of the raw material stores for manipulation in the shop, and factory storage costs can be figured up to that point. There is an investment and a corresponding interest charge on material while undergoing conversion in the shop into the finished product, but the storekeeping function ends with the passage of the material out of the stores. This is also true of goods sold and shipped out of storerooms and warehouses. If strict accuracy were desired on this point, it would be necessary to

figure the exact amount of interest on the money from the time the cash outlay was made until the material was moved from the stores. The cost of borrowing money to carry goods in storage cannot be considered if proper allowance is made for interest on money invested in goods in storage, as this would simply be duplication of costs.

Storage costs must bear their proper proportion of general burden and overhead expense; when these have been equitably divided and spread over an establishment their effect on storage costs can be accurately determined.

Insurance is another item of expense which for goods in stores should be segregated from the general insurance expense of an establishment. It is quite easy to average the value of the stock on hand and keep it amply covered, allocating to storage costs the exact amount of the premiums.

Finally, all items of expense for which the storeroom is directly responsible are a part of storage costs. These include salaries and wages connected with stores bookkeeping, and in receiving, handling, and delivering the stock. All stationery and appliances used exclusively in the storeroom should be charged accordingly.

Storage Profits

Appreciation in price is the only source from which a profit can be shown, and this appreciation must run at a faster rate than the storage costs to enable a profit to appear. If the activities of the sales department of an organization result in disposing of the goods in storage at a profit, that is something quite apart from what happens to those goods during the

quiescent period while they are lying dormant in the stores. The present discussion is confined to that period.

By far the greatest number of transactions which involve the storing of goods for long or short periods are made with the prospect that the market price will remain stationary during the storage period, but purchases are often made with the expectation and hope that an advance will take place before a resale is effected. Nobody wants a decline to take place during the period under consideration, but there are many occasions when material and articles must be stored without too much weight being given to questions of appreciation and depreciation in price.

Some jobbing and supply houses have a policy of carrying a certain amount of stock to take care of their regular trade, and will do this in the face of unrest and upheavals in market prices. Even if losses are contemplated through depreciation, it is considered better policy to take the risk of these rather than risk the loss of good customers.

While market prices naturally influence the buying of raw material for a manufacturing plant, still there comes a time when this influence is counteracted by the necessity which exists of keeping a sufficiency of raw material in the stores to enable the production department operations to proceed without let or hindrance. Much greater losses would probably be sustained by a temporary stoppage of active manufacturing operations through lack of raw material than from losses through depreciation in price.

What becomes of the so-called profits in storing materials? From the point of view of the jobber

and supply house it is comparatively simple, because when a sale is made the profit can be absorbed into the profit and loss account; but what is the manufacturer going to do who may have to maintain a stock of 50,000 pounds of sheet copper as a minimum for his factory requirements? This may be inventoried one year at 30 cents per pound and a year later at 40 cents per pound. Such a condition has been quite possible in the recent strenuous times.

If fluctuations in market prices are allowed to control inventory prices, there is here an apparent profit of 10 cents per pound, equaling $5000. This, however, is far from being the case, unless during the interval between the inventories the price of all incoming copper had been at 30 cents, the price prevailing when the first inventory was taken. This is almost an impossible condition in a rapidly advancing market such as the change in price would indicate. What actually occurs is this: the copper in the stores when the first inventory was taken would be absorbed into the manufacturing costs at the price paid for it. All shipments of copper coming into the stores after the inventory would likewise be absorbed into the production costs at the price paid for it. Shipments might come in during the year at 32, 34, and 36 cents per pound and the stock still maintained at a uniform level of 50,000 pounds. There are then only the last receipts into the stores to be considered. Assuming that the price paid for the last 50,000 brought into the stores was 36 cents per pound and when the inventory was taken the market price was 40 cents, this would show a storage profit of 4 cents per pound or $2000.

Market Prices and Inventory Prices

The foregoing discussion brings to the front the subject of inventory prices, and there are many concerns whose customary methods are to adopt the market prices in compiling inventory values. This policy has all the elements of instability. "What goes up must come down" is a saying in the speculative world; and while the purchasing and storing of merchandise is usually far removed from speculation, still if there is any truth in the saying, then an inventory taken at the top of an unusual rise would be to a large extent fictitious and simply inflating the profits. The reverse would be the case after a severe downward movement of prices which would have a tendency to indicate losses not actually incurred.

It is possible that the variations in prices over a period of years would be so slight that the prevailing prices could be used each time an inventory was made up. When conditions are unusual it does not seem that ordinary methods are applicable. Then, what should the man do who is carrying a heavy stock of raw materials and merchandise, and prices are fluctuating abnormally? This is a problem for the manufacturer, wholesaler or retailer.

During recent years nearly all prices have advanced, and most of these advances have been maintained at a level which would justify one in regarding the high prices as normal. Why, then, cannot an inventory be made up at existing prices and the profit and loss account credited accordingly? Even if a decline is not imminent, even if the exceptional price level has every appearance of stability, still there must come ultimately an easing of prices if not a rapidly falling market.

The conservative man can only treat abnormal rises in prices in one way as far as his inventory is concerned. He should figure that he has but half completed the transaction and that it is better not to consider the increases as permanent profit. He should consider that he is temporarily custodian of this profit, a part of which may remain with him if his judgment has been sound and no adverse conditions arise.

Instead of crediting the advance to profit and loss account, it is better to keep a separate account of the "temporary profit." Should the high prices continue from one inventory to another until they become almost stable and normal, it may be permissible to consider part of the temporary profit as permanent profit, but a certain amount should be retained as a reserve against a decline that is inevitable.

Losses in Storing

Depreciation in prices is a factor already alluded to. Sound judgment in buying should reduce this to a minimum, but values will sometimes suffer from this cause, even when buying is done with the utmost discretion.

Physical deterioration is a factor which varies with the character of the material. For instance, highly perishable goods can scarcely be considered in connection with storing. They must be disposed of or consumed promptly. There are many so-called semi-perishable articles and materials composed of fabrics, paper, leather, rubber, etc., which are liable to deterioration, and some must have special protection. Even the harder metals are not improved by storing,

although they may not deteriorate. There are many materials which are liable to injury from abrasion and handling. Others may suffer from rust or weather conditions. While great care may be taken to prevent depreciation in values from these causes, there is always a more or less intangible loss from them in storing.

Sudden changes in fashions may render part of a retailer's stock a white elephant and entail a loss in disposing of it. For the manufacturer and wholesaler there is not so much danger, but new discoveries, processes, and developments may result in changes or improvements in a product which would render out of date or partially obsolete whatever stock might be on hand. The danger of this is naturally much greater in the case of manufactured articles than with raw materials. These evolutions, however, do not often come so suddenly that an alert buyer cannot protect himself.

The New Importance of Storage

Into every form of commercial activity which involves the retention for long or short periods of materials and supplies of any kind is penetrating the new importance of storing. It is, perhaps, unobtrusive, but none the less sure. It is not a new problem, but it has attained a new importance and is rapidly and forcefully compelling attention. This is largely due to more intensive methods of figuring costs and the desire for a better realization of these costs, in so far as they affect storage problems.

This brings into more prominent consideration the storage questions and forces decisions on a more

scientific basis, of whether to store or not to store. If one looks through the technical press or even the daily papers of recent times, plenty of evidence can be obtained of shortages of various goods and materials. This is not always owing to actual famine, but to hesitancy to store by some firms and a tendency to excessive storage by others. These conditions are caused by inability to properly solve the storage question. Mere price fluctuations do not create shortages except as they may be allowed to influence one's buying and storing policy. The question is deeper than just one of price, lack of labor, car shortages, embargoes, and other factors, but all these have brought storage problems more prominently to the front.

Indulging in Extremes

The storekeeper of a manufacturing establishment who is responsible for maintaining a sufficiency of raw materials may have become alarmed by tardy deliveries and if he is coöperating with a purchasing agent who is alarmed by rapidly rising prices a combination may be developed which illustrates one extreme. Reckless and unbalanced buying and storing may result, and all the economic losses these involve will be suffered.

The other extreme is represented by an indifferent or too complacent attitude on the part of the storekeeper and purchasing agent. As a consequence of this attitude many opportunities to replenish stocks are allowed to pass. In strenuous times greater watchfulness of the market and supervision of stocks is necessary or shortages will occur, and attempts

will be made to cover these by hurried purchases from warehouses at prices much higher than those prevailing for mill shipments.

Scientific Storing is Safe and Sane

Probably safe and sane storekeeping is more essential in a manufacturing establishment than in any other commercial activity. This is because of the imperative necessity of keeping the exact quantity of raw material on hand in advance of the production department's actual needs. Storage problems cannot be solved by chance or impulse; they are matters of calm deliberation and weighing of the advantages and disadvantages.

The storekeeper does not want to do too much worrying about price fluctuations. Scientific rules are possible for storeroom operations and for determining the maximum and minimum quantities to keep on hand. If the storekeeper does not maintain a rigid adherence to these rules the fundamental economic factors on which the rules are based are thrown to the winds.

The storekeeper has to consider and carefully weigh his storage costs in relation to his maximum and minimum quantities. To commence pondering whether certain price fluctuations warrant his increasing or decreasing his stock is dangerous because it may bias his judgment on purely storekeeping problems. It is better to let the purchasing agent deal with questions of price fluctuations and market conditions.

When the high and low limits have been definitely fixed is the proper time for other factors to be taken into consideration, but until they are fixed external

considerations should not be considered, because the limits are purely problems of internal management. It may become necessary at some time to consider the advisability of disregarding the safety limits set by the inexorable demands of the production department and the economic factors connected with good storage. This will be discussed in the next chapter, but when such occasions do arise it is because of purchasing problems. It is then that the storekeeper must be called into consultation and he must be prepared to demonstrate his storage costs and problems as an aid and assistance in arriving at a decision regarding the contemplated departure.

CHAPTER III

Economic Questions Connected With Storage (*Continued*)

The Time Element in Storage

TIME is the great enemy of goods in storage. Efforts are unceasingly made in all commercial transactions to keep costs at the lowest point, but time is adding to these costs every day and twenty-four hours a day for every article in the storeroom. Time is therefore one of the great storage problems. This is evidenced by the lower cost of goods which pass direct from the producer to the consumer without being subjected to any storage process.

There is but one way time can render a service of a favorable nature to goods in storage, and that is through a change in price which would increase the intrinsic value, but considerations of this character do not alter the influence which time has on the storage function.

Any active industrial establishment or supply house must maintain its stock of raw material and goods at a certain point which will insure a sufficiency to meet the demands of the business. Knowing the importance of this, knowing the imperative necessity of maintaining a supply, the general storekeeper could play safe and keep his stock at a point higher than absolutely necessary. No good storekeeper, how-

ever, would do this; he would carefully weigh the economic factors, which are continually adding to the cost, and the physical factors, which may be lowering the value of the goods under his charge. Having by scientific calculations determined the maximum amount to carry in stock, anything in excess of this entails expense and added cost, the burdens of which must be spread and distributed over all other goods in the stores.

Whenever a purchase is contemplated in excess of known storage requirements, the considerations mentioned compel close attention because they represent the storekeeper's bill of costs, and these costs must be set against the lower purchase or against the appreciation in price it is hoped to gain.

Psychology in Storing

A full warehouse and an abundance of goods induces extra efforts on the part of salesmen. For its psychological effect this is worth something. With a depleted stock the activities of salesmen are liable to slacken. The worker in a factory will also slacken his efforts if he sees very small quantities of raw material in front of him. This is a well-established fact, although the worker may be unconscious of it and no doubt many would deny it.

A record kept by an engineer in charge of large building operations showed a decrease of 30 per cent in the number of bricks laid per day when the supply had diminished to small proportions. With an abundance of material and with all supplies coming in freely the percentage immediately rose rapidly.

The income tax and other taxes real and threatened

have been known to affect the storing of materials and supplies. Some concerns have permitted the investment of part of their profits in raw materials where they may escape part of the taxation which would be levied if these profits appeared in the profit and loss or surplus account. There can, however, be only isolated instances where such a policy is advisable. To evade successfully a real or threatened tax the storage policy would be affected for an indefinite period, and when all the risks of such a course are taken into account it cannot be recommended.

Obsolete Materials

Crude raw material practically never becomes entirely obsolete. A manufacturing plant may discontinue the use of a certain raw material, but that renders it obsolete only so far as that particular establishment is concerned. It may still be in demand by many other concerns. Just as soon as any crude raw material goes through a manufacturing process the danger of its becoming obsolete increases. As some finished products go through many such processes, it follows that greater care must be exercised in such cases. To illustrate this, suppose a manufacturer is using brass sheets and suddenly decides to substitute aluminum sheets, the brass sheets could scarcely be considered obsolete if they were of standard gauge and size. If, however, the brass had been subjected to an additional manufacturing process and pressed or spun into special shapes, it might become entirely obsolete.

Obsolete material is dead material. It is worse than dead, because storage costs in connection with

it are a live factor and are continually mounting upwards. It is imperative, therefore, that all obsolete material be quickly disposed of. It is better, however, never to let obsolete material accumulate. If an infallible system could be devised for fixing maximum and minimum limits, it would obviate any danger of having in the stores surplus or obsolete material, but this is an impossibility. There is at some time in every storeroom obsolete material of some kind, and to prevent this a close study and constant watch must be kept of the maximum and minimum limits set for governing the quantity of each item in the storeroom.

What do "Maximum" and "Minimum" Mean

These terms in relation to goods in storage are important. They are, in fact, the most important features in storage problems. The correct determination of maximum and minimum quantities to be carried in stock is a science, and the storekeeper who can come nearest to accuracy in respect to the two factors will have attained an economic advantage of great value.

The needs of every business require a certain amount of raw materials, articles, goods, and supplies. For successful operation there must be sufficiency and there must not be lack. Every dollar's worth of goods carried in stock beyond the sufficiency point creates an expense beyond the needs of the business and to that extent decreases the profits. Insufficiency of raw materials and supplies endangers the smooth working of the whole establishment. A manufacturing plant closed down or compelled to temporarily

suspend the operations of its production department sustains severe losses, and a supply house unable to furnish from stock articles which it is supposed to carry suffers losses both tangible and intangible.

All of the preceding discussion has served to emphasize the importance of fixing accurate maximum and minimum limits and the question naturally arises as to the manner in which this can be done. There are a great many calculations to be made and there are many features and elements which influence the setting of these limits, and as these vary to some extent with every business, the final decision is individual, but the fundamental principles on which these decisions are based is the same in every case. The main features to be considered are as follows:

1. The needs of the business.
2. The minimum quantity which can be kept in the storeroom without endangering the suspension of factory operations, or in the case of a jobbing house the normal requirements of customers.
3. The available storage space.
4. The length of time required to obtain the material.
5. The quantity which can be purchased most economically.
6. The financial position of a concern may have some influence in certain cases.

For every item in every storeroom there is an exact quantity which is a safe minimum. Every time this is exceeded, rent, interest, insurance, and every other economic factor is working against the storeroom. If it were possible immediately to replace the quantity

taken from the storeroom with a fresh supply, an ideal condition would exist, and the only factor to be considered would be the minimum quantity one should carry. But this is an impossible condition and to provide a margin of safety a maximum quantity must be fixed.

Fixing the Minimum Limit

Perhaps the establishment of a minimum is not so important for a supply house as it is for a manufacturing plant, and perhaps the rules governing the minimum are not so rigid. The quantities sold in the past can be accurately determined and forecasts of sales for given periods should give close estimates of future demands. From these calculations a minimum can be established.

In all manufacturing industries there is a constantly increasing demand for economy in operation and reduction of costs. The fact is too often overlooked that the cost of a manufactured article does not begin when the workman starts operations, but the initial item of cost is the price paid for raw material. From that point the cost piles up in a succession of accretions which follow each other in regular rotation. Storage costs must take their proper place and be absorbed into the cost of the manufactured article. It is important, therefore, to keep these costs at the lowest possible point, and this can best be done by maintaining a minimum amount of stock in the storeroom. The production manager has to consider the output of his factory, whether this output is uniform throughout the year and whether any manufacturing changes are contemplated, which are likely

to make any change in the rate of output or change in the character of the material. Having determined these points in reference to all articles he is making, he can then compile a schedule of his raw material requirements. Each item in this schedule must be reviewed at periodic intervals. Failure to do this is frequently the cause of shortages or the accumulation of obsolete material.

The storekeeper being furnished with these schedules, it then becomes his duty to have always on hand the raw materials to supply the demands of the factory. For example, the production manager may specify his requirements of a certain material at 400 pounds per week. It then becomes the storekeeper's duty to determine the minimum amount he can keep in the stores to satisfy this demand.

For the economic reasons already given every calculation of the storekeeper must keep in view the maintenance of his stock at the lowest level consistent with safety. For every item in a storeroom there is an exact quantity which is a safe minimum. Every time this is exceeded the storage costs are working unduly against the manufacturing costs. Every time the quantity is lower than the exact minimum the danger is imminent of a factory shut down, with all the losses that entails.

Fixing the Maximum Limit

The maximum quantity must be flexible, to meet changing conditions. One of the most difficult situations to deal with is a growing scarcity of some commodity with the attendant uncertainty regarding time of delivery. There have been many instances

where a commodity could be procured with certainty in two weeks. A growing scarcity or congestion on the transportation lines extended this time to one month, and later to two, four, or even six months. And in such cases deliveries are very uncertain at best. A three months' promise of delivery may be a four months' performance. Such conditions can only be safely taken care of by liberally increasing the maximum limits to provide for all contingencies.

Flexibility in fixing the maximum quantity is also permissible in those cases where it is found more economical to buy in larger quantities. For example, a buyer may find that he can purchase 1000 units at a much lower price than 500, but he may be restricted to 500 if he is to keep within the maximum. It then becomes a question of balancing the advantage in price against the storage costs. If the decision is in favor of buying at the lower price the maximum must be increased. It is not always just a question of price only; sometimes it may be advantages in transportation and in payment of delivery charges which influence the decision.

Two maximum limits are used in the operation of some stores. The lower one represents the maximum amount of material which must be in the storeroom at any time, while the higher one represents the maximum amount requisitioned, but not delivered into storeroom. In these cases the lower limit is inflexible, but the higher limit can be made as flexible as necessary to meet delivery conditions. By way of example, we will assume the needs of a business require a stock of 50 tons of #16 gauge steel sheets 36″ × 96″ as a minimum, and owing to space conditions the

stock of this material must never exceed 75 tons. Here we have two inflexible limits, and it might be possible in normal times for the storekeeper to requisition and the purchasing agent to buy and procure delivery without breaking through the barriers set in either direction. But it is not always possible to do this, and a flexible maximum must be arranged.

The illustration given is a very simple one. In actual practice much more complicated problems arise even in normal times. Continuing the discussion of the example given, the flexible maximum must be fixed to meet the market conditions. Assuming that the difference between the limits, which in this case is 25 tons, represents one month's consumption, then the buyer always has this length of time to replenish the stock, but it may become impossible to procure deliveries regularly enough to maintain this, or the buyer may find he can purchase 200 tons at much more favorable prices. Thus it becomes necessary to determine a flexible or buyer's maximum. In such cases we have first the minimum limit set as the least amount which must be in the storeroom at any time. Next we have the limit set as the maximum amount to be in the storeroom, and thirdly we have the maximum amount which may be purchased. The difference between the second and third limit is set to give the purchasing agent freedom of action. He can use all the art of his profession within those limits. He can buy or not buy, but he must obtain delivery as and when storeroom conditions demand.

The storekeeper's calculations must be accurately made on the following points. He must figure the exact time required to receive, inspect, and store

each item, so that he may be able to specify on his requisition to the purchasing agent the exact date on which material must reach the establishment.

The fixing of minimum and maximum limits has been called scientific guessing, but economic reasons demand as much science and as little guessing as possible. Very close figures can be prepared for any storeroom. It has been shown that important factors control the establishment of a minimum and the flexibility essential in establishing the maximum is largely caused by the freedom of action necessary in buying.

Influence of Purchasing Problems on the Storeroom

Many purchasing problems are closely related to storing problems. In many cases they cannot be dissociated. Due consideration must be given by the party exercising one function to the problems of the other. The purchasing agent must keep the storekeeper advised of delivery conditions. The storekeeper has, therefore, on one hand a schedule of quantity requirements from the production manager and a shedule of time requirements from the purchasing agent.

Some items may be freely obtained at a few days' notice; others may take weeks, and others months. In all these instances changes are liable to occur, but the purchasing agent should sense the changes from market indications and give due notice to the storekeeper to enable him to prepare his requisitions a sufficient length of time ahead of actual needs to permit the purchasing function proper scope and to insure delivery at the specified date.

Theoretically these may look like comparatively easy problems, the solution of which should offer no difficulties, but in practice they are not so simple. Many of the calculations made do not materialize in the manner estimated. It is necessary, therefore, for the purchasing agent to consider the variations and how to overcome them. Assuming that he has entered into a contract for a staple material to be supplied in quantities of uniform amounts at regular intervals to conform to the storekeeper's minimum, still, he may suddenly find the regular supply stopped. Strikes, breakdowns, embargoes have played havoc with deliveries in recent strenuous times.

Such contingencies must be provided for and auxiliary sources of supply located and kept in view, so that the deficiency can be made good. If this shortage has to be supplied by purchases from local warehouses at a higher price than for mill shipments called for in the contract, then it is a question as to whether it is a more economical proposition to pay the higher price or raise the storekeeper's maximum limits. If goods are bought from warehouse and afterwards stored by the buyer, he is paying storage costs twice, that is, both the seller's and his own. Recourse to increasing the maximum adds to storage costs, but enables a larger stock to be carried to tide over temporary shortages.

Production Problems and the Storeroom

Some mention of these is necessary to emphasize their influence on the storeroom. An example has already been cited of production requirements, but that example contemplated a uniform demand on the

storeroom for a staple material. When manufacturing one article or machine, such as a typewriter, it is comparatively easy for the production manager to specify his needs both in respect to quantities and time, because he should know accurately his rate of production; but it is much more difficult and complicated when the output of a factory consists of many different types of machines, some of which may be called for and constructed at irregular intervals.

The production manager would naturally wish to be in a position to make promptly any of the various machines sold by his establishment. There are, however, many instances in which certain large machines may be built several times within a few weeks, and there may be an interval of some months when but very few are constructed. This condition of irregularity is difficult to meet as far as providing the raw material is concerned. The production manager must base his estimates very largely on information from the sales department. He has got to look far enough ahead but at the same time if he should specify requirements too far in advance and very few sales were effected in that period, the storeroom might get loaded up with a vast amount of slow-moving raw material.

The storekeeper can be of great assistance in such matters. He can give the production manager accurate figures as to the amount of space available for such material and he can also give him exact figures of the storage costs for that material per day, week or month. This is valuable information for a production manager, and of considerable help in the circumstances quoted.

CHAPTER IV

Specifications, Definitions, and Standardization

General Remarks

FOR every article in every storeroom there is a correct description. This description may consist of only two or three words and figures, or it may require a detailed technical specification to identify properly the material so that no misconception can possibly exist as to what is actually meant.

Failure to describe properly articles or to have standard methods of defining them leads to endless confusion in some storerooms, and entails much extra work and expense in referring requisitions back and forth to clear up moot points.

The matter has been engaging the serious attention of many large manufacturers, and illustrations will be given of the efforts made to solve the problem. Whatever is undertaken in this direction must be comprehensive; that is, it must apply equally to the storeroom, production department, purchasing department, and to the engineering or other interested departments. Every employee of a concern having anything to do with the material, articles, and supplies purchased and used should be compelled to conform to the standard methods of describing them.

The advantages of standardization are not confined to the particular establishment putting it into force, but it has a much wider and broader influence, for it has a favorable effect on the economics of business in general. The discussion on this point will be limited, because it is somewhat outside of storeroom economics, but it is desired to point out what far-reaching influence loose storeroom methods may have.

If a storekeeper draws up a requisition for materials or supplies and uses incorrect or inadequate descriptions, it is more than probable that these will be repeated by the purchasing agent in sending out his inquiries and orders. The recipients of these will come back with requests for information of a more exact and definite nature.

If reports were obtained from business houses an overwhelming majority would testify that their expenses are largely increased because of the conditions referred to. A vast amount of the time of salesmen and clerks is taken up investigating the inquiries and orders they receive in an endeavor to discover exactly what is required. This means many unnecessary telephone calls, much correspondence which could be avoided, and a great deal of salesmen's time wasted. The additional expense caused by these factors must be added to the cost of the goods and covered by the selling price; therefore the buyer must eventually pay them. The storekeeper has a large part to perform in reducing these expenses, and in accomplishing this he will reduce the cost of the goods under his charge.

To specify means to describe accurately, to be definite, to be explicit. With many small articles in

common use this accuracy can be expressed in the commercial terms in general use in the trade, but there are certain materials which need greater particularization and must be described in highly technical terms and probably some tests must be specified which the material is to undergo. This distinction segregates roughly all articles and materials into two classes, and they will therefore be discussed separately.

Technical Specifications

Under this heading are those descriptions of material which the engineering staff should draw up and which become the standard specifications for the raw material used in the factory. These specifications should be furnished to the storekeeper and purchasing agent. It may not be the duty of the storekeeper to see that the material under his charge conforms to these specifications, but he should have copies and inform himself regarding the characteristics of the material in his storeroom. These specifications may provide for certain physical tests or chemical analyses. If these are not carried out before the material reaches the storeroom, it may be the storekeeper's duty to have them made, and this phase of his work will be referred to in a subsequent chapter in discussing the operation of a storeroom.

The specifications themselves should be kept in folders properly indexed as indicated in Figure 2. In addition to this a numerical list of all specifications should be kept to enable any one of them to be found quickly, either by number or title. With some articles the engineering staff may furnish blue prints,

and these can be kept in a manner similar to the specifications.

Correct Commercial Definitions

These definitions are those which apply to articles in general use and for which there are well-recognized trade names and descriptions. Many storerooms carry

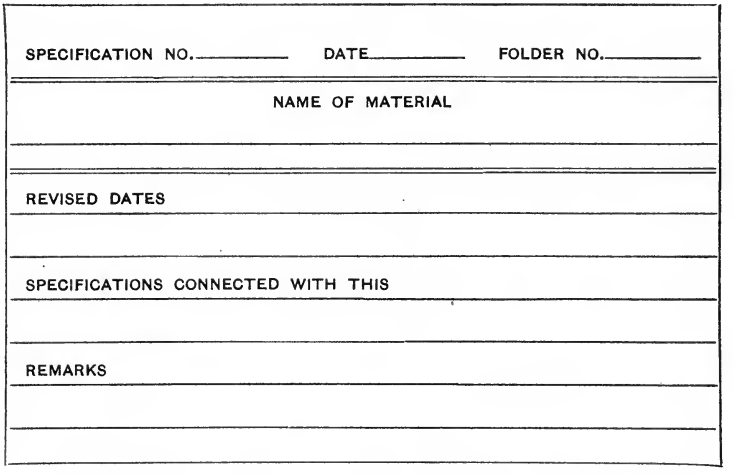


FIGURE No. 2. — Index card for specifications. Size 3 × 5.

no other goods and every storeroom has some of them. Comprising, therefore, a very large proportion of the stock in storerooms, it is essential that they be properly described and designated.

The correct definition does not only mean getting the right name; it also means specifying the quantity, size, and weight correctly. In those establishments where standard definitions are not enforced it is a common occurrence to see one man name the length first and the width next, while another will reverse this. Again, one man will give the name of the ar-

ticle first, followed by quantity, size, or weight, while another will give the quantity or weight before naming the article. The variations are so many and lead to so much confusion in some establishments that it has been found imperative to compel the use of proper definitions.

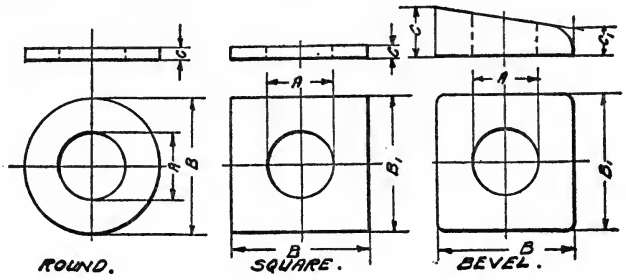
The storeroom is probably more interested in this matter than any other department, because it is the medium through which the material and articles are distributed, and because it has to use the names more frequently than other departments. The storeroom employees come into physical contact with the goods, whereas to the cost department and purchasing department employees the mention of them carries no more meaning than just a name. The storeroom usually draws more requisitions than any other section of an organization, and as already pointed out it is necessary for these requisitions to be correctly written up.

There have been a great many attempts to standardize the materials used in manufacturing plants. Probably all factories make some efforts in this direction. But very little has been done towards standardizing the *use of proper definitions*. The purpose of enforcing the use of these is:

1. To secure uniformity in naming and defining all materials, articles, and supplies.
2. To avoid confusion and misunderstanding.
3. To familiarize employees with the material used in making the product of a factory and with the supplies used and consumed.
4. To reduce the variety of materials.
5. To reduce the variety of supplies.

Illustrations of Definitions

In figures 3 to 7 are given several illustrations of sheets of definitions which have proven very success-



WASHERS

DEFINITION:

The term "Washer" shall be understood as indicating a thin part or piece with a hole in it. The part and hole are usually round in form although both or either may be rectangular or some irregular shape.

The term "Washer" shall not be applied to a thin part or piece that does not have a hole in it. Such parts shall be known as "Disks" or "Plates" depending upon their shape, and **no part shall be known as a washer where the thickness is greater than the diameter of the hole or inside diameter of the part.** Such parts shall be known as Bushings, Collars, etc. which are properly described under their several headings.

Several forms of washers are shown above, also the general method of dimensioning that should be followed on all drawings.

Washers are used for many purposes, such as taking up space, to insure a better bearing for bolt head or nut, insulation, etc. If made of a yielding material, they may be used to make a tight joint between bolt, nut and part it is in contact with.

They are made in an endless variety of forms and from many classes of material.

In specifying plain round washers, not standard, the dimensions should be given in the following order, viz., Inside Diameter, Outside Diameter, Thickness and Material.

In specifying "Narrow Gauge" standard washers, state diameter of bolt used on, material and state "Narrow Gauge."

For dimensions of U. S. standard and standard narrow gauge round iron washers, see table "Dimensions of Standard Wrought Iron Washers" **#5209** Data Class.

For list of iron washers giving Part Numbers see **#1128** Table Class.

For dimensions of standard round brass and copper washers, see table "Dimensions of Standard Brass and Copper Washers" **#5211** Data Class.

The term "Standard" when applied to brass and copper washers refers only to the Otis Elevator Company's Standard as there are no commercial standard brass and copper washers.

For list of brass and copper washers giving Part Numbers see **#1127 #1129** and **#1201,** Table Class.

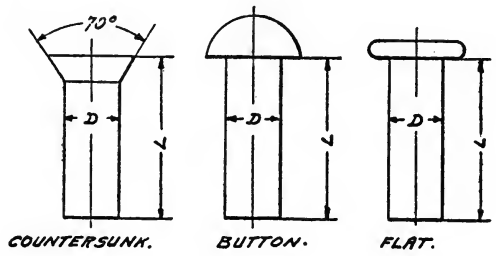
In specifying rectangular washers, the dimensions should be given in the following order, viz., Diameter of Hole, Thickness, Width and Length.

SPECIFICATIONS FOR PURCHASE ORDERS AND STOCK LEDGER SHEETS.

Quantity, Bolt Diameter, Standard Iron Cut Washers.
Example: 20 lbs. (approximately 500) ½" standard iron cut washers, or
25 lbs. (approximately 500) ½" standard iron cut washers, "Narrow Gauge."

FIGURE No. 3 — Standard definition for washers.

ful and of great benefit in securing the objects outlined. In all establishments of sufficient magnitude



IRON RIVETS

DEFINITION:

A rivet is a pin for holding two or more plates or pieces together. A head is usually formed on one end when the rivet is made; the other end is upset, or headed, after rivet is put in place, and draws the riveted members close together.

Iron rivets are made with many different style heads. **Requirements are to be confined to countersunk and button heads** wherever possible.

For length of rivet before forming head, see table "Rivet Lengths for Forming Round and Countersunk Heads" #5210 Data Class. For list of iron rivets giving Part Numbers, see #1178 Table Class.

The included angle of head of countersunk head rivet is 70 degrees.

The material used in the manufacture of "iron rivets" is Extra Soft Steel and must have a tensile strength of not less than 50000 pounds per square inch.

SPECIFICATIONS FOR PURCHASE ORDERS AND STOCK LEDGER SHEETS.

Pounds (Approximate number of rivets) Diam. x Length { Countersunk / Button / Flat } Head Iron Rivets.

Example: 200 lbs. (approximately 2000) $\frac{1}{2}$" x 2$\frac{1}{2}$" button head iron rivets.

Note:—For number of iron rivets in 100 lbs. see table on page #2.

SPECIFICATIONS FOR STOCK OR SHOP LISTS AND REQUISITIONS.

Quantity, Diam. x Length { Countersunk / Button / Flat } Head Iron Rivets.

Example: 25—$\frac{1}{2}$" x 2$\frac{1}{2}$" countersunk head iron rivets.

SPECIFICATIONS FOR DRAWINGS AND ENGINEERING PART LISTS.

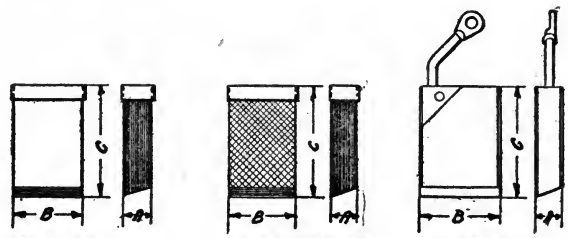
Quantity, Diam. x Length { Countersunk / Button / Flat } Head Iron Rivets, Part Number.

Example: 25—$\frac{1}{2}$" x 2$\frac{1}{2}$" countersunk head iron rivets, Part No. 7895.

FIGURE No. 4 — Standard definition for rivets.

some similar scheme should be in force. There are certain points in connection with the illustration which

need some explanation, although their general import can be readily comprehended by a careful perusal.



BRUSHES

DEFINITION:

The term "Brush" shall be understood as indicating an electrical conductor bearing against a surface for the purpose of maintaining a continuous electrical sliding contact between the same. There must be relative motion between the brush and surface such that the said parts slide over each other in normal operation, but this contact must be maintained when such motion ceases.

They are made in an endless variety of forms, and from a variety of materials.

The material will be generally understood as being carbon or graphite, or a combination of both, either with or without a given percentage of metal, depending upon the specifications.

Several forms of brushes are shown above, also the method of dimensioning that should be followed on all drawings.

When specifying brushes, they must always be specified per O. E. Grade numbers as shown on **#433-B** Data Class and **#973-B** Specifications.

When ordering brushes, reference must always be made to a drawing or sketch.

SPECIFICATIONS FOR PURCHASE ORDERS AND STOCK LEDGER SHEETS.

Be guided by drawings and specifications when making Purchase Orders and Stock Ledger Sheets, using in addition to description, the Part Number.

SPECIFICATIONS FOR STOCK OR SHOP LISTS AND REQUISITIONS.

Be guided by drawings and specifications when making Stock or Shop Lists and Requisitions, using in addition to description, the Part Number.

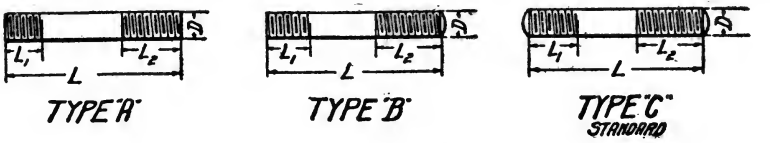
SPECIFICATIONS FOR DRAWINGS AND ENGINEERING PART LISTS.

Quantity, Name of Part, Class, O. E. Grade Number, Part Number, Drawing Number.
Example: 25 motor brushes complete, class #10, O. E. grade #7, Part No. 12340, No. 5047 E. D.

FIGURE No. 5 — Method of defining carbon brushes.

Figures 3, 4, and 5 illustrate the method of defining well-known small articles. They indicate how these should be specified on the storerooms perpetual inventory or ledger sheets, which should in all cases

correspond with the specification on the storeroom requisitions and on the purchasing agent's orders. It will be noticed that when specified on drawings



STUDS—STEEL AND IRON

Part Number	D	L	L_1	L_2	Type	Material	Remarks
12162	½″	1 7/16″	½″	—	A	C. R. S.	#C-93 SW
80806	7/16″	1½″	7/16″	7/16″	A	C. R. S.	#1696 E. D.
85237	7/16″	1½″	Full length		C	C. R. S.	#83 MA. (#10-32 Die)
89760	7/16″	4 7/16″	½″	½″	C	C. R. S.	#94 MA. (#10-32 Die)
89467	7/16″	1 7/16″	½″	½″	B	C. R. S.	#194 SW. (#12-24 Die)
801867	.242″	1½″	7/16″	½″	A	W. I.	#559 E. D. (#14-20 Die)
801042	.242″	1½″	7/16″	½″	A	C. R. S.	#2095-A E. D. (#14-20 Die)
801037	.242″	2½″	½″	½″	C	C. R. S.	Part List 1485. (#14-20 Die)
80807	.242″	2½″	Full length		C	C. R. S.	#2427-B E. D. (#14-20 Die). Weight rod
801038	.242″	3″	½″	½″	C	C. R. S.	Part List 1485. (#14-20 Die)
801416	.242″	3 13/16″	½″	½″	A	C. R. S.	#436 SW. (#14-20 Die)
800127	.242″	4″	½″	—	C	C. R. S.	Part List A-54-CR. (#14-20 Die)
80808	.242″	4″	Full length		A	C. R. S.	#1253-B E. D. (#14-20 Die)
800369	.242″	5½″	½″	½″	A	C. R. S.	#97 MA. (#14-20 Die)
87125	½″	½″	½″	—	A	C. R. S.	#2873-B E. D.
802290	½″	1½″	½″	—	A	C. R. S.	#2385-B E. D. (#14-20 Die)
286	½″	2″	½″	—	B	C. R. S.	#B-126 CR Special, one end slotted
80809	½″	2″	½″	1½″	A	C. R. S.	#2314 E. D. Special, see drawing
80810	½″	2½″	½″	½″	C	C. R. S.	#3253 E. D.
84548	½″	2½″	½″	½″	C	C. R. S.	#B-225 N. Special, copper plated
801322	½″	3½″	½″	½″	—	C. R. S.	#418 SW. (#14-20 Die)
80811	½″	4″	7/16″	1″	B	C. R. S.	#1619 E. D.
801040	7/16″	1½″	7/16″	1″	A	C. R. S.	#2135-A E. D. (#16-20 Die)
802291	7/16″	2″	1 7/16″	—	C	M. S.	#106 SW
802292	7/16″	2″	1 7/16″	—	C	M. S.	#106 SW. Special, sherardized
80812	7/16″	2½″	½″	½″	C	C. R. S.	#3129 E. D.
80813	7/16″	2½″	½″	½″	A	C. R. S.	#3128 E. D. Obsolete, use #89437
89437	7/16″	2½″	½″	½″	C	C. R. S.	#93 MA
89603	7/16″	2½″	½″	½″	C	C. R. S.	Part List A-65 SW. (#18-18 Die)
80814	7/16″	3″	Full length		A	C. R. S.	#3827 E. D.
89438	7/16″	3½″	½″	½″	C	C. R. S.	#93 MA
80815	7/16″	5″	7/16″	2″	C	C. R. S.	#3399 E. D. (#18-18 Die)
801790	½″	13/16″	7/16″	—	A	C. R. S.	#4526 E. D.
801704	½″	1½″	½″	—	A	C. R. S.	#4561 E. D.
801705	½″	1½″	½″	—	C	C. R. S.	#10737 Sketch
801839	½″	1½″	7/16″	—	A	W. I.	#3523-A E. D. Special, one end drilled for cotter pin
84849	½″	2″	½″	—	A	C. R. S.	#4030 E. D. Special, one end drilled
801732	½″	2 7/16″	½″	1″	C	C. R. S.	#74 SW
801437	½″	2½″	½″	1″	C	M. S.	Part List 1962.
80817	½″	2½″	1 7/16″	1 7/16″	C	Forged Steel	#109 SW Special, sherardized, one end drilled for cotter pin
12039	½″	2½″	1½″	1½″	A	C. R. S.	#B-5 CR
80816	½″	2½″	1 7/16″	1 7/16″	C	Forged Steel	#109 SW Special, one end drilled for cotter pin
18977	½″	2 7/16″	½″	—	A	C. R. S.	#593-A E. D. Special, one end drilled for cotter pin. M.O.S.
80818	½″	2½″	Full length		C	C. R. S.	#4382-B E. D.
80819	½″	2½″	½″	½″	C	M. S.	#3326-A E. D.
18978	½″	2½″	½″	—	A	C. R. S.	#1725-A E. D. Special, one end drilled for cotter pin. M.O.S.
80820	½″	2½″	½″	1 7/16″	C	C. R. S.	#109 Duplex motor
800909	½″	2½″	1″	—	B	C. R. S.	#3596 E. D.
87231	½″	3½″	½″	1 7/16″	C	C. R. S.	Part List A-87 SW
80821	½″	3½″	½″	½″	C	C. R. S.	#3326-B E. D.
89607	½″	3½″	13/16″	1½″	C	C. R. S.	Part List 108 SW
80822	½″	3½″	½″	½″	C	C. R. S.	#3119 E. D.
87141	½″	3½″	1 7/16″	1 7/16″	C	C. R. S.	Part List B-66 SW

FIGURE No. 6 — Method of tabulating part numbers.

DEFINITION OF PARTS

above definition that is less than 12″ long shall be known as a "Connector." In the case of large cables the smaller insulated cables may be twisted together forming one large cable and then be further insulated by an additional wrapping.
The term cable should not be applied to hoisting ropes, governor ropes, etc., these will be defined under their proper headings.

Specification should state: Quantity, Size, Name of Part, Material, Part Number.

Example: 1—#261-32 cable, Copper, Part No. 8798.
1—#520-36 cable, Copper, Part No. 8897.

CAGE—A skeleton frame to limit the motion of a loose piece or loose pieces, as ball cages, valve cage, etc.
Apply a prefix to the term indicating function.

Specification should state: Quantity, Name of Part, Material, Part Number.

Example: 4—thrust bearing ball cages, Brass, Part No. 7807.
1—5½″ valve cage, Bronze, Part No. 2073.

CALK—This term will be understood as indicating an operation to tighten a joint formed by overlapping metal plates, or similar parts, by driving the edge of one plate hard down on or into the surface of the other with a tool called a "Calking Iron."

CAM—A rotating or sliding piece of any precise shape, or a projection of definite shape, as on a wheel, either for imparting desired particular movement to a roller moving against its edge, to a pin free to move in a groove on its face, etc., or for receiving motion from such a roller, pin, etc.
Apply a prefix to the term indicating location.

Specification should state: Quantity, Name of Part, Material, Part Number.

Example: 3—limit switch cams, C. I., Part No. 3724.
1—rheostat cam, C. I., Part No. 8737.
4—switch arm cams, Brass, Part No. 3235.

CAP—This term will be understood as indicating the detachable portion of a shaft bearing or a box, when used as a receptacle for a stationary pin, shaft, etc., either directly or through an intermediate lining.
Apply a prefix to the term indicating function.

Specification should state: Quantity, Name of Part, Material, Part Number.

Example: 1—drum shaft bearing, cap, C. I., Part No. 8888.
1—back gear stand cap, C. I., Part No. 9979.
2—vibrator shaft box caps, C. I., Part No. 3797.
2—brake frame caps, C. I., Part No. 2155.

CAPSTAN—A vertical cleated drum or cylinder revolving on an upright spindle, with pawls at the foot of the drum, and surmounted by a drumhead with sockets for bars or levers. It is much used for moving or raising heavy weights, or exerting great power by traction upon a rope or cable passing around the drum. It may be operated by steam or electric power, or by means of capstan bars pushed by hand.
A capstan is distinguished from a windlass in that a windlass turns on a horizontal axis.

CAR—This term will be understood as indicating that enclosed part of an elevator apparatus in which the passengers or freight are placed.
If the part is not enclosed it will be termed a "Platform."

CARRIER—A device that carries or drives, as the traveling part of a mechanism or system directly supporting something conveyed from one place to another. This term must not be applied to a single part, but is to be used to indicate a complete apparatus, as a releasing carrier, etc.
Apply a prefix to the term indicating function.

Specification should state: Quantity, Name of Part, Part Number.

Example: 3—releasing carriers, Part No. 673.

CASE—A part used as an enclosure or protecti parts. See also "Housing."
Apply a prefix to the term, indicating locatio

Specification should state: Quantity, Name Part Number.

Example: 1—worm gear case, C. I., Part Nc
1—brake magnet case, C. I., Part
1—stop motion case, C. I., Part N

CATCH—A part used to check, retard, stop or ho parts either permanently or for a predetermin The term catch should be used with discre wherever possible.
Apply a prefix to the term indicating function.

Specification should state: Quantity, Name Part Number.

Example: 1—contact arm catch, Brass, Par
1—weight lever catch, C. I., Part
1—magnet armature catch, C. I.,

CENTER—This term has been erroneously used cate a detachable hub for wheels, gears, sheav The use of this term must be avoided in the f the term "Hub."

CHAIN—This term will be understood as i links or rings, connected or fitted into or various purposes, as a support, restrain, or of mechanical power, etc. Chains are also weight." Chains are made in many forms ar
Apply a prefix to the term, indicating type o

Specification should state: Quantity, Size Material, Part Number.

Example: 20 ft. #10 Diamond sprocket chain, S
30 ft. ¼″ bicycle chain, Steel, Part
40 ft. ¼″ open link chain, W. I., Par
20 ft. ¾″ sash chain, Brass, Part N

CHAIR—A block or plate used for supporting a time securing it to another part.
Avoid the use of this term, using instead Catch, Clamp, etc., depending upon conditi of Bracket, Catch, Clamp, Etc.

CHANNEL—This term will be understood a rolled iron, steel, brass, etc., having a gutter

Specification should state: Quantity, Siz Material, Part Number.

Example: 3—pcs. 8″ x 11½# channel, Ste
5—pcs. 6″ x 8# channel, Steel, P
Or it may be written:—
3—pcs. 8″ x 11½# [s Steel, Part N
5—pcs. 6″ x 8# [s Steel, Part No

CHECK NUT—A nut screwed down hard on a from slacking back. This part is sometimes a "Jam Nut." For further information concer and method of specifying, see #5036 Data Cl For dimensions of standard check nuts see #5 For list of standard check nuts giving Part and #1194 Table Class.

CHEST—This term will be understood as indica tacle or box, usually for holding gas, steam, l steam chest for an engine, or water chest for h
Apply a prefix to the term indicating functio

Specification should state: Quantity, Name Part Number.

Example: 1—5″ x 5″ water chest, C. I., Part
1—8″ x 10″ engine steam chest, C.

FIGURE No. 7 — Method of defining terms used in connection with parts of apparatus. This information is valuable to non-technical men.

and engineering part lists the "Part number" should be given. This is a detail which it is not necessary to specify on a purchase order because it would have no meaning to the recipient of the order. It is information solely for the members of the organization and enables them to identify the article with the part number.

Figure 6 shows in what manner the part numbers are tabulated. The purpose of this table is clear and needs no explanation.

Figure 7 indicates the use of the various parts. This sheet gives very valuable and very interesting information. It enables all employees to acquaint themselves with the purpose of the many articles used in constructing and assembling the product of a factory. In this respect it is a liberal education.

The sheets illustrated in Figures 3 to 7 should be distributed to all members of an organization whose duties require them to name or specify any material, and should be kept in handy binders for ready reference. The purpose which the sheets are intended to serve will, however, be defeated if they are not used. This is the one defect of this system. They are apt to be treated as books of reference for use when in doubt, and too often are not referred to at all, with the result that many mistakes are made. In spite of this they are eminently successful and a rigid enforcement of their use would make them completely so.

What the Storeroom can do in Standardizing Definitions

The discussion in this chapter has been confined to schemes and efforts which are general in their nature;

that is, they are for use throughout the establishment and are not of storeroom origin. But there are many organizations which are not of sufficient magnitude to adopt such an elaborate scheme and perhaps do not care to incur the expense which it entails. Nevertheless, their need is just as insistent as that of the larger concerns. It is in such instances as this that the storeroom can render inestimable service. It can do it to better effect than any other department, because it is the medium through which the articles pass and it has both the acquaintance with the physical properties of the article by daily contact and the acquaintance with its description through the daily clerical work of recording and stores bookkeeping. Large results can be accomplished by the storeroom if the problem is approached in the right manner and grappled with in a systematic way.

It is not contended that the storekeeper should define what material should be used in production work. That phase of manufacturing must be left to the technical staff. It has probably been adopted after exhaustive and extensive experiments have determined its suitability, and this work cannot be rendered nugatory by a non-technical man. What it is suggested the storekeeper's activities should cover is the proper description and ordination of the innumerable small articles which form a composite part of the product of the factory.

But in connection with all supplies and small tools the storekeeper's activities may take on a wider scope. In many establishments it may be wise to let him have the deciding voice in selecting such things as waste, brooms, brushes, all kinds of packing materials, etc.

If he is a man of the right caliber, with common sense and discrimination, he can keep the varieties of these used around the plant at the minimum. It, too, frequently happens that personal likes and dislikes are allowed to influence the use of these articles, with the result that entirely too many come into use when there is no controlling hand. Many instances have come to the writer's attention in which storerooms were carrying many styles of brooms and several varieties of waste in excess of actual needs. The storekeeper has these things lined up alongside each other in his racks and bins, and it should become apparent to him before it does to any one else that the number can be reduced.

Obtaining Proper Definitions and Method of Using Them

It is not assumed that a storekeeper could from memory give the correct definition of every article under his charge. In some establishments these may run into thousands; but he can obtain them, and it is not the stupendous task that the number would seem to indicate. Much information can be obtained from catalogues, but this source should be used to collect general information regarding an article, that is, the number of sizes in which it is made, the different styles, etc., rather than to secure the correct definition.

It is necessary to approach the manufacturers and get their technical staff to specify correctly many new items and quite often some of the old ones. There is an extensive movement among manufacturers of many products to standardize the specifications of their output. When the correct definition has been

obtained a permanent record should be made of it in the manner indicated in Figure 8. By adopting this course the whole range of articles in the storeroom can be covered within a reasonable time and without disturbance of the routine work. If it is found necessary, in very large storerooms, a man can be designated to standardize definitions and devote his whole time to it until completed.

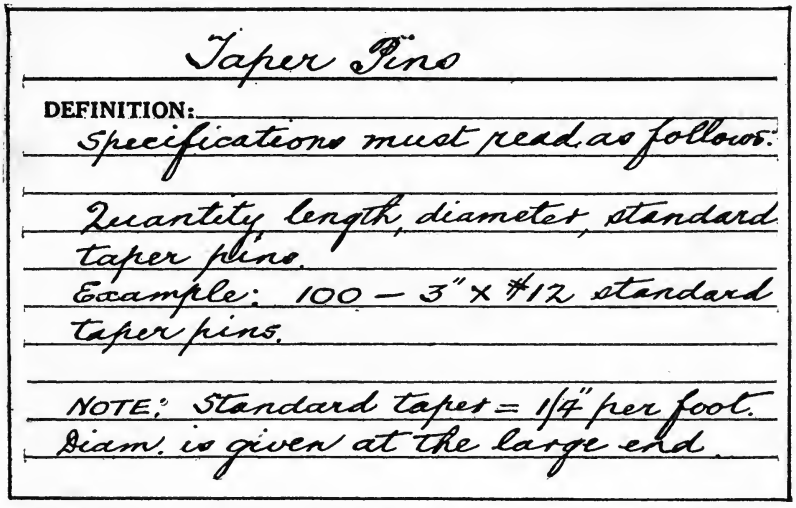
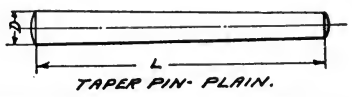


FIGURE No. 8 — Card for recording standard definitions. Size 4 × 6 inches.

If separate cards are not kept on which the definitions can be recorded they can be specified on the perpetual inventory cards or sheets, as shown in Figure 9. Constant visualization of these definitions in their proper form ultimately compels the use of them. There is one great advantage in this scheme in that the definition is always in view of the person writing up a requisition for additional material and renders it almost impossible to use incorrect descriptions. The preceding discussion covers some



SPECIFICATIONS MUST ALWAYS READ AS FOLLOWS:

	QUANTITY	LENGTH	DIAM.	STANDARD TAPER PINS
EXAMPLE:	400	3″	#10	" " "

NOTE: STANDARD TAPER = $\frac{1}{4}$″ PER FOOT.

ORDERED			RECEIVED			DELIVERED			BALANCE VERIFIED
DATE	ORDER NO.	QUANTITY	DATE	ORDER NO.	QUANTITY	DATE	REQ. NO.	QUANTITY	

FIGURE NO. 9. — Perpetual inventory card or sheet showing method of recording standard definitions.

of the main features of a storekeeper's activities through which he can render signal and valuable service. There are inevitably many minor details which would suggest themselves to an intelligent and resourceful man. The stores department is between the buyer and the user, and in this position it can be of material assistance in coördinating the activities of the purchasing and production departments. In manufacturing establishments it is not an easy matter to get all foremen to specify correctly each article when they make requisitions to draw material from the stores. Very considerable improvement could be effected over the conditions existing in many plants. Even if requisitions come into the stores with incorrect or inadequate definitions, the stores department should not repeat these delinquencies in writing up the requisitions, which go to the purchasing department.

CHAPTER V

Location and Equipment of Storeroom

Location

INDIVIDUAL circumstances will largely govern the amount of space necessary, and space requirements will frequently determine the location. At one time it was considered necessary for supply houses handling similar lines of goods to concentrate in close proximity to each other and the practice is still very largely followed. But this theory is losing adherents, because of the improvement in transportation facilities and to some extent because of the success achieved by the large terminal warehouses, which are being used as receiving and distributing points for many classes of goods. It is apparent that these must show economic advantages over warehouses located in a congested section of a city.

Better transportation facilities are also largely responsible for the changed conditions in municipal storing. This and the better equipment now obtainable have had their influence in effecting the improvements which have taken place. In some large cities it has been found practicable to reduce the number of stores fifty per cent. In these cases it has effected considerable saving in the amount of help necessary to operate the stores, reducing this item of expense nearly to the same extent as the reduction in the number of storerooms.

The problems connected with the location of storerooms in manufacturing plants are multitudinous, and the solution of them involves consideration of many features which are not met with elsewhere. Well-selected locations will save much physical effort and be a help in keeping down costs, which is the great desideratum in manufacturing operations.

No set rules can be laid down, because the conditions prevailing in establishments vary greatly and each one needs very close study. It may seem fit from the result of these studies to have one central storeroom furnishing to each department its supplies by means of conveyors or transveyors. In other cases it may be decided to have separate storerooms in each department, with some form of centralized control. The facilities which exist to-day for transporting goods between departments have modified the ideas which at one time prevailed regarding storeroom locations. These facilities will be discussed later on in this chapter.

Proportion

In any manufacturing establishment the apportionment of space for storage purposes is a matter of some importance. The ideal condition would be to have no vacant storage space and at the same time to have no congestion or overcrowding.

This condition is almost impossible of realization, but every effort should be made to get as near as possible to it. Vacant storage space is a dead loss, but nearly every storeroom has some when stocks are at the minimum point. Considerable improvement has been effected by the flexibility of the equipment which

is now obtainable. A description of this will be taken up later in this chapter. The reverse of excessive space is a too limited area. This means congestion and is perhaps worse from an economic viewpoint. It frequently means handling goods more often than should be the case, entailing not only extra expense but liability to damage, errors in counting and checking, loss of time in making deliveries, etc.

FIGURE NO. 10
Showing method of lettering and numbering aisles.

Equipment

Nothing is more conducive to economical and efficient storage than proper equipment. This is fixed and movable in character and some types of each kind will be dealt with in detail. It would be manifestly impossible to cover everything required for storing all kinds of material; the discussion, therefore, will be confined to such equipment as is needed for a general line of supplies and raw material.

Generally speaking, too little attention is paid to

the proper housing and arrangement of stores. In the majority of industrial plants large sums are constantly being expended in developing and perfecting machinery and tools for obtaining quicker and better results in the shop. Some establishments will be prodigal in this respect, but a niggardly policy will prevail in stores equipment resulting in loosely kept and poorly arranged stores. Damage, deterioration, and disorder follow, while the untidy appearance causes slackness and low efficiency.

FIGURE No. 11

Illustrates the arrangement of various sizes of compartments from the same size units. The first assembly is arranged with fronts for bins, while the second shows plain shelves fitted with tote boxes.

Bins and Shelving

Practically every storeroom needs some kind of racks, bins, and shelving. These are just as essential as correspondence files in an office. It would not be deemed possible to operate a bank without proper receptacles for the different forms of money, or to run an office without a system for taking care of its

records, so that they are quickly available for reference. Without these, banks and offices would be working in confusion. Yet, frequently unnoticed, many storerooms are working in confusion, because of lack of the right equipment. It has been emphasized that everything in storage is wealth, and every storekeeper should consider his stock in the same manner as he would if it consisted of pennies, nickels, and dimes.

FIGURE No. 12

An excellent type of bin extending full height of room if necessary, with lower part arranged for larger and heavier goods.

If the value of every foot of storage space were determined on the lines laid down in Chapter Two, the great advantage of flexible steel equipment would be apparent. With this it is possible to do almost anything in the way of extending or contracting the receptacles formed by them. If, for instance, several sizes of rivets are being carried and it is desired to discontinue one size or add one, either change can be made without disturbing the proper sequence of sizes and usually without much disturbance to the existing stock.

Steel equipment can be had in many forms, and a

description of some of them will be given. The reader is referred to the illustrations shown throughout this chapter for further details and for the purposes for which they are used. In some stores it may be necessary to use lockers for small and valuable

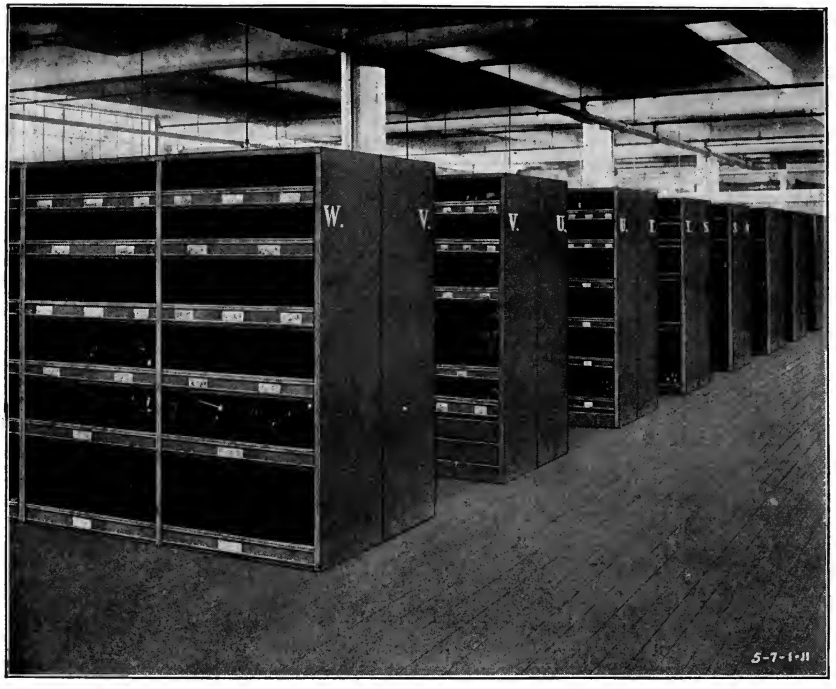


FIGURE No. 13

Showing assemblies of a lower type arranged so as not to obstruct the light.

articles and in some instances special construction of bins may be required, but as a rule most of the material kept in bins or racks can be stored in one of three types. These are known as the closed type, open type, or rack type of receptacle.

Any of these types can be secured in the unit system

of construction, which permits of great flexibility. That is, the unit can be extended or contracted at will, within the limits of the adjustment spaces. These are arranged every three inches vertically and approximately every six inches horizontally. The partitions or dividers provide for the greatest economy

FIGURE No. 14

Showing wide aisle to permit drawing long articles from bins and also the passage of large trucks.

of available storage space. It is computed that the use of these effects a saving in storage space of 30 per cent over the ordinary type of wooden bins and shelving. Further advantages are secured by the simplicity of construction, which makes erection so easy that any handy man, with only a screw driver,

can assemble and erect them, or make such changes as may be desired or caused by variations in stock. There are many other advantageous points, and one which may be mentioned is the additional protection from fire over the wooden construction. Even if the building itself is of fire-proof construction and is equipped with wooden bins and shelving, the risk is much greater than if these were steel.

FIGURE No. 15

An illustration of the flexibility in arranging the sizes of bins. These are much larger than others shown to take care of castings.

The Closed Type of Bins

This type is made up in the following manner. The flat steel backs extend the full height and full length of assemblies. These backs act as dividing walls when it is a double-face assembly. The uprights are attached to the backs at right angles with stove bolts. There are flanges on the uprights punched with holes to correspond with holes in the backs, so all that is necessary is to insert and tighten up the bolts. Both the uprights and backs are punched for the attachment of shelving. The shelving is then connected with the uprights and backs with stove

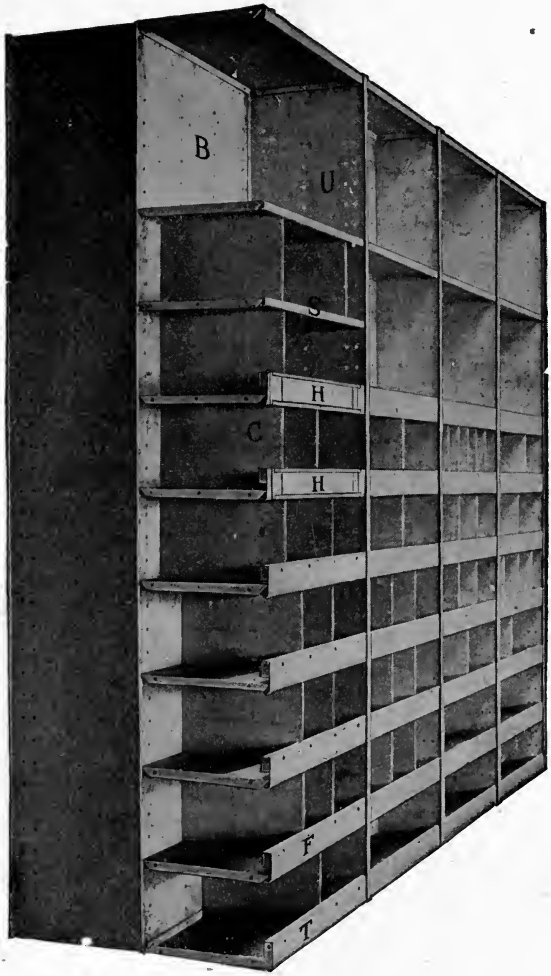


FIGURE No. 16

Showing details of construction of closed type of bins.

bolts. This method of construction distributes the load on the shelves between the uprights and the back.

After erection, as described in the last paragraph, we have shelving inclosed on three sides and spaced practically any distance apart within a range of three inches. These shelves can be promptly converted into bins by simply attaching a bin front in connection with the front face of the shelves. This arrangement permits part of an assembly to be used as bins while part can remain as shelves.

FIGURE No. 17

These are plain shelves; if the back was omitted, the assembly would be what is known as "open shelving." Note the weights which can be carried.

It will be observed from the description given that this form of construction provides absolute rigidity, as the bin fronts and shelves are bolted to the frames, but at the same time does not prevent shelves being converted into bins, or bins into shelves. Neither does it prevent the spacing adjustment of shelves and dividers that may be necessary to accommodate the receptacles to the changes in bulk of the contents.

Open Shelving

The term "open shelving" is used to designate the type of construction which has no backs to the shelves,

enabling the helpers to take material from either side of the assembly.

The shelf is formed from one piece of sheet steel with edges turned on all four sides. The front face of each shelf is attached to the upright with four bolts.

FIGURE No. 18

When fronts are attached to the shelves they are converted into bins. This assembly is carrying more than 15,000 pounds. The two shelves without fronts are carrying 200 pounds per square foot.

This method of fastening provides for any lateral thrust, as it acts as a knee brace. Each shelf being attached in this way makes the entire assembly absolutely rigid. The uprights are formed from one piece of sheet steel, having the front face punched with

holes, permitting a three-inch range of adjustment. Both faces of the shelves are alike, and the system of fastening these to the uprights and the design of the assembly makes it self-anchoring.

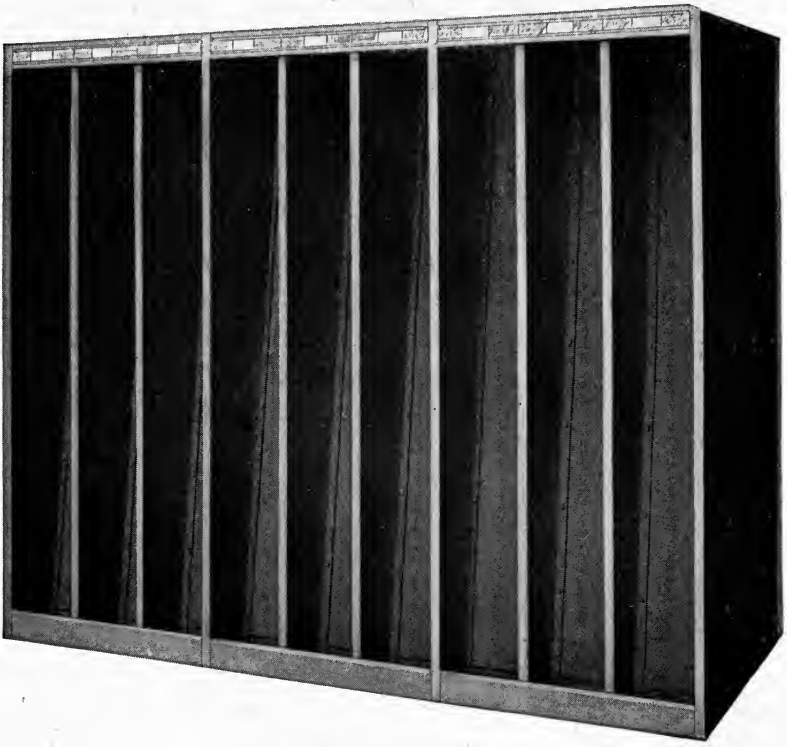


FIGURE No. 19

An excellent type of closed rack which can be used for drill rods and similar material of uniform length.

Reference to the illustrations will demonstrate that the open shelving consists simply of shelves and uprights, but these shelves can be converted into bins in the same manner as the closed type by simply attaching the bin fronts. The unit principle is ad-

hered to and these units can be made to bear a proper proportion to the class of goods being stored.

Racks

Many kinds of material can be stored to better advantage in racks, avoiding the use of solid dividers or uprights. There is no limit to the depth of the racks, and they can be used for babbitt metal, drill rods, moldings, lumber, sheet metal, tubes, etc.

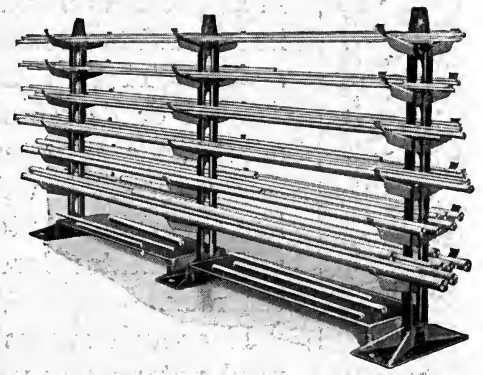


FIGURE No. 20

New Britain Stock Rack.

Rack for storing bars, rods and tubes. Very heavy loads can be placed on these racks and the material is very accessible.

The construction of these racks consists of steel tee uprights with shelves having specially formed edges, which are attached to the uprights in such a manner as to make the assembled rack self-anchoring. The formation of the edge of the shelves and the manner of their attachment to the uprights forms a knee brace and provides for any lateral thrust. Each shelf has four of these knee braces, and this renders the assembly, when completely erected, absolutely rigid.

With all of the types of closed and open shelving and racks already described, slotted holes are provided for attaching card holders.

Another type of rack suitable for heavy loading is illustrated in Figure 20. This is designed for the economical and convenient storing of heavy bars and

rods. The unit idea is carried out in its construction. This permits of the rack being easily and completely knocked down and reërected in another location, with the minimum amount of work. It also enables the rack to be expanded or contracted to meet practically any requirements. The rack shown in the illustrations is arranged so that changes in height can be made in multiples of ten inches and the posts are spaced 47 inches apart. These dimensions can be increased or decreased almost at will to accommodate material from 12 to 30 feet long. It is well to have an overhang, as it distributes the load uniformly and facilitates loading and unloading the rack.

FIGURE No. 21

The construction of this rack is similar to that shown in Figure 20 but is arranged for placing against a wall, thereby economizing space.

If enough spaces are provided there need not be any undue mixing of sizes, which eliminates handling in getting at the desired size. One big advantage gained in using this type of rack is that the bars can be taken from the front. In other styles if long bars are drawn from the ends a very large amount of floor space is required.

It is impossible to overload racks of this construction. The hooks and tension bolts are of steel, which will withstand the combined bending and tensile stresses. Cast iron distance pieces sustain the compression due to load. The hooks are made with a roll up on the end to prevent the load spilling off. The hooks are graduated in length, long at the bottom and short at

the top; this effects a saving in space, as only narrow runways are necessary. There is the advantage also of being able to lift the bars out with a hoist. The base being wider than the spread of the longest hooks, no condition of unequal loading can render these racks unstable.

This type of rack can be arranged for erection against a wall, as shown in Figure 21. Where floor space is limited, this is particularly valuable. It will be noticed that pans can be used at the bottom of the racks for storing short pieces.

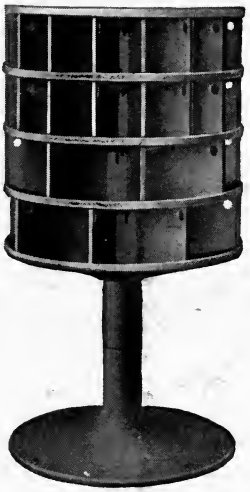


FIGURE No. 22

New Britain Revolving Rack.

A revolving type of rack for storing small articles. These can be made in a variety of sizes and with a large or small number of compartments.

Utilizing all Available Space

There are many storerooms where it has been found desirable to keep the height of the shelving low on account of the nature of the material, or because of the construction of the building. But there is no objection in some instances to the shelving being carried up to the full height of the room. Larger quantities can be stored in a given area if this is done, but provision must be made for getting at the upper shelves. Many improvements have been made in ladders for this purpose, making it much easier to utilize spaces hitherto considered inaccessible, or so difficult of access that it was not considered worth while to attempt to use them.

Ladders made for operation through the center of the aisles are particularly useful. They have a double

overhead track, which eliminates any possibility of the ladder tipping when heavy loads are lifted from the shelves on either side. The flexibility of the connections and the self-adjusting top fixtures have several excellent features. They permit the weight of the ladder and the load on it to be carried by the floor, and not by the ladder connections. They also prevent the ladder bending on the track should the floor be uneven. Another desirable feature is that the ladder can easily be raised clear of obstructions in the alleyways and trucks can readily be moved under them.

CHAPTER VI

Appliances for Use in the Storeroom

Movable Equipment

THE preceding chapter covered a few of the principal needs of a storeroom in the way of fixed equipment. It is now proposed to call attention to some appliances which are essential to the proper operation of every storeroom. It would be manifestly impossible to cover every appliance on the market, but at the same time no discussion of stores problems could be considered complete without reference being made to some of them. The main object in doing this is to emphasize the necessity of modern equipment for the storeroom.

Accuracy in counting, weighing, and measuring is just as essential in a storeroom as accurate bookkeeping is in an office. Goods should be moved with expedition and without lost motion. To secure this one must have the right tools and appliances. The storeroom requirements in this respect are apt to be overlooked in many establishments, particularly in some manufacturing plants.

A vast amount of endeavor is devoted to the reduction of costs in production work. Large amounts are expended in the perfection and improvement of tools, and much has been done in the study of motions to achieve this result. In some of the instances where this has been done the efforts have been confined ex-

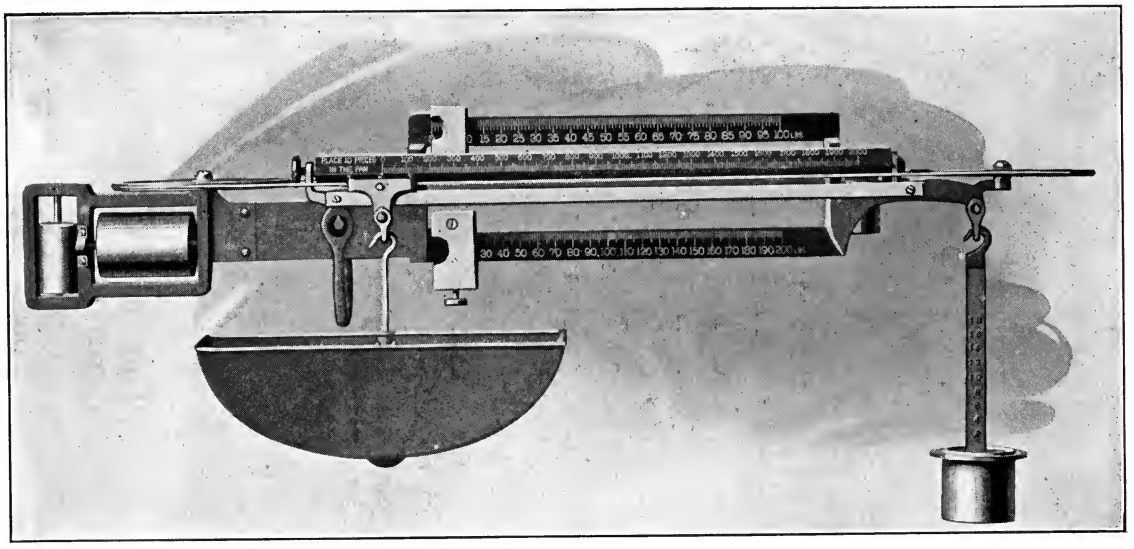


FIGURE No. 23

The beam of an automatic counting machine showing ratio pan, counting bar, ratio information, weighing beams, balance ball, and counterpoise. The method of operation is described in Chapter VII.

clusively, or almost so, to the shop. Now the cost of a manufactured product commences with the purchase and storing of the raw materials, tools, and supplies necessary for such product. To keep the cost at the lowest point it is essential that equal attention should be paid to storeroom appliances to insure freedom

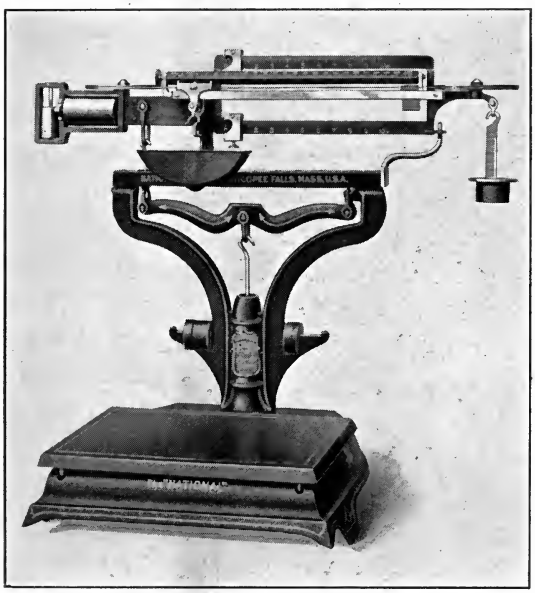


FIGURE No. 24

Counting machine of the counter type. Will accurately count pieces of quarter ounce or over.

and facility in handling the goods. If it is considered desirable to get the maximum output from a machine tool in the minimum time, then it is equally desirable to keep at the lowest point the cost of taking the raw material up to the machine and away from it.

In the common routine of every storeroom counting, weighing, and trucking are operations which go on

unceasingly, and some of the appliances for doing this work are brought to the reader's notice.

Counting Machines

Counting machines give an accurate and quick count of any commodity, consisting of similar parts or pieces, without the use of tabulated figures of weights, mental calculation, or figuring of any kind. The total count of the contents of any box, barrel, bag, truck, or barrow containing an unknown number of like parts or pieces can be determined accurately and almost instantly.

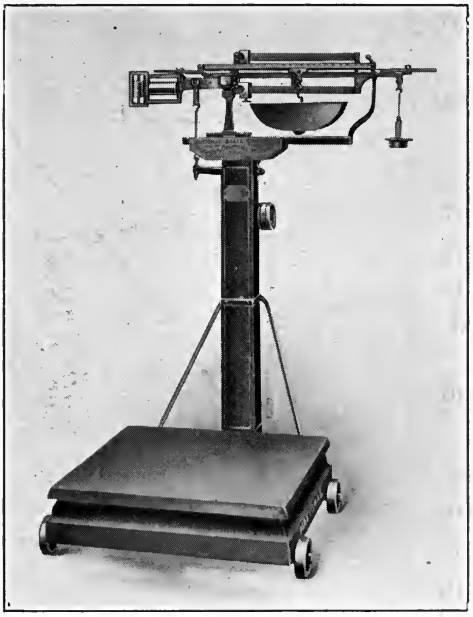


FIGURE No. 25

Counting machine of the portable floor type. Will accurately count pieces weighing one ounce and over.

There is no chance for confusion of figures, errors in estimates, or defective calculation, as the accuracy of the count is governed mechanically. Mental fallibility is eliminated, and from fifty to ninety per cent of time and labor is saved over every other known method of device employed for the purpose of counting.

The method is one of ratio weight, scientifically applied in a simple machine of few parts, which any ordinary laborer can operate and understand.

While knowledge of the weight of the material handled is at no time a feature in obtaining count, yet, whenever it is so desired, weight and count may be secured at practically one operation.

These machines are indispensable when taking inventory, and a complete description of the manner in which they are operated will be given in the chapter on manual and clerical work. The counting bars on the machine can be graduated to meet any requirements. For example, the counting can be done by the dozen, gross or hundred.

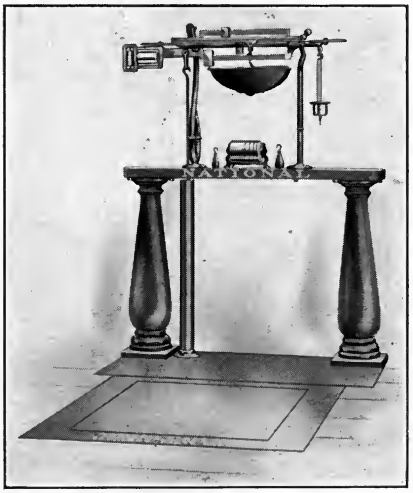


FIGURE No. 26

Counting machine of the dormant type. These can be made for almost any capacity.

Weighing Machines and Scales

If it is considered necessary to exercise care and judgment in selecting tools for the shop, then it is just as essential to use equal discrimination in selecting the best apparatus for weighing storeroom material. The mechanical construction and capacity should be suitable for the work they have to do. Scale manufacturers have developed their product to a point where they can supply the needs of any storeroom, no matter how exacting its requirements may be.

When purchasing new scales and weighing machines the storekeeper should carefully investigate the ma-

chines which appear to meet his needs. The mechanical construction and reliability under service conditions should be tested. Too little attention has been paid to securing proper weighing apparatus for storerooms. It is a common practice to make out a requisition for a balance scale, platform scale, fixed or portable as may be desired, and then let the purchasing agent buy the cheapest article which will meet this crude specification.

FIGURE No. 27
Counting machine of portable type for method of operation. See Chapter VII.

It is not always the purchasing agent who is responsible for obtaining suitable articles. For storeroom use the man who has charge of the material and is responsible for every ounce going in or out should be in a position to determine what is best for his needs and have a deciding voice in the selection. The production department of a manufacturing plant is also interested in the question of accurate weighing and counting.

Any recording instrument is liable to get out of order; it is important, therefore, that periodical

inspection and testing of all weighing machines should be provided for. This can be arranged with the manufacturers and will insure accuracy at all times. As an illustration of this the author had reported to him three consecutive shipments of copper from a large supply house all of which were short in weight. It was found on investigation that the supply house had not had its scales tested for a long period. They

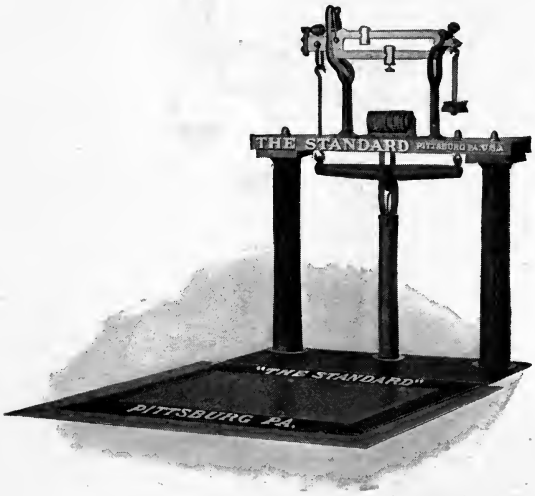


FIGURE No. 28
Weighing machine of the dormant type.

discovered, on examination, that some registered overweight and others short weight.

It is equally essential to have correct weights in a factory. This is particularly important when small parts are being made. For example, if a storekeeper receives a requisition from the shop for 200 pounds of brass tubing and his scales are wrong to the extent of one per cent, either plus or minus, there will be a very radical discrepancy shown at the end of a year

if similar requisitions come in frequently. This will affect not only the storeroom, but the cost department will be at fault, for the number of finished pieces

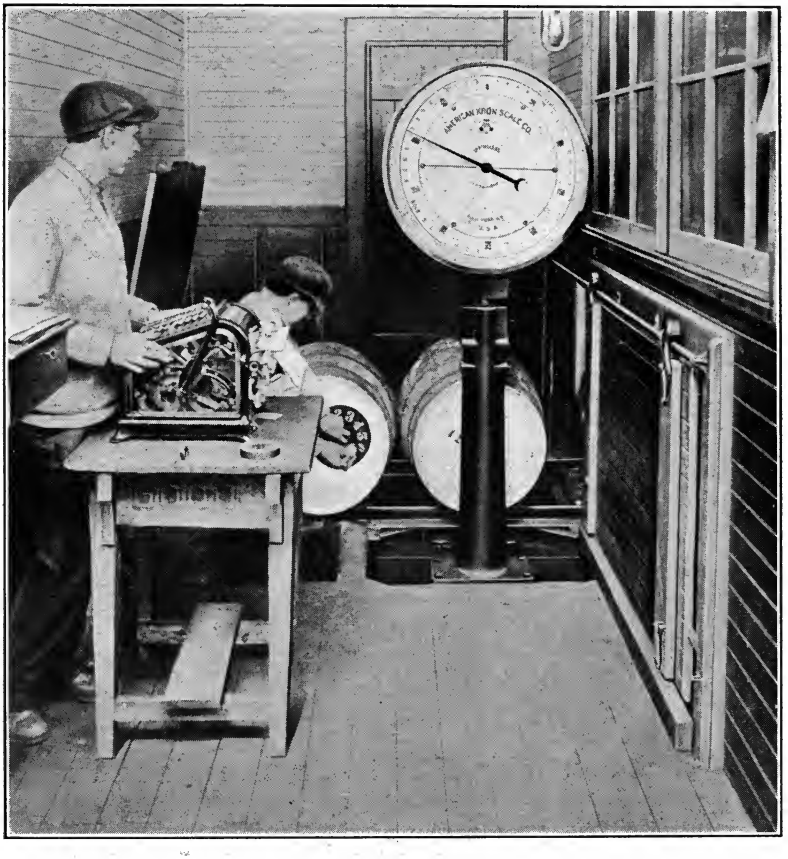


FIGURE No. 29

Weighing scale with dial, showing the tabulation of weights on an adding machine.

obtained from the material taken from the stores would be greater or less than if the quantity was exactly 200 pounds.

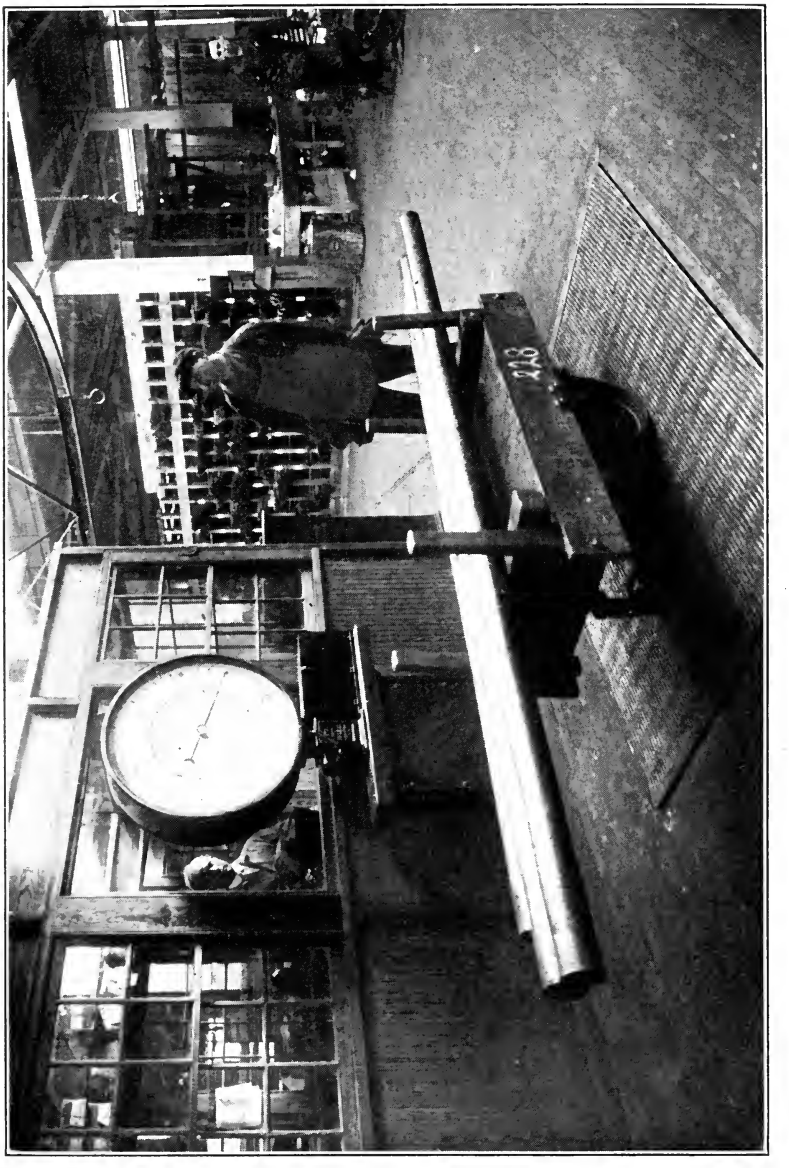


FIGURE No. 30
Heavy type of weighing scale with double-faced dial for reading weights.

Inaccurate weighing is inexcusable, because nothing has been gained except perhaps an approximation of the weight. But this cannot be tolerated if it is desired to keep correct records, and correct records are a fundamental condition in manufacturing efficiency. A supply house with inaccurate weighing apparatus is either robbing itself or its customers. The only remedy is regular and frequent testing. Waiting for some flagrant fault before resorting to inspection and testing is the worst kind of carelessness.

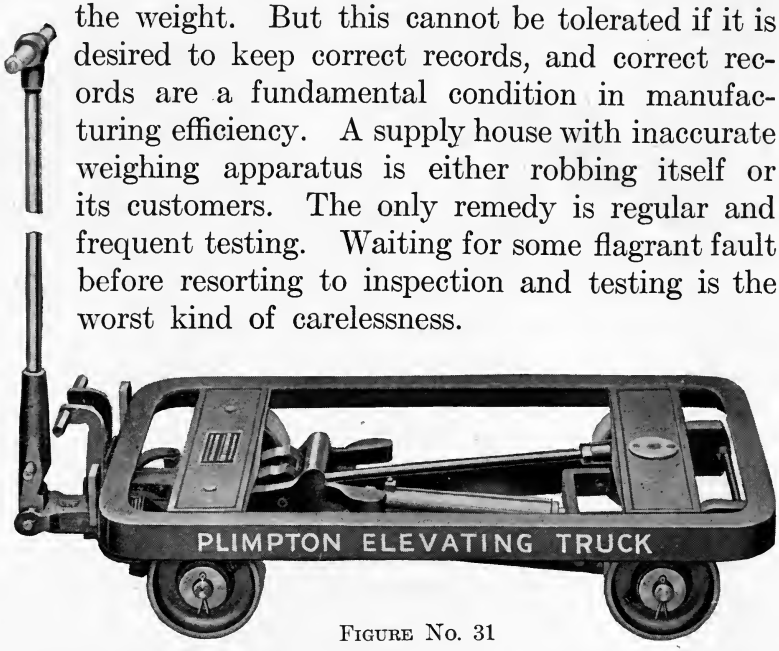


FIGURE No. 31

This truck is equipped with automobile steering gear and knuckles, making a right-angle turn possible without any part of the mechanism projecting beyond the platform, and at the same time maintaining a four-point contact with the floor, keeping the load absolutely steady.

Trucks

The problem of handling material in a storeroom should have just as much attention paid to it as is given to the manipulation of the same material in the shop. When a manufacturer is shown a new tool by which he can turn out a given amount of finished pieces at a saving of 20 per cent, he lends a ready ear to listen, but when he is shown a storeroom appliance which will effect savings and expedite the movement of the goods he too often gives it only casual attention.

There are many types, styles, and sizes of trucks made, all of which have their specific uses, but the elevating or lifting truck could with profit be substituted in the majority of cases where the old style of fixed platform truck is still in use. This was practically the only known means of transporting certain materials on the floor until the new type became better known. The separation of the running gear from the platform has revolutionized transportation in stores.

An examination of the illustrations given in this chapter will demonstrate their wide adaptability. They can be obtained to carry any loads likely to be handled in the average storeroom and they can be arranged so that the platforms have sufficient clearance for unevenness in floor conditions, and they are good for any grades which can be negotiated with an ordinary truck.

Some of the advantages of the elevating or lifting truck will be enumerated. One running gear can have any number of flat platforms or boxes as its accompaniment. This means that while one load is being transported to its location in the storeroom another load is being placed on a platform at the receiving end. The truck does not have to wait at either end of its journey to be loaded or unloaded. All that is necessary is to run the truck under the platform and haul it to its destination. This greatly reduces the amount of labor required by the old trucking system which necessitated a wait at both ends of the trip or dumping the material on the floor.

The platforms being simple and inexpensive, they can, if so desired, have the material remain on them

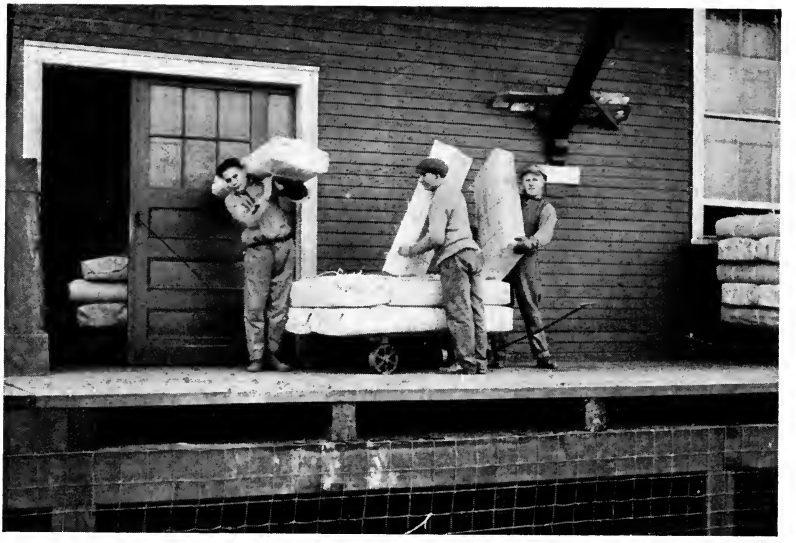


FIGURE No. 32
Method of handling packages and material with the old-style truck.

FIGURE No. 33
The elevating or lifting truck will move the packages shown here without re-handling, and the truck is not delayed at the commencement or end of its journey.

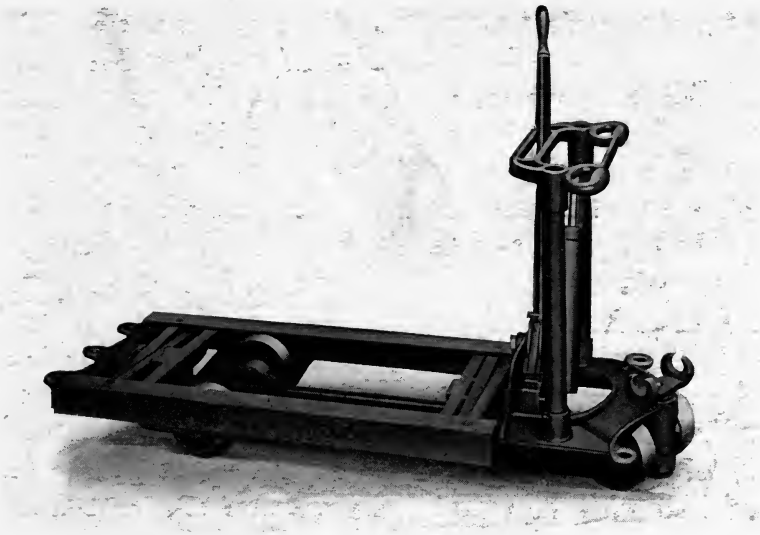
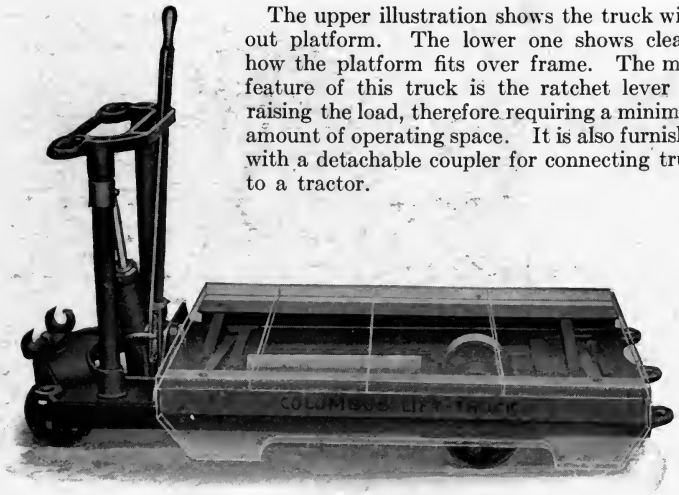


FIGURE No. 34



The upper illustration shows the truck without platform. The lower one shows clearly how the platform fits over frame. The main feature of this truck is the ratchet lever for raising the load, therefore requiring a minimum amount of operating space. It is also furnished with a detachable coupler for connecting truck to a tractor.

FIGURE No. 35
Columbus Lift Truck.

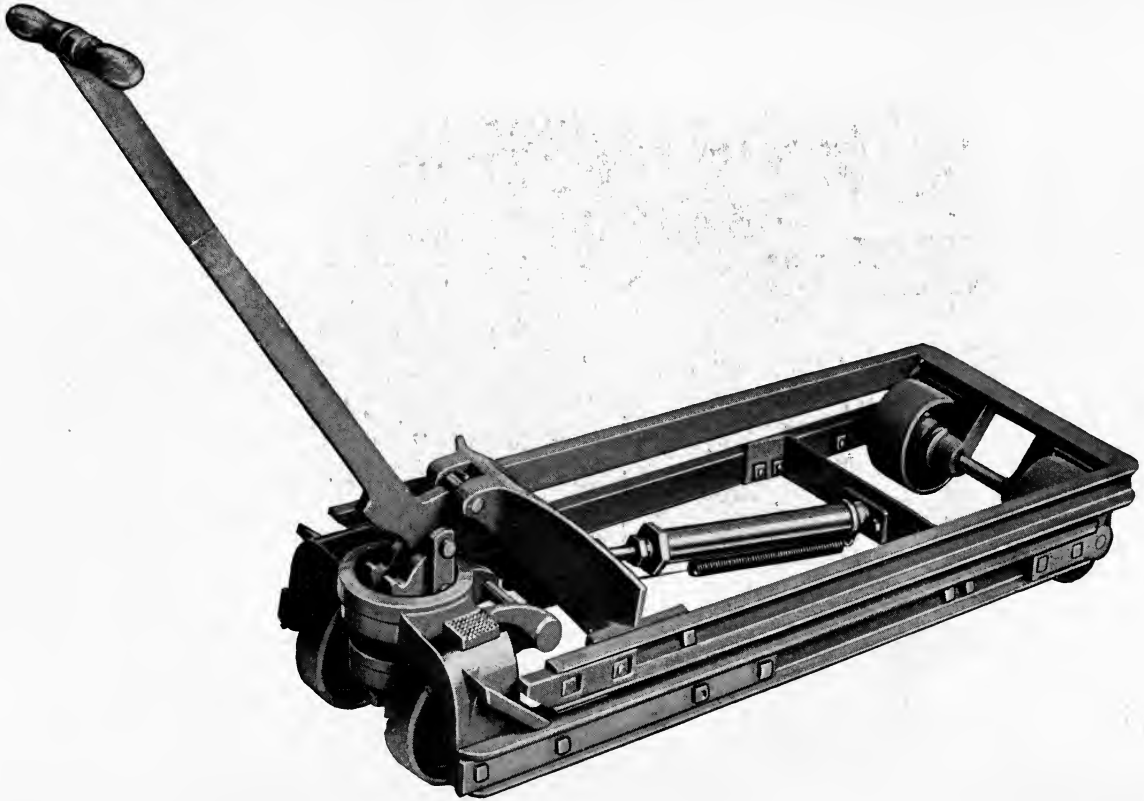


FIGURE NO. 36
The Barrett Multi-Truck.
An excellent type of a strongly built serviceable truck for use with multiple platforms.

while in the storeroom. For example, if forgings are being received which will ultimately go into the shop in lots of 100, they can be loaded on the platforms in this quantity when received and the platforms stacked in the storeroom. When the shop sends a requisition to the storeroom the forgings can be delivered immediately, and without the labor of loading, by running a truck under one of the platforms. This is much on the same principle as tote boxes are used; in fact, tote boxes or stacking barrels can be used instead of platforms.

FIGURE NO. 37

Anything which can be stacked can be carried on the platforms and deposited without rehandling.

The labor item in storerooms is further reduced, because when the material is to be unloaded and placed in bins or on shelves, it can be done at any time to suit conditions. The platforms can be run alongside the bins when material is received and put in the receptacles at any convenient time.

Another point worth mentioning is that when it is

found necessary to stack the loaded platforms in two or three tiers, and it is desired to get at the rear tier, it can be easily done by running the lift truck under the front tiers, pulling them out, and the rearmost tier is then accessible.

FIGURE No. 38

Tote boxes, stacking barrels, and other forms of containers can be moved easily and rapidly.

A summary of the principal advantages over the fixed platform type of trucks would include:

1. The investment in trucking equipment would be much lower.
2. Much time is saved because of the elimination of some loading and unloading.

FIGURE No. 39
Storing steel filing equipment with multiple lifting trucks.

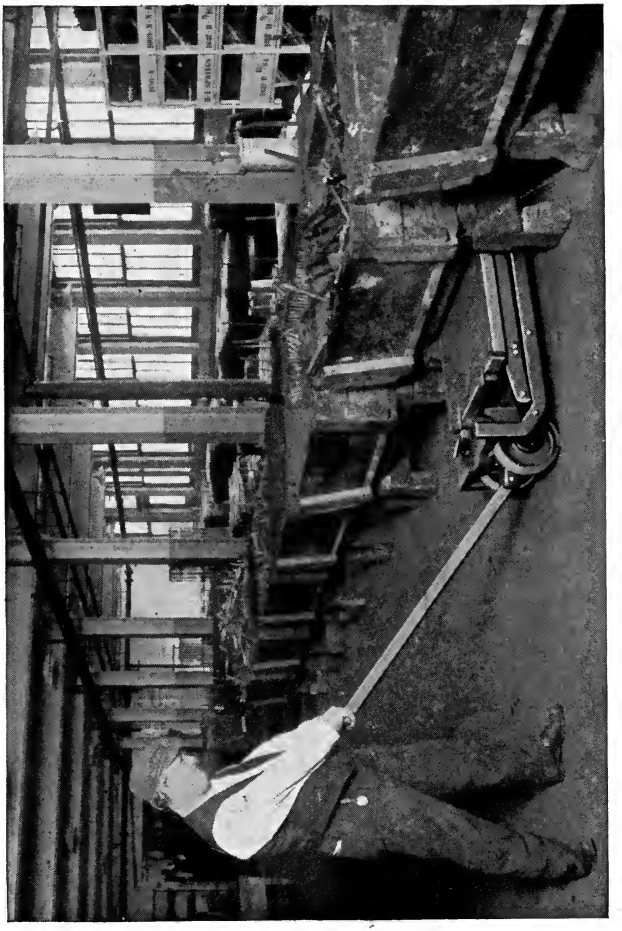


FIGURE No. 40
Handling tote boxes filled with castings.

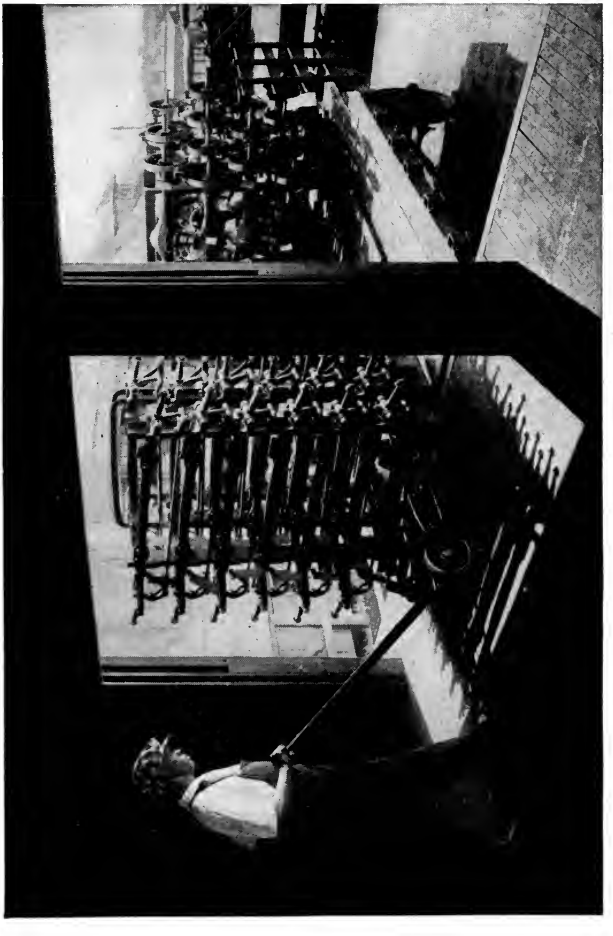


FIGURE No. 41
Racks are built on platforms to carry axles and other parts.

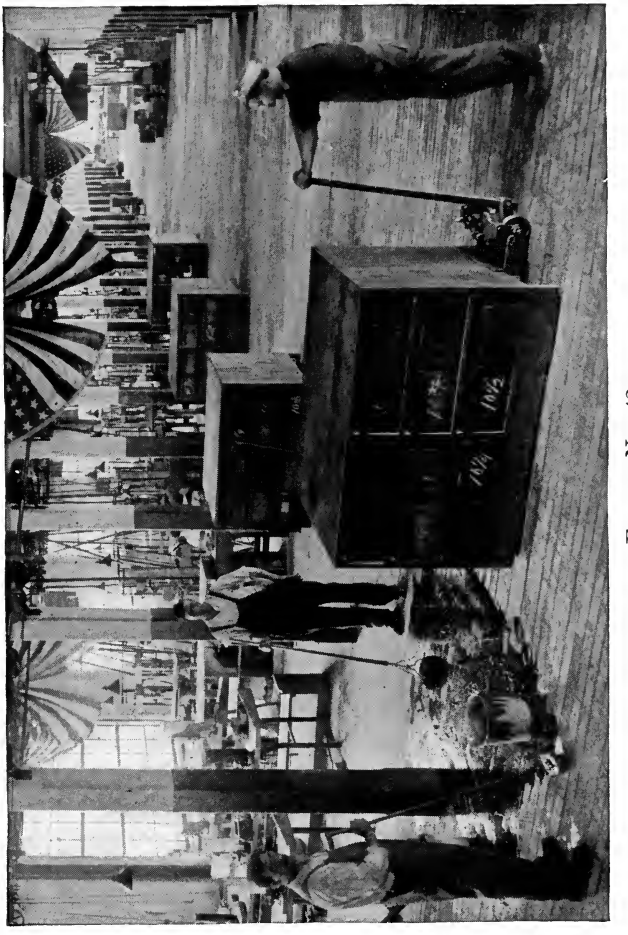


FIGURE No. 42
Handling cases filled with small parts for typewriters.

FIGURE No. 43

Note the large number of cases of cigarettes which can be handled on elevating trucks.

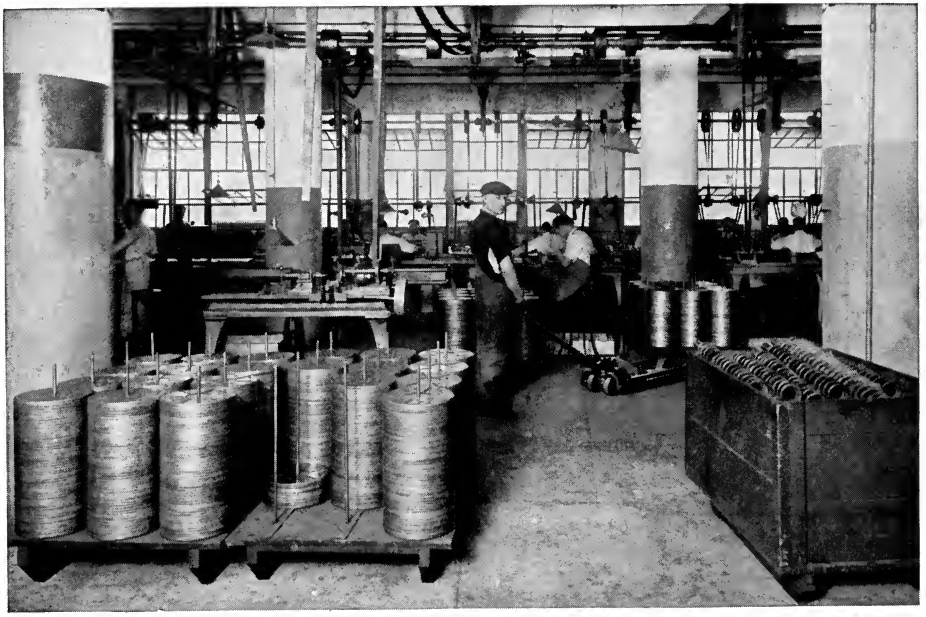


FIGURE No. 44
These platforms are arranged with special racks for carrying Edison records.

3. There would be a very appreciable reduction in the labor item.
4. A great saving in floor space would be effected, because the platforms can be stacked.
5. The elimination of some handling would reduce the risk of loss by damage.
6. The trucking system would be more expeditious and flexible.

When required for very heavy duty the load can be lowered gradually and effectively by a hydraulic check. Electric drive can be substituted for manual operation, if the storeroom is a large one or considerable distances have to be covered. The head and front wheels make a complete cycle turn, enabling the truck to operate in its own length in narrow aisles. A further development in elevating trucks is in connection with simultaneous weighing and transporting. The trucks are equipped with scales from which can be ascertained the gross, net, and tare weights. With these trucks a special set of side bars carry the load to prevent any strain on the scale mechanism.

Gravity Conveyors

It does not come within the scope of this work to discuss all the various methods of moving materials. Elevators, lowerators, carrying devices, and conveyors which depend on some form of power for their operation, it is not proposed to discuss, although they may be necessary in many storerooms. The gravity conveyor, however, cannot be passed over, as it is a necessary part of the equipment of many storerooms, or at least is often the link between the receiving room and storeroom, or the storeroom and the shop when

they are on different levels and the force of gravity can be used. An investment in this form of conveyor is very moderate, and after installation the cost of operation is negligible, for it is confined to the renewal of a few parts, as may be required. The

FIGURE No. 45
This illustration shows how the gravity conveyor can be adapted to curves and other unusual conditions.

force of gravity costs nothing, and it is ready for work every day for the full twenty-four hours.

It is usually advisable to have the storeroom in close proximity to the point at which the goods are received into an establishment. Hand-trucking may not prove the best means of transporting material

FIGURE No. 46

These boxes of limes are being stacked at the rate of sixteen per minute with the use of the conveyor.

FIGURE No. 47
Conveying to the storeroom cases of glassware rapidly and without breakage.

between these two points, and it becomes necessary to use self-propelled trucks or some kind of conveyor.

FIGURE No. 48

A straight run to the storeroom. The capacity is only limited by the grade of the conveyor and the loading and unloading facilities.

The gravity roller conveyor will carry all kinds of material or packages having one flat hard surface. These articles are conveyed by their own weight, provided there is a grade of four per cent. Even if the

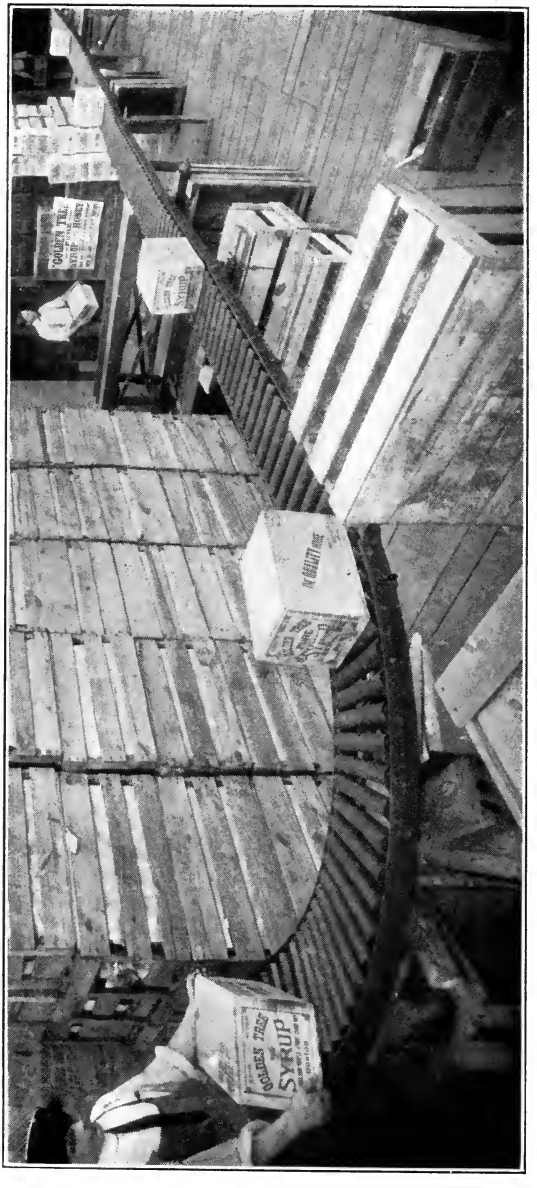


FIGURE No. 49
Conveying cases of syrup.

grade necessary to put the force of gravity in motion does not exist, it can be secured by elevating the material at the starting point. It may prove more economical to do this than to resort to a power conveyor or trucking. If the material has to be placed on trucks anyway at the end of its journey on the conveyor, it may be better to truck it the whole distance.

Some storerooms located in basements can best receive material and goods via a gravity chute, while a storeroom intended to serve several departments of an establishment could well be located at a sufficient height to feed raw material to all of them by means of gravity conveyors.

One of the greatest advantages of the gravity roller conveyors is its flexibility by means of curves, switches, chutes, elevators, and other appliances; the conveyors can be run around corners, through partitions and floors, and may be laid out practically where desired. Conveyors depending entirely upon gravity naturally have their limitations, but engineers and managers of industrial plants have devoted considerable attention to harnessing the force of gravity to solve their problems, with very excellent results.

Mechanical Aids

It is not so long ago that physical prowess was considered essential for men engaged in handling and storing material, but physical strength in the human being has been largely equalized because of the many mechanical appliances and aids for doing the work. These should be taken advantage of wherever their use will serve a good purpose. It is still possible to see three or four men struggling with barrels, bags,

and cases filled with heavy materials, when perhaps seventy per cent of the labor could be saved by the use of hoists, barrel stackers, or sack stackers. The utilization of these contrivances gives employees the opportunity to devote their mentality to still further improvements. Intensive, strenuous, monotonous work dulls thinking and hinders advancement.

CHAPTER VII

Manual Operations

Dual Nature of Storeroom Work

IN the operation of a storeroom there is both manual and clerical work to perform. It is in respect to this dual nature of its functions that the storeroom differs from other departments of a business. Both sections of the work must be on the same equality of accuracy and efficiency. Accuracy in one of these and inaccuracy in the other would only lead to confusion. A helper might hand out 50 bolts, but through inadvertance the number might get entered on the clerical records as 60. Again, a requisition for 100 pounds of copper might pass through the clerical records correctly, but through a mistake in weighing 110 pounds might be delivered. Every storeroom transaction is susceptible to these delinquencies, and it is only by accuracy in both the manual and clerical work that a physical inventory will tally with the written records.

Storeroom clerical records can be simple yet complete, and this fact, together with the general demand which exists for bookkeeping accuracy, has placed this section of the work in advance of the manual work, so far as the percentage of errors is concerned. But there is no good reason for this, and the demand for better methods in the physical handling of the

stores has developed appliances for counting, weighing, and measuring which are having considerable influence in the right direction.

General Considerations

Prompt handling of all material as it arrives in the storeroom is an essential feature of successful storeskeeping. It is a phase of the work which needs close watching, because there is always a tendency, particularly during busy hours, to get the goods into the room and then allow them to lie around on the floor waiting for a more favorable time to place them in the bins and receptacles. Such methods as these involve the risk of damage to the property, makes the storeroom untidy in appearance, and is prolific of irregularities in deliveries.

When a requisition is received it is a natural thing in making the delivery to take the goods from the nearest or most accessible place, which may be a pile which has been dumped at some convenient location. With some material this may not be important, but there are instances where the older material should be given out first. Anyway it is good practice to make it a rule to deliver all material in the sequence in which it was received, giving priority in delivery to the material which has been longest in the storeroom.

Every storeroom probably contains some articles which are seldom called for, while others are in constant demand. The latter should be placed in convenient locations to facilitate their delivery. Heavy material should be stored at a convenient height for loading onto trucks to prevent any unnecessary labor in raising or lowering it.

Great care must be exercised in placing articles in their designated places. It is just as bad to dump some quarter-inch nuts in a bin containing five-sixteenths-inch nuts as it is to make an entry in the sales ledger against the wrong customer. It is probably worse, for it is likely to lead to more confusion. The mixing of the wrong sizes, or of the same sizes of different grades, is perhaps the most prevalent fault in storeroom practice.

Next to the mixing of sizes and grades the commonest fault is having more than one shelf or bin for the same article. If all storerooms were equipped with adjustable racks, bins, and shelving, as described in Chapter Five, there would be no occasion for this, because the receptacles can be expanded or contracted at will to correspond to the increase or decrease in the quantity of goods on hand.

With the old-style wooden bins or metal bins of the inflexible type it is impossible to provide for an increase in the quantity of material being stored, except by placing it in more than one receptacle, and there are many objections to such a course. If more than one bin or location is assigned to an article, the man delivering the material is apt to overlook the second bin. The regular bin being empty, he fails to remember that there is more of the same article in another bin. The use of more than one location tends towards the accumulation of shelf-worn or old stock, because the nearest receptacle will invariably be approached first and the more remote one be neglected. Duplication of this character only leads to more errors, because it gives the helpers more things to remember.

Counting

Even when goods are weighed or measured they invariably have to be counted. For example, 20 barrels of material may be received. The material

FIGURE No. 50

Automatic counting of small parts. Whatever the number is in the pan on the platform it will be accurately recorded.

is checked by weight, but the number of barrels has to be counted. This is an extreme illustration, the antithesis of which would be 20 barrels of very small articles which must be counted. The first instance

is a simple mental count, but the latter could not be done accurately except with the aid of some mechanical contrivance. Counting is the biggest problem in receiving and delivering articles from stores and deserves some discussion.

It must first be recognized that the masses of things in a storeroom come in like units or in units which vary so slightly in weight and size that the variations can be neutralized on a bulk machine count. Consequently the great problem is one of counting with the least expenditure of time and labor.

The counting methods now in use can be logically divided into five separate systems as follows:

1. Hand Counting.
2. Weighing and Estimating.
3. Even-balance Scale.
4. Proportional Scale.
5. The Automatic Counting Machine.

The importance of the subject demands a short review of each of these methods.

Hand Counting

The usual method of operation is to make a mark with a pencil as the hand-counter finishes a hundred. In hand counting, therefore, there are three distinctly different operations: the hand operation, the mind operation, and the pencil operation. To keep this up long enough to count any large quantity creates unusual mind strain, and errors are often made. It is evident that if a person counts 1000 small pieces by fives, 200 separate operations have been performed, both mental and physical. If the pieces are large,

so that only two at a time can be counted, then it means 500 similar mental and physical operations.

When counting in this manner a person may have his attention diverted from the task by some form of interruption and is liable to forget whether he has made the pencil notation, or may have to recount. Modern business methods do not tolerate uncertainties of this nature. Cost keeping in a manufacturing establishment would be "all at sea" if 1100 parts were handed out of the stores to the production department, instead of 1000, and the stores records would be in confusion.

A valuable aid to hand counting is the mechanical counter. By using this the worker has only to perform the physical operation. These counters can be used to great advantage when it is necessary to handle each piece for the purpose of inspection or examination. In making the movement necessary to examine the article the hand or arm of the worker comes in contact with a knob or lever on the counter and the record is automatically made.

Counting by Weight and Estimate

In any modern establishment it is evident that hand counting could not be tolerated, because of the expenditure of time and labor, and because of the uncertainties of the final results. To save time and labor the weighing and estimating method is used. This represents the first step between hand counting and the use of a machine made especially for the purpose.

Any ordinary weighing scale can be used in working with the weighing and estimating method. The weight is first obtained of a given number of the

articles to be counted, preferably an even number for the sake of rapid calculation. For example, if 100 articles weigh six pounds then sixty pounds of the same article would represent a total 1000 pieces.

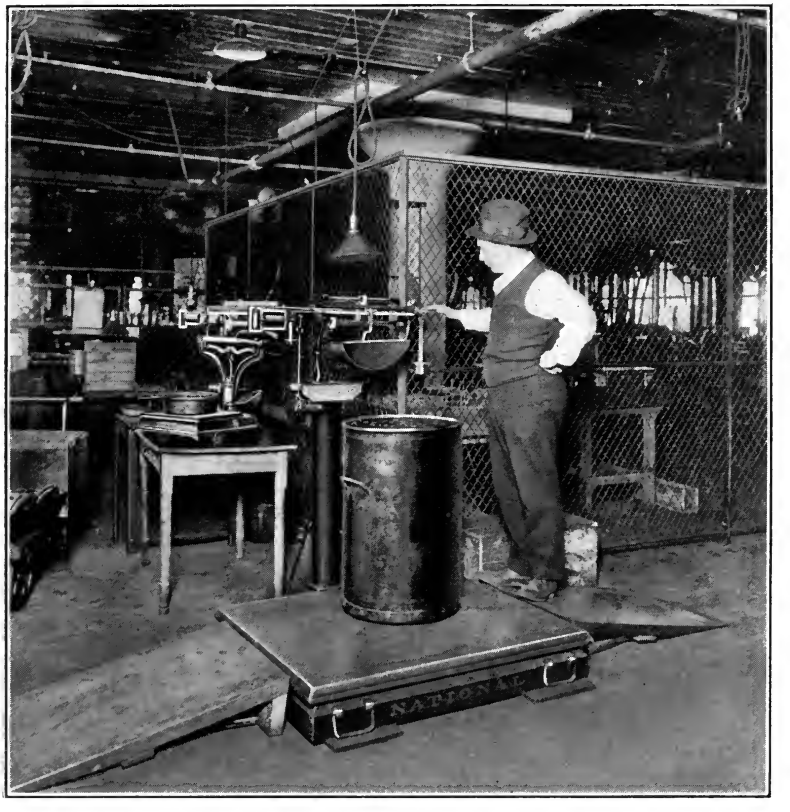


FIGURE No. 51
However small or large the pieces are they can be accurately counted in any kind of container.

This method has the advantage of greater speed and fewer operations over hand counting, but it is still susceptible to inaccuracies from mental computation. The ordinary scale is not always accurate, and any

error in weighing the smaller quantity would be intensified in making the computation for the larger quantity. Very few weighing scales of any considerable capacity can be compared with mechanical counting machines as to sensitiveness. And the degree of sensitiveness is the chief factor in determining the efficiency of a machine used for counting by balance. The least hesitation of one of these devices in responding when the burden on the platform is increased or decreased is a flaw on the accuracy of the machine. Exceedingly quick response to what is technically termed "sensitive break" is absolutely necessary to accuracy.

Even-balance Counting

Like the weighing and estimating method this is an attempt to improve on hand counting by some mechanical device. It commences by deciding on some number as a base. For instance, if 50 is the base number these are counted by hand and placed on the tray on one side of the scale. A quantity is then placed on the opposite tray or receptacle until an even balance is struck. The two together should then total 100 pieces and these being placed on one tray can be balanced by a like quantity, giving a total of 200 pieces.

This process can be continued indefinitely until the quantity remaining is too small to create a balance. Hand counting must again be resorted to to complete the count. This method, while quicker than hand counting, has many of the drawbacks of the weighing and estimating method, with the added defect of a final hand count.

Counting with Proportional Scales

Proportional scales are arranged to work according to certain set, even ratios. These ratios usually

FIGURE No. 52

The work of counting can be done by boys or girls. There are no mental calculations to make. Weights can be taken on all machines shown in Chapters VI and VII.

range from 10 to 1 up to 200 to 1. A scoop hangs from the end of the scale beam, serving as the counterpoise. With a ratio of 10 to 1, one hundred small pieces in the counterpoise scoop will balance 1000 similar pieces on the platform.

FIGURE No. 53
An interesting illustration of counting tubes or rods.

To count the contents of unknown bulk lots with this scale, the material to be counted is put on the platform, while enough pieces are put in the counterpoise scoop to bring the beam to a "low balance." Then a single piece is removed from the scoop, giving a "high balance." Next, enough pieces are taken

FIGURE NO. 54

The Root Counter.

This counter is arranged so that the girl's arm presses the lever each time a sheet is taken from the pile. In this way counting and inspecting are done simultaneously.

from the platform to make a perfect balance. The total of the pieces removed from the platform is added to the total of pieces on the platform, which total has been determined by multiplying the ratio of the machine by the number of pieces in the counterpoise scoop.

To count out a specified number of pieces with the proportional scale a number of pieces are placed in the counterpoise, in number equal to 1/10, 1/50, or 1/200 of the total quantity to be counted, the proportion depending, of course, upon the set ratio capacity of the scale in use. The platform is then burdened with a load of pieces sufficient to bring the beam to the perfect balance point. Without further adjustment of beam or counterpoise scoop, it is then possible to count out as many lots as desired by simply repeating the process of loading the platform to the balancing point. These scales can also be used for the purpose of weighing material as well as for counting.

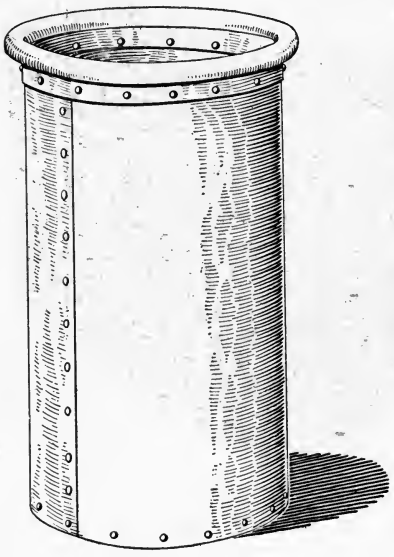


FIGURE No. 55

Stacking barrels can be used to great advantage in many storerooms. They can be had in sizes suitable for storing the number of articles usually called for by the shop.

Automatic Counting Machines

The counting machine, which retains the form of a scale, has reduced the process of mechanical counting to the point where, with the exception of the comparatively small hand count necessary to provide the ratio number necessary to operate, all mental computations have been eliminated. The results are secured almost automatically and the total counts are indicated in plain figures on graduated counting

bars which are attached to the beam. These machines have the usual small scoop to take the ratio count of pieces, but this scoop or ratio pan slides along the counting bar, instead of resting in fixed position on the counterpoise.

To obtain the count of an unknown quantity of pieces with the counting machine, the tare of the package or contents is set out on one of the weighing beams, of which there are usually two. From the contents of the package the number of pieces required for the ratio pan are taken out; the number required for this purpose is indicated on the counting bar. The ratio is then moved along the counting bar until the beam is in balance. A pointer indicator immediately above the ratio pan then denotes on the counting bar the exact number of pieces resting on the platform.

FIGURE No. 56

Stacking tote boxes made by The New Britain Machine Co. These have been referred to in Chapter VI.

Where it is desired to count in certain specified lots, say 144, the tare of the package is set out as above indicated, the pointer indicator is set against the 144 mark on the beam, and the package is then loaded until the beam balances.

These counting machines are made to cover practi-

FIGURE NO. 57

Storeroom rack designed to accommodate the tote boxes shown in Figure 56. These can be filled or emptied in the position shown without danger of falling out of rack.

cally any known requirements in the way of counting. They range from delicate machines, which will record the count of pieces so small that it takes 25,000 to equal an ounce, to the heavy dormant type of machine which will count pieces weighing a ton.

Having such machines available it is conservation of time and energy to employ them. There is certainly no room for comparison as to speed, simplicity, or automatic accuracy between the results obtained with these machines and from any of the more antiquated methods. Why should we have adding machines and similar devices in the office, and no mechanical counting devices in the storeroom or factory? Each is an attempt at the solution of the problem of obtaining a maximum saving of time and of mental and physical energy by some automatic mechanical means.

FIGURE No. 58

Tote boxes of the nesting type. The feature of these which commends their use is that when empty hundreds of them can be nested and stacked in a very small space.

Summary

Complete accuracy in the manual operations of a storeroom would be exceedingly difficult to maintain without cleanliness, orderly arrangement of the stock,

and general tidiness. These must be enforced. With these conditions, coupled with efficient mechanical devices, well-arranged bins, shelves, and other receptacles, and finally with alert, capable, and willing helpers there will not be much go wrong with storeroom operations.

CHAPTER VIII

Clerical Work. — Inventories

The Stores Records

THERE is nothing complicated or intricate in connection with stores bookkeeping and clerical work, but it must be accurate. This last statement is, perhaps, true of all bookkeeping, but it applies with unusual force in connection with stores records, because an error in them can sometimes only be brought to light and rectified by a physical count of articles in the stores, which might involve considerable delay and expense. With other forms of bookkeeping errors can be discovered and rectified by reference to some allied clerical work.

Probably the simplicity of the work has some bearing on the inaccuracies which appear, but this is no good reason for their appearance. The more probable reason is that too many accountants look upon the work as unimportant, at least that part of the clerical work which has to do simply with recording the quantity of material in stock, while at the same time they will lay greater stress on keeping a stores account which reflects the value of the goods in the storeroom. To the custodian of the property, and in control of its movements in and out of the stores, quantities, sizes, and weights are of greater moment.

The purpose of this work being to limit the discussion to storekeeping problems, it is not intended to

dip deeply into financial problems and cash values. Such problems come more properly under accounting work, and any digression into these problems would involve cost keeping, which in itself is a subject on which volumes have been and could be written.

To compile and maintain the stores records, certain forms and documents are necessary. These will be taken up in detail in a later chapter dealing with the routine work. All stores clerical work is based upon, and revolves around, the perpetual inventory, or stores ledger. This instrument, therefore, will be discussed in detail from different angles.

The Stores Ledger

The ledger accounts with customers should not be more accurate than the ledger or perpetual inventory, which records quantities received into stores, delivered out of stores, and balances on hand. This should be kept posted so closely that complete detailed information can be obtained from it monthly, weekly, daily, and hourly. The information required from a perpetual inventory is not just what quantities of each article are in the storeroom, but it should tell what quantities are on order, what have been received in any given period, what has been delivered or the rate of consumption, and whether that consumption is uniform all the year around or subject to variations.

The record can be extended so that a balance of credits against the stock can be proven with the daily sales, also a balance of the debits against the purchases daily, thereby proving the work as well as indicating the exact amount of stock on hand each day, and at the end of a month the actual value of

each commodity, even in case of fluctuations in prices. These features, however, go beyond strictly storeroom work, and it is not proposed to discuss them.

Machine Bookkeeping

As the use of the bookkeeping machine is being applied to stock records, its possibilities should not be overlooked. Owing to the absolute control of the work done it eliminates the necessity of some of the higher priced labor which hand methods make indispensable. The work is turned out at far greater speed than can be attained by hand, it is more legible, and part of the higher grade labor can be allocated to other work.

FIGURE No. 59

Elliott-Fisher Bookkeeping Machine.

Perpetual inventories of the card or loose-leaf type can be written up with a bookkeeping machine. The forms are placed on the flat surface shown under the machine.

By way of illustration in its application to perpetual inventories a machine to handle this class of work in such a way as to show the necessary results must be extremely flexible and simple of operation and it must furnish the required results without attention on the part of the operator beyond printing the proper items in their proper columns. Two cross computations must be made simultaneously, one of quantities and one of values. To the quantity in stock, with its value, must be added the quantity and value of merchandise placed in stock, the new total of quantity

and value shown in the register being then printed in the balance columns. Likewise, withdrawals of quantity and value from stock must be deducted and the balances shown. Simultaneously with these operations a control total of the value of the merchandise put into stock or taken out must be furnished daily, and where required the machine should also furnish totals of quantity placed in or withdrawn from stock. This method of handling the stock ledger gives a perpetual inventory of all classes of goods, as well as an immediately available total of their value, both as units and as a whole.

The Physical Inventory

Before discussing the clerical inventory from other viewpoints, it is necessary to make some observations regarding physical inventories. It would, perhaps, seem that these could be dispensed with if the clerical inventory were kept perfectly accurate. Many arguments have been advanced advocating the abolition of physical inventories, and the matter has been given some publicity in technical publications. It is proposed to recapitulate some of these for the better elucidation of the problem.

It is claimed that although the clerical records may show the true state of the stock as far as the documents go from which the record is compiled, still it might not represent the true condition of the stock. For instance, suppose a requisition was received for 200 washers, and through a mistake on the part of the helper 300 were delivered, how would such a mistake be discovered except by a physical count? Another instance would be in the event of pilfering

or theft; this could never be discovered except by making a physical count or examination of the material and comparing it with the clerical record.

In a manufacturing plant it is claimed that for a certain period every year the plant must be closed down for repairs, renewals, and replacements, during which period a physical inventory can be taken and a stores "house cleaning" indulged in, because at such a time most of the help in the stores has to be paid anyway and it costs nothing to make the inventory.

It is contended also that the fact being known that a physical inventory will be taken prevents pilfering, and at the same time is an incentive to accuracy on the part of the clerks keeping the clerical records, because they know a check will be made against their work and this prevents carelessness.

The stock of some materials, such as coal and sand and anything which is not counted or weighed out in accurate quantities, can only be approximated from the clerical records. To get a correct inventory of these it is imperative that physical particulars be taken.

There are, of course, some concerns who keep no perpetual inventory. This omission is, perhaps, more prevalent among small manufacturers than any other class of business men. They probably keep a record of the quantity of material used in production work and duly charge it to the respective shop orders. They take an annual physical inventory to enable them to prepare a balance sheet and ascertain what profit or loss they have made during the year. This is, of course, not in any sense a check on the incom-

ARTICLE _____ VERIFICATION DATES | | | | | | SHEET NO. _____

ALWAYS SPECIFY AS FOLLOWS: QUANTITY, DIAM, LENGTH, STYLE HEAD, CAP SCREWS, THREADED U. S. S.

EXAMPLE: 300 1-2" 4" HEX. " " " "

LOCATION SECTION NO.	SHELF NO.	BIN NO.	UNIT	MAX.	MIN.	AVERAGE MONTHLY

ORDERED AND RECEIVED				ISSUED				ISSUED			
DATE	ORDER NO.	QUANTITY ORDERED	QUANTITY RECEIVED	DATE	REQ. NO.	QUANTITY	BALANCE	DATE	REQ. NO.	QUANTITY	BALANCE

FIGURE No. 60

Perpetual inventory form showing method of inserting standard definition of the article. Cards or loose-leaf sheets can be used of suitable size.

ARTICLE _____ SHEET NO. _____

SHELF NO. _____ BIN NO. _____ MAX. _____ MIN. _____ VERIFIED _____

ORDERED			RECEIVED			DELIVERED				DELIVERED			
DATE	ORDER NO.	QUANTITY	DATE	ORDER NO.	QUANTITY	DATE	REQ. NO	QUANTITY	BALANCE	DATE	REQ. NO.	QUANTITY	BALANCE

FIGURE No. 61

Perpetual inventory form, alternate to Figure 60. Note the difference in the columns for recording quantities ordered and received.

ings and outgoings of the storeroom and is only given as an illustration of outworn methods which, however, are still permitted to exist.

The Perpetual Inventory

It is universally conceded that a perpetual inventory is essential; and it is asserted that if properly kept no other form of inventory is necessary; that it can be brought to a state of perfection and accuracy, and that periodic physical inventories can be dispensed with. Statements have been made that this course has been adopted in some establishments, resulting in large savings.

It is claimed that in a manufacturing plant it is a very serious loss to close down for a week to take inventory. This loss falls heavily on the workmen, because it takes from them about one fiftieth or two per cent of their annual income. The overhead expense of the establishment goes on during this period without any production work being done. The salaries also of all those engaged in the work of taking the inventory while production is at a standstill are a dead loss, for while nothing is being produced they cannot be distributed as a burden on the factory.

Another point made is that perpetual inventory figures are more reliable than those of a physical inventory unless the latter results are checked by recounting and reweighing. If this has to be done to insure accuracy it is equivalent to taking two inventories. If the periodical physical inventory is dependent for its accuracy solely on counting and weighing which may have been done hurriedly or under stress, then it is not likely to be as reliable as

the clerical records. This work is frequently done under pressure, largely in overtime. The persons engaged often labor long hours to complete the work within a specified time, and sometimes amid the confusion of changing and rearranging the stores, which is a fruitful source of errors.

Summary

The whole discussion can be condensed into a few sentences. Both inventories are necessary. If a banker kept absolutely correct books, would that prove that no cash was missing? Would he go on indefinitely without checking one against the other? It is a fallacy to think that either can be dispensed with. The dual nature of the storeroom work has been mentioned before. In the matter of inventories its duality is still more in evidence.

There are, however, conditions and exceptions which need elucidating and in doing this the ideal method of inventorying will be explained.

Correct Inventorying

It must be obvious to the student and close observer of storage problems that both the clerical and physical inventory are necessary, or rather that the clerical records are absolutely imperative, while the physical feature is more in the nature of a check on the former. To say that it is positively essential at periodic intervals to count, weigh, measure, and tabulate every item in the stores is not literally true, because such a comprehensive tabulation is not really necessary. There is an alternative course which can be adopted and which will cover all requirements deemed essential for checking the bookkeeping records.

The ideal inventory is the perpetual record compiled accurately with the entries made immediately after any material is put into or taken out of the bins. The records should be so accurate that at any moment one could count the pieces in any bin and find the contents tally with the balance shown on the records. This state of perfection may be approached very closely, but the complete elimination of all errors cannot always be attained while the human factor has to be considered. The problem, then, is to get this work executed to conform as nearly as possible to the ideal outlined.

The perpetual inventory is compiled from the documents or vouchers which show the entries into and out of the stores. These documents are not as a rule as legible or clearly defined as the documents from which debits and credits are entered in the ledger with customers, yet no accountant would take these entries as correct without some verification or check. It is equally essential to verify the entries in the stores ledger.

It is an excellent plan for a storekeeper to consider himself in the position of a banker. The recipient of cash at a bank must give a check or receipt and when cash is deposited a deposit slip must be made out. These papers form definite evidences of the transfer of cash, and when collected, tabulated, and totaled show unmistakably exactly what has passed in and out. Now a storekeeper should have corresponding papers and should jealously guard them, for these form the basis of his clerical work.

The physical check, for it can scarcely be called an inventory, should be carried out at convenient

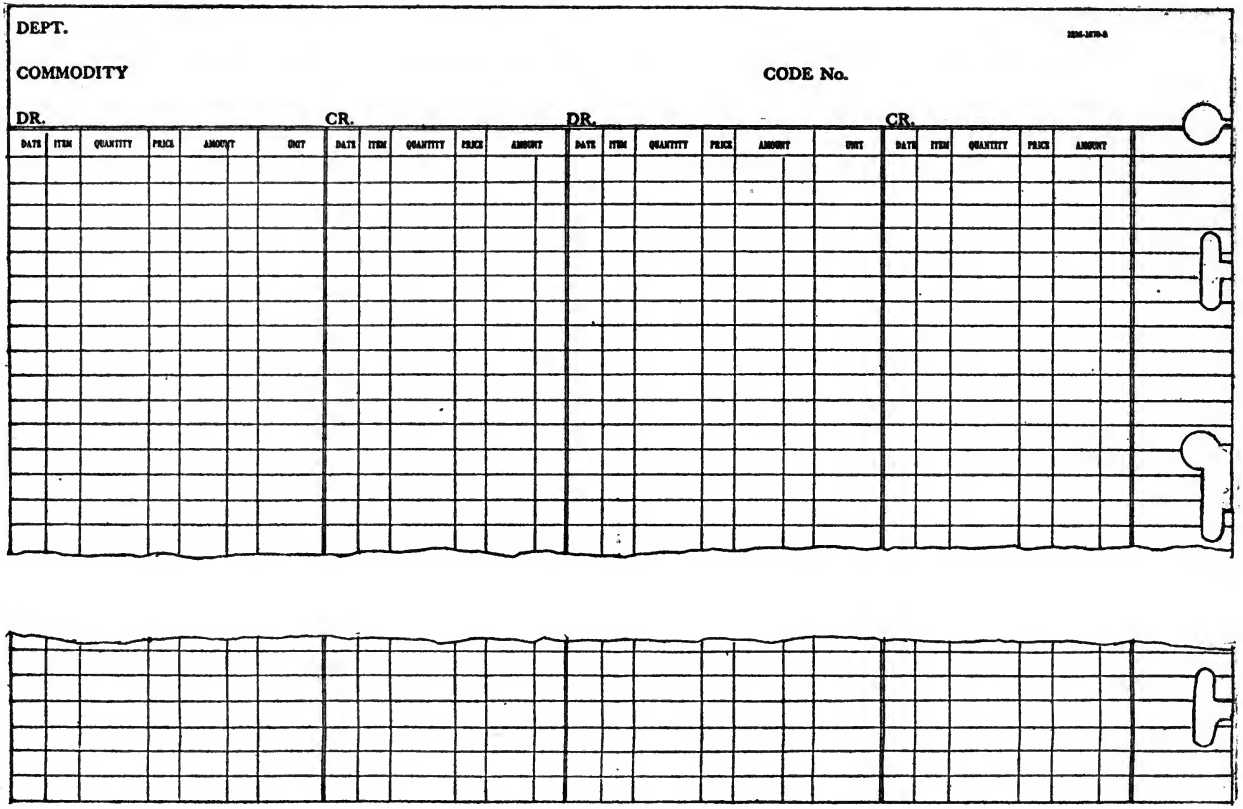


FIGURE No. 62

Perpetual inventory form of the loose-leaf type used by H. W. Johns Manville Co.

times. In large storerooms the dislocation and interruption of regular routine caused by the stupendous task of counting or weighing or measuring and then tabulating everything in the storeroom should not be tolerated. The alternative to this is to do the work at any time an opportunity offers, but the whole storeroom should be covered in this way within certain time limits. Possibly some active items should be checked at more frequent intervals than others.

By following this practice closely and covering all of the stores within a prescribed period there will not be much go wrong, and if there are errors and discrepancies they will be quickly discovered and rectified. They can be rectified by recourse to the documents from which the records were written up. In a manufacturing establishment these usually pass into the cost department, and in a supply house they would finally go to the accountant. In either case they should be preserved long enough to enable the storekeeper to have access to them to clear up discrepancies.

There are usually lulls in storeroom routine operations when this work of checking can be done, but if it cannot be carried out by the regular help, or if it is desired to have some independent help perform the task to prevent collusion, there are several persons who could be called upon from the receiving department, shipping room, or office. In large factories, where inspectors are employed in the production department, these men might take some part in it.

Other Considerations

It is possible that there are storerooms which contain comparatively few items, and these may be of a

PERPETUAL INVENTORY VERIFICATION

MATERIAL _____

I HAVE THIS DAY ACTUALLY—COUNTED—WEIGHED—MEASURED THE STOCK ON HAND AND AM POSITIVE AS TO THE ACCURACY OF THE AMOUNT RECORDED BELOW.

DATE _____ QUANTITY _____ UNIT _____

SIGNATURE OF PERSON CHECKING STOCK _____

I HAVE COMPARED MY RECORDS WITH THE ACTUAL STOCK ON HAND AND CERTIFY TO THE CORRECTNESS OF THE AMOUNTS ENTERED BELOW.

RECORD BALANCE _____ MAX. _____ MIN. _____

INVENTORY CLERK'S SIGNATURE _____

NOTE. THE COMPARISON WITH THE PERPETUAL INVENTORY MUST BE MADE IMMEDIATELY AFTER STOCK IS CHECKED AND BEFORE FURTHER ENTRIES ARE MADE OF INCOMING MATERIAL OR WITHDRAWALS.

FIGURE No. 63

Verification card used by the checkers or auditors of the goods in stores and the perpetual inventory.

bulky nature, where the physical check may be a matter of no great consequence. It can never be said to be entirely negligible. It is probably in connection with such storerooms that the contention has been made that physical checking is unnecessary. Still, it is not good practice to dispense with it entirely.

There is no insuperable objection to a periodical inventory being taken if the activities of the establishment have to be suspended anyhow for some other reason. But to suspend business just to take an inventory is seldom necessary and cannot be commended. As these pages are being written the author had an experience of this character with a very large steel concern, which for one week made no deliveries and put many of their customers to great inconvenience. With many manufacturers custom has decreed the annual closing down for inventory purposes and they do not seem to be able to break away from it. To produce at a profit is what a manufacturing establishment exists for. To suspend this function cannot be considered good policy. Inventory taking can be done when it does not entail a loss of profitable productivity.

Values and Stores Inventories

Generally speaking a storekeeper thinks and calculates in quantities, not in values. In their larger aspects, and outside of the storeroom physical conditions which surround a storekeeper's work, values must be considered. If a storekeeper ponders these his vision projects itself into the purchasing agent's sphere in one direction and into the cost accountant's work in the other direction. There is no objection

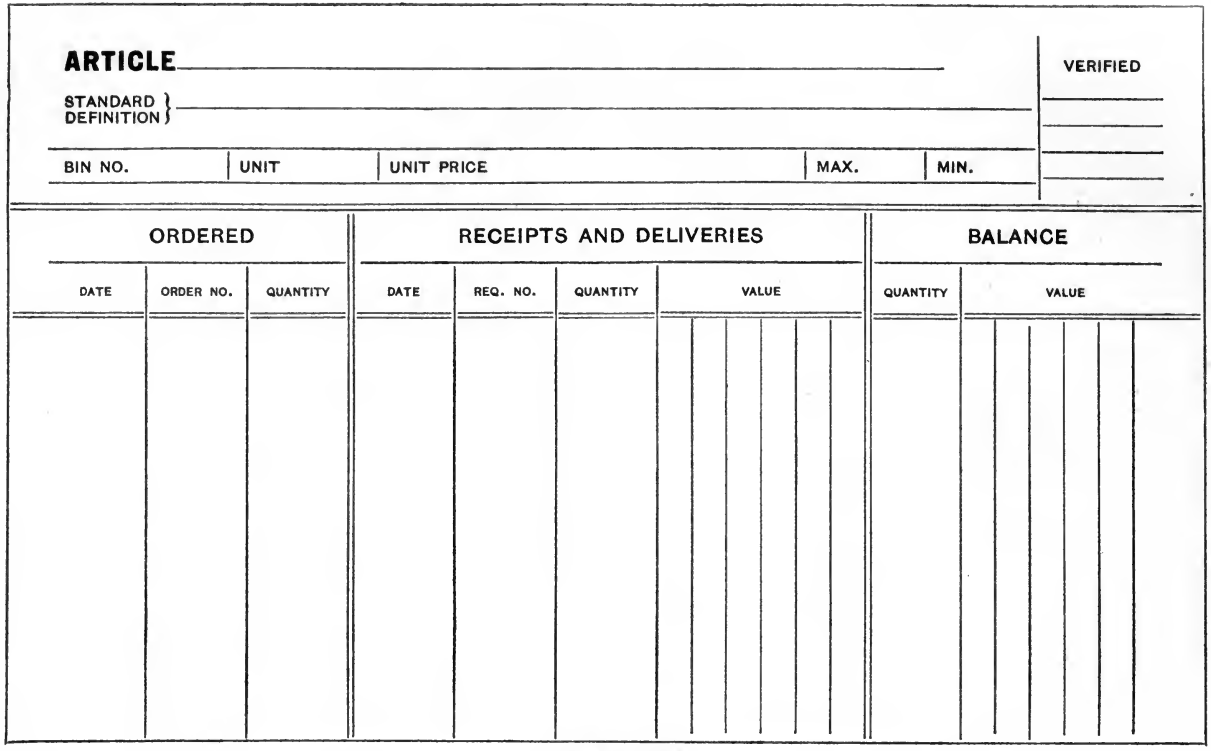


FIGURE No. 64

Perpetual inventory form with columns for recording values.

to a storekeeper having vision beyond his job, but it is from a desire to confine this discussion strictly to stores problems that so little has been said of values.

Some concerns insist on the records of values kept on the same form as the records of quantities, and an illustration is given of such a form in Figure 64. This scheme may be found advisable with some smaller concerns, and is certainly desirable when the accounting or cost departments do not keep such records.

In manufacturing establishments there are two methods of pricing the material delivered from the stores to the shop. The cause for there being more than one method is the fact that there is so often a variation in the price of articles received into the stores. For example, 1000 pounds of copper is received costing 40 cents per pound; 400 pounds of this is delivered to the shop, leaving a balance in the stores of 600 pounds. At this point 500 pounds more are received at 43 cents per pound. The total quantity in the stores would then be 1100 pounds and the average price would be 41.36 cents per pound.

It is a practice with some establishments to average the price immediately there is a change, because it is claimed that it is better to have one price apply on all material of the same kind. This is really making the stock of material in the stores subject to all market fluctuations. It is, of course, subject to these fluctuations, but for cost-keeping purposes in the factory, fluctuations of this character cannot be considered. This point has been discussed in Chapters Two and Three. Those who adopt this method argue that it is less liable to lead to mistakes, simplifies pricing of material, and renders the calculations

connected with arriving at the value of an inventory much easier.

On the other hand, there is much to be said against it. For instance, suppose the sales department made a contract to sell certain articles, the product of the factory, and among other materials in making these articles 1000 pounds of copper was needed. The shop might withdraw 600 pounds to commence the work, but on subsequent withdrawals the price would be raised. This is not fair or reasonable, because the original contract for the sale of the articles was made on the basis of 40 cents per pound for copper and it was procured and delivered into the stores at that price.

While it entails a little more clerical work it is good practice to charge out the 1000 pounds at the price paid, even if it was delivered in quantities of 10 or 20 pounds at a time. The theory in all stores-keeping is that the material which has been in the stores the greatest length of time should be delivered first; and this being the case, then it should be charged out at its own price, and not at the price of some later delivery.

In many manufacturing operations it is not desirable to have the stores show a profit or a loss, which it would do if the average pricing feature was in vogue. The only way to obviate this is to adopt the plan of charging the outgoing material at its incoming price. Of course, the regular percentage must be added to cover stores costs, and this percentage can be figured so closely that over a period of one year the balance one way or other is negligible.

CHAPTER IX

The Stores Department

The Storekeeper

THE man in charge of the stores of any establishment holds a responsible position. If it is a concern with many branches or factories he usually carries the title of General Storekeeper and would have assistants at each factory or branch. In such cases he may have under his control property worth millions of dollars, and his responsibility is a heavy one. Many concerns do not take this view of a storekeeper's duties, but look upon him as a man who simply has charge of receiving into and delivering out of the stores the material and articles used or needed in the establishment. He is not supposed to have a thinking job, but to have only physical duties. In many cases, even, the clerical work is taken from him and handled in the accounting office.

The position of a storekeeper needs better recognition; it needs recognition on a basis somewhat different from that which is usually accorded it. Sufficient consideration has not been given to the potentialities of the keeper of the stores. He is in complete control of a very large proportion of the wealth of many concerns. If he is not in complete control, it is because of lack of ability and vision on his part, or because he is not appreciated at his full worth, or because he is not given a standing commensurate with that to which he is entitled. From a wide experience

the author's opinion is that a sufficiently high standard is not placed on the position of the storekeeper. Observation will disclose plenty of instances where he is considered as a useful man to place articles in bins and on shelves provided for him, and to hand them out as needed. He is too often regarded as an amplified laborer, rather than as a man big enough to have a keen insight into the affairs of a concern.

This fact must be recognized — and there is ample evidence that many executives are beginning to recognize it — that storekeeping problems are problems of vital importance in the economics of business; they are of vital and individual importance in every establishment. This being so, then let us put in control of the vast amount of wealth in storage men who have the ability, capacity, keenness, and foresight to solve these problems.

Sphere of Usefulness

In Chapters Two and Three some points were discussed on storage economics. No concern which carries any material in storage for long or short periods can afford to ignore or refuse consideration to storage problems. The man who knows most about his business seldom fails, and the one who knows least is usually the one who does fail. A very large percentage of business failures are caused by buying too much or too little. The act of buying, however, is often only incidental; the real cause of the failure is frequently through lack of consideration to the after results, — the consequences which follow buying, — and this includes the care of the material while it is in the possession of the buyer, that is, while in storage.

An establishment composing many departments may use many varieties of material, and some of the departments may not come in contact with material used in other departments, but the storekeeper comes in contact with them all and long practice will give him a broader acquaintance and knowledge of the requirements of a concern than any other man. While he may not have such an intimate technical knowledge of the material as the man who is actually working it, still he should have some very good information of its general characteristics.

In the matter of the supplies used in and around an establishment the storekeeper should have a deciding voice. He should be a man who can determine the utility of an article. In some manufacturing plants very large sums are expended annually for such things as soap, cleaning compounds, disinfectants, oils, brooms, etc., and considerable duplication exists which could be avoided by placing the control of them entirely in the hands of one man, instead of permitting the supply of them to be influenced by the likes, dislikes, and prejudices of each department. Being in an independent position, serving all departments with equal fairness, he is in a position to weigh all the points connected with furnishing supplies with good judgment, and to give a decision fairly and judicially.

Relations with other Departments

The storeroom exists as a place of safe keeping for the materials needed throughout the establishment. Its resemblance to a bank can be again demonstrated, for it is the place of deposit of the wealth of a concern as represented in materials and supplies. It

MANILA TRANSMISSION ROPE

Circumference of Rope Inches	Diameter Inches	Approximate Weight per Foot 4-Strand Pounds	Approximate Breaking Strength Pounds	Largest Working Tension Pounds	Length of Splice Feet	Diameter of Smallest Sheave Inches	Maximum R. P. M. for 5000 ft. per min.	Approx. Tension Weight Pounds
2¼	¾	0.20	4,200	112	7	30	650	95
2⅝	⅞	0.26	5,700	153	8	35	550	125
3	1	0.34	7,500	200	10	40	475	175
3½	1⅛	0.42	8,900	250	10	45	425	225
3¾	1¼	0.52	11,700	310	10	50	400	275
4¼	1⅜	0.65	13,200	380	12	55	350	325
4½	1½	0.76	16,700	450	12	60	320	375
5	1⅝	0.87	18,500	530	12	65	290	425
5¼	1¾	1.04	23,000	610	12	70	270	550
6	2	1.34	30,000	800	14	80	240	650

Weight per foot = $0.34 \times \text{Diameter}^2$. Breaking Strength = $7500 \times \text{Diameter}^2$. Maximum Tension taken at $200 \times \text{Diameter}^3$. Diameter smallest Sheave advised = $40 \times$ Diameter.

CONTRACT WITH _____

DATE _____ EXPIRES _____

AVERAGE MONTHLY CONSUMPTION _____

ORDERS PLACED

FIGURE No. 65

The data on rope can be obtained from catalogues and on the same sheet a record can be kept of orders placed.

exists as a unit in an organization to supply from its deposits the needs of the other units. The attitude of the other departments will, therefore, be a reflection of the stores department's service to them and to some extent the gauge by which its efficiency will be measured.

The storekeeper should be in sympathy with the requirements of other departments, particularly in the matter of supplies, if these are under his control. Having control of these places him in a position where, should his decisions run counter to the desires of other departments, he may be accused of being out of sympathy with the legitimate aims and purposes of those departments. For this reason a certain amount of tact and diplomacy must be exercised.

Catalogues and Information

Every storekeeper should have information about the material and articles under his charge. He should know something about specifications and should be able to define correctly all goods by their recognized commercial definition. Specifications and definitions have already been discussed in Chapter Four. In compiling these definitions the storekeeper will have need of a good line of catalogues.

It is not just the fact that catalogues give the trade names of articles, the different sizes in which they are made, and the different grades, but they contain valuable technical information which forms a liberal education for the men in the storeroom. It must be remembered that technical information in catalogues is frequently written by experts in their particular line, by men whose ideals are the perfection of their product. Such information in catalogues can gener-

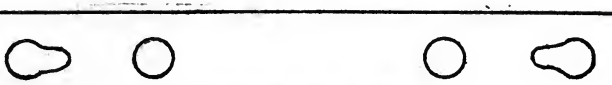


TABLE OF WEIGHTS OF

SHEET COPPER

Per Square Foot, and Thickness Per Stubs Gauge

Rolled Copper has specific gravity of 8.90. One cubic foot weighs 558.125 lbs.

Special sizes made to order.

Stubs wire gauge	Thickness in decimal parts of 1 inch	Weight per square foot in ounces	Weight of sheet 14x48 in. in pounds	Weight of sheet 24x48 in. in pounds	Weight of sheet 30x60 in. in pounds	Weight of sheet 36x72 in. in pounds	Weight of sheet 48x72 in. in pounds
35	.00537	4	1.16	2	3.12	4.50	6
33	.00806	6	1.75	3	4.68	6.75	9
31	.0107	8	2.33	4	6.25	9.	12
28	.0134	10	2.91	5	7.81	11.25	15
27	.0161	12	3.50	6	9.37	13.50	18
26	.0188	14	4.08	7	10.93	15.75	21
25	.0215	16	4.66	8	12.50	18	24
24	.0242	18	5.25	9	14.06	20.25	27
22	.0269	20	5.83	10	15.62	22.50	30
21	.0322	24	7.	12	18.75	27	36
19	.0430	32	9.33	16	25	36	48
18	.0538	40	11.66	20	31.25	45	60
16	.0645	48	14.	24	37.50	54	72
15	.0754	56	16.33	28	43.75	63	84
14	.0860	64	18.66	32	50	72	96
13	.095	70	.....	35	55	79	105
12	.109	81	.....	40½	63	91	122
11	.120	89	.....	44½	70	100	134
10	.134	100	.....	50	78	112	150
9	.148	110	.....	55	86	124	165
8	.165	123	.....	61	96	138	184
7	.180	134	.....	67	105	151	201
6	.203	151	.....	75½	118	170	227
5	.220	164	.....	82	128	184	246
4	.238	177	.....	88½	138	199	266
3	.259	193	.....	96	151	217	289
2	.284	211	.....	105½	165	238	317
1	.300	223	.....	111½	174	251	335
0	.340	253	.....	126½	198	285	380

Approximate Weight of Sheet Copper per Square Foot in Fractional Parts of an Inch

⅛ in. thick..... 3 lbs. to the square foot
⅛ in. thick..... 6 lbs. to the square foot
¼ in. thick..... 12 lbs. to the square foot
½ in. thick..... 24 lbs. to the square foot
1 in. thick..... 46½ lbs. to the square foot

The area of a circle is equal to the square of the diameter multiplied by 0.7854. The circumference of a circle is equal to the diameter multiplied by 3.1416.

To Ascertain the Weight of Copper—Find the number of cubic inches in the piece, multiply by 0.3214, and the product will be the weight in pounds. Or, multiply the length and breadth (in feet) and that by the pounds per square foot.

These weights are theoretically correct, but variations must be expected in practice.

FIGURE NO. 66

Method of recording information on sheet copper.

ally be accepted without reservations. But at the same time it must not be forgotten that catalogues are advertising mediums, and advertisements cannot always be taken at their face value. Catalogues, therefore, which contain general statements praising the articles described must often be considered as rating them above par, although it must be admitted that the modern tendency in catalogues is towards exactness in the claims made.

However, the catalogues are useful and a good library should be accumulated. The storeroom stands between the shop and the purchasing agent in industrial concerns, and there are many times in which the storekeeper is able to help out both departments. A case in point was in connection with some small brass rivets required by the shop for a special job in a hurry. A requisition for 10,000 of these with oval heads 3/32 of an inch in diameter and 5/16 of an inch long was sent to the storeroom. Not being an article usually carried in stock, a requisition was made on the purchasing agent to buy them.

After several days' fruitless work the purchasing agent abandoned the search for the article making the statement that such a size could not be obtained from stock and that the exigencies of the production department would not permit of its waiting to have them made. This result was reported back to the storeroom and it came to the attention of the assistant storekeeper, who, on referring to catalogues, found that escutcheon pins could be obtained in the size required. On reporting this to the production department it immediately decided these would answer the purpose and the difficulty was overcome.

STAR HACK SAW BLADES AND MACHINES

HACK SAW BLADES FOR HAND USE

Fig. 11279A

These blades are made from the highest grade of steel according to a special formula. They are perfectly toothed with a patent set, scientifically designed and correct as to width, thickness and number of teeth to the inch.

Size Inches	Teeth per Inch	Weight per Gross Pounds	Price per Gross	Size Inches	Teeth per Inch	Weight per Gross Pounds	Price per Gross
6x⅜x.022	14, 24	2¾	7.00	10x½x.022	14, 24	4⅝	10.00
7x⅜x.022	14, 24	3	7.50	11x½x.022	14, 24	5	11.00
8x⅜x.022	14, 24	3¼	8.00	12x½x.025	14, 24	5½	12.00
9x⅜x.022	14, 24	3½	9.00	14x½x.030	14	10	15.00

Packed ½ gross in a pasteboard box.

HACK SAW BLADES FOR POWER USE

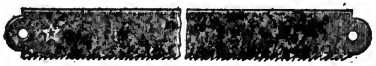


Fig. 11279B

12x ⅝x.032	14	10	14.40	14x1x.049	10	28	31.20
12x ¾x.032	14	13	15.00	17x1x.049	10	34	36.00
12x ¾x.049	10	15¾	18.00	17x1x.065	10	45	39.00
12x1 x.049	10	25	28.80	24x1x.049	10	48	50.40
14x ¾x.032	14	14	18.00	24x1x.065	10	63	54.00
14x ¾x.049	10	18	21.60	.....	..	..	.....

Inch Gauge	.032	.049	.065
Packed in Pasteboard Box .....gross	½	⅓	¼

CONTRACT WITH _____

DATE _____ EXPIRES _____

AVERAGE MONTHLY CONSUMPTION _____

ORDERS PLACED			

FIGURE No. 67

This shows method of recording contract date and consumption.

WEIGHT OF

WIRE

COPPER, BRASS, IRON AND STEEL

Diameters Determined by Brown & Sharpe Gauge

No. of gauge	Decimal equiv., inch	Weight of wire per 1000 linear feet			
		Wrought iron, pounds	Steel, pounds	Copper, pounds	Brass, pounds
0000	.46000	560.74	566.03	641.2	605.18
000	.40964	444.68	448.88	508.5	479.91
00	.36480	352.66	355.99	403.3	380.67
0	.32486	279.67	282.30	319.8	301.82
1	.28930	221.79	223.89	253.6	239.35
2	.25763	175.89	177.55	201.1	189.82
3	.22942	139.48	140.80	159.5	150.52
4	.20431	110.62	111.66	126.5	119.38
5	.18194	87.720	88.548	100.3	94.666
6	.16202	69.565	70.221	79.55	75.075
7	.14428	55.165	55.685	63.09	59.545
8	.12849	43.751	44.164	50.03	47.219
9	.11443	34.699	35.026	39.68	37.437
10	.10189	27.512	27.772	31.46	29.687
11	.090742	21.820	22.026	24.95	23.549
12	.080808	17.304	17.468	19.79	18.676
13	.071961	13.722	13.851	15.69	14.809
14	.064084	10.886	10.989	12.44	11.746
15	.057068	8.631	8.712	9.869	9.315
16	.050820	6.845	6.909	7.827	7.587
17	.045257	5.427	5.478	6.207	5.857
18	.040303	4.304	4.344	4.922	4.645
19	.035890	2.413	3.445	3.904	3.684
20	.031961	2.708	2.734	3.096	2.920
21	.028462	2.147	2.167	2.455	2.317
22	.025347	1.703	1.719	1.947	1.838
23	.022571	1.350	1.363	1.544	1.457
24	.020100	1.071	1.081	1.224	1.155
25	.017900	.8491	.8571	.9710	.9163
26	.01594	.6734	.6797	.7700	.7267
27	.014195	.5340	.5391	.6107	.5763
28	.012641	.4235	.4275	.4843	.4570
29	.011257	.3358	.3389	.3841	.3624
30	.010025	.2663	.2688	.3046	.2874
31	.008928	.2113	.2132	.2415	.2280
32	.007950	.1675	.1691	.1915	.1808
33	.007080	.1328	.1341	.1519	.1434
34	.006304	.1053	.1063	.1205	.1137
35	.005614	.08366	.08445	.09553	.09015
36	.005000	.06625	.06687	.07576	.0715
37	.004453	.05255	.05304	.06008	.05671
38	.003965	.04166	.04205	.04765	.04496
39	.003531	.03305	.03336	.03778	.03566
40	.003144	.02620	.02644	.02996	.02827
Specific gravity		7.7747	7.848	8.900	8.461
Weight cubic foot		485.874	490.45	555.6	528.2

These weights are theoretically correct, but variations must be expected in practice.

FIGURE No. 68

Recording information regarding weight of wire.

Steel Collars

With or Without Set Screws

Shaft Diam. Inches	List Price	Diam. Inches	Width Inches	Shaft Diam. Inches	List Price	Diam. Inches	Width Inches
1 3/16	$ .60	1 3/4	1 3/16	3 1/16	$5.50	5 1/16	1 7/8
1 3/16	.80	2	7/8	4 7/16	6.00	6 3/16	1 7/8
1 5/16	.90	2 5/16	1 5/16	4 1/16	7.25	6 1/16	2
1 7/16	1.00	2 3/16	1	5 3/16	8.50	7 3/16	2
1 1/16	1.25	2 1/16	1	5 7/16	10.00	7 7/16	2
1 5/16	1.60	3	1 1/16	6 3/16	12.50	8 5/16	2
2 3/16	1.90	3 7/16	1 1/4	6 7/16	14.00	9 1/4	2 3/16
2 7/16	2.40	3 1/16	1 3/16	8	19.50	10 1/4	2 3/16
2 1/16	2.70	4 1/4	1 1/2	9	25.00	11 1/2	2 1/2
2 5/16	3.00	4 7/16	1 1/2	10	32.00	12 1/2	2 1/2
3 7/16	4.50	5 1/16	1 1/16				

ORDERS PLACED

FIGURE No. 69

Extract from catalogue with data on steel collars.

Probably great changes will take place in the method of compiling and issuing catalogues in the near future. In fact, the change has commenced, but so little has yet been done that it does not carry much weight. There is no good reason why such a large variety of sizes should exist or why there should be so little uniformity in their compilation. Why are some

ARTICLE OR MATERIAL_____

MANUFACTURER	ADDRESS	SECTION	CAT. NO.

FIGURE NO. 70

Index card for catalogues, size 3 × 5 inches.

printed with the index in the front and others with it in the back? Why do some have prices attached and others have separate price lists?

Uniformity in these particulars would make catalogues much more valuable, or at least more convenient for reference. This of itself would increase their value, because of the greater ease in referring to them. A very wide movement is on foot to standard-

ize catalogues. The eventual outcome of this movement will probably be the adoption of the bulletin form of standard size, each bulletin describing one machine or article. This form has already been put in force by many manufacturers.

The best method of filing catalogues is to group them according to size. Owing to the lack of uni-

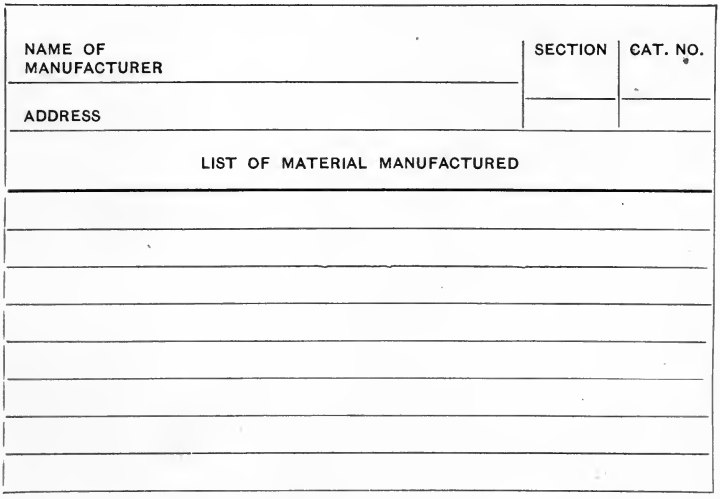


FIGURE NO. 71

Index card for catalogues under name of manufacturer.

formity in size already alluded to, catalogue filing is loose, ragged, and uneconomical at best as far as space conditions are concerned. But until this defect is remedied the best that can be done is to group the sizes. If attempts are made to group in subjects, all the disadvantages named are aggravated. A good cross index should be kept, as indicated in Figures 70 and 71.

Charts and Diagrams

Some very useful charts can be kept by the storekeeper, especially if he is in control of all supplies. He can, for instance, keep a chart of cotton waste used showing increase or decrease in consumption, made by any change in the quality used. This applies also to lubricating oils, files, and innumerable small tools. Of course it is not intended to suggest the charting of things not worth while, but charts are much more illuminative than mere figures and they take very little time to prepare.

Possibly these charts or diagrams might be extended to advantage to some of the raw materials, but this may be going somewhat beyond the storekeeper's province. Anyhow they would show beyond a question of doubt just when consumption was greatest and when it was lowest. These fluctuations are important, because if there are wide fluctuations during the course of the year in the demand for material the storekeeper should know it in order to specify the correct delivery dates in his requisition to the purchasing agent.

Personnel of the Stores Department

Only a general outline of the employees necessary for this work can be given, because of the great variation in the amount of work to be done. Some very large concerns may have much less actual storeroom work than smaller concerns. This is because of the nature of the product manufactured. The class of storing which involves an enormous amount of detail work is that in which the product is made up of an infinitesimal number of small parts, many of these

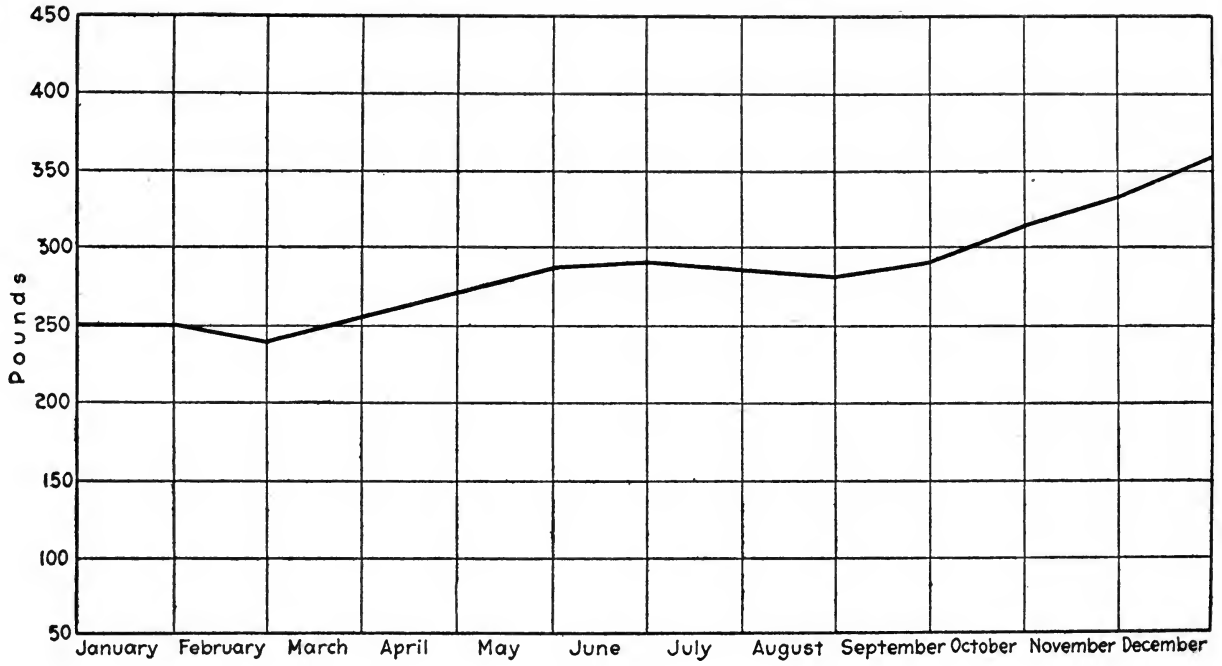


FIGURE No. 72

Chart showing variations amount of cotton waste issued by storeroom monthly over a period of one year.

parts being themselves composed of more than one kind of material.

Some establishments have factories or warehouses located in different parts of the country with a general storekeeper who supervises the storerooms in each locality, having an assistant or man in charge at each place. If these are not separated too widely it may be possible to keep the clerical records in one central office. This would depend to a large extent on the arrangements made for cost-keeping and accounting work. If these could be centralized, then it is quite possible to follow the same course with the final stages of the stores clerical work, that is, the perpetual inventory.

The clerical work itself naturally varies greatly, because of the difference in the product as already stated. For instance, one concern may make 20 deliveries from the stores, while another concern equally large and doing as much or more business may make only one delivery. The author recently investigated the methods used in a stores where over 70,000 items were carried in stock, while in another there were only about 3000, yet these two concerns were doing in dollars and cents practically the same amount of business annually.

There are certain fundamentals in storage work which must be observed. It is impossible to get away from them if the work is to be done properly, irrespective of the size of the concern. These will be outlined, but in considering these the fact should be kept constantly in the foreground that nowhere is orderliness, system, and cleanliness more essential than in the storeroom. Some shops may get through a vast

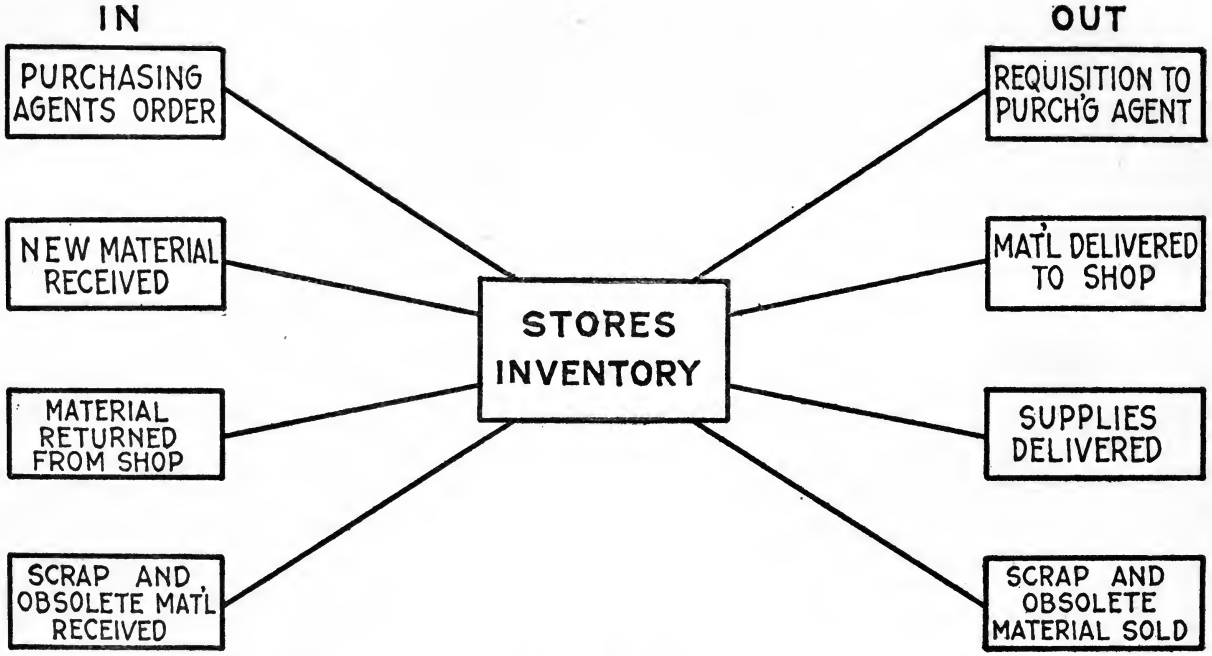


FIGURE No. 73

Diagram showing relation of the various storeroom operations to the perpetual inventory.

amount of work with very untidy conditions, and the output may not suffer from this condition, but not so in the storeroom. Damage, deterioration, and irregularities, involving losses which can only be estimated, will occur if the storeroom is not kept clean and orderly. There should be a place for everything and everything in its place. To accomplish this one must have assistants who are themselves clean and orderly. They must be methodical, but at the same time alert. The storeroom is too often looked upon as a lounging place. Some workmen and messengers like to go there for material, because of the opportunity it offers for loafing for a few minutes. The storeroom help can largely obviate this by promptness in filling their requirements.

Outline of Work

In subsequent chapters it is proposed to discuss in detail all features of the routine work of a storeroom. For a comprehensive appreciation of what this work covers the reader is referred to the accompanying diagram (Figure 73). In explanation of this the main features are enumerated as follows:

1. When any material arrives some form of receipt must be given for it and some form of record must be made of its arrival in the establishment.
2. There must be some form of inspection and examination. Goods may be received in packages or some form of container and an acknowledgment given for the receipt of so many packages, but later the contents must be scrutinized and checked with the shipper's statement.

3. The goods must be passed along to their ultimate destination. This may be a separate warehouse, or it may be the storeroom adjacent to the receiving room, or the material may pass directly into the shop for immediate use in production work.
4. The goods must be placed on shelves or racks or in bins, drawers, or other receptacles in the respective places already assigned to them.
5. Proper entries must be immediately posted on the stores records of the receipt and disposition of the goods.
6. Requisitions will come in for the withdrawal of material from stores; these must be examined for authenticity and accuracy.
7. If the material is in the stores, it must be delivered promptly and in good order.
8. Proper entries must be made immediately on the perpetual inventory of the withdrawal from the stores.
9. Requisitions should be sent promptly to the purchasing agent, with instructions to buy such material as may be required, but which is not ordinarily kept in the stores.
10. Requisitions should be sent to the purchasing agent daily, with instructions to buy regular stores material, which on account of the withdrawals has passed the minimum point which has been predetermined.

CHAPTER X

Receiving Material

The Delivery Point

EVERY order placed for material should specify a place of delivery. If goods are bought locally the seller may deliver at the buyer's warehouse, factory, or place of business, or the sale may have been f. o. b. the seller's warehouse. In the latter case the buyer must arrange to get the goods to their ultimate destination. In the case of material purchased from a seller located at some distance from the buyer's place of business the delivery point may be either f. o. b. point of shipment or f. o. b. destination.

There are other variations in stipulating delivery points; but wherever this point may be, it is the place where ownership of the material passes from the seller to the buyer. The seller, therefore, has fulfilled his part of the contract by delivering the material to the transportation company at the point named. This point may be several hundred miles from the buyer's place of business, and if the material should be lost or damaged in transit subsequent to the delivery being made, the buyer would, nevertheless, have to pay for it.

Questions regarding delivery do not usually come within the scope of the storekeeper's work, but occasionally the regulations of an organization call for the storekeeper to take charge of material at the delivery

point and get it transported to its final destination. It is necessary, therefore, to make some reference to these questions. The principal fact to be borne in mind is that the delivery point specified is the place at which ownership passes to the buyer, and that any transportation or trucking company receiving material at that point simply acts as agent for the owner.

Tracing Shipments

In Chapters Two and Three storeroom economics were discussed from many angles, and many of the factors outlined in that discussion apply equally to material, whether in transit or in the stores. These points should be given due consideration and the material followed up closely to avoid delays. In the case of local deliveries it may be found advisable to have one's own trucking system, or arrangements must be made to have the sellers deliver the goods to some reliable local expressman. When the deliveries are made to railroad, steamship, or express companies it is imperative for the man who is going to follow up the goods to have documentary evidence of shipment, that is, a bill of lading or express receipt. In case of delays these are needed, because the particulars on these documents must be quoted when making inquiries.

In all work connected with tracing shipments discrimination should be used. There are too many requests made on the transportation companies to trace shipments, and if no discretion is used in making the requests they will be disregarded. Some buyers will insert a clause on all orders reading "Ship and trace," and insist on a tracer being put on all shipments

as soon as they are made. This is not good practice, for a sufficient amount of time should be allowed to elapse to permit material to reach destination, and if it does not show up promptly a tracer should then be started.

Getting Delivery

Securing delivery of material or "following up" an order, as it is generally termed, is work that usually comes within the purchasing routine, but there are cases where a storekeeper may have to take care of following-up orders placed for the storeroom. In a manufacturing plant the production department looks to the storeroom to supply its needs, and the storeroom looks to the purchasing agent to buy what it requires and usually to get delivery, but in the case of an establishment having several factories in different parts of the country, with a central purchasing department, considerable time is consumed if the storekeeper in a far distant factory applies to the purchasing agent for information regarding delivery. He can do this himself in certain instances, particularly in those cases where the supplier is located nearer to the factory than to the purchasing agent's office.

It is exceedingly difficult to get satisfactory results with follow-up work, because the shippers are lavish with promises and tardy in performances. Promises are intangible at best, although some concerns, jealous of their reputations, will strictly live up to them. This, however, is the exception and not the rule. Because one has a promise of shipment one cannot sit back at ease. These promises must be converted into performances and the material obtained when it is needed.

FORM 654 (REV. 5-5-16)

FOLLOW UP ON MATERIAL ORDERS

TO _____ DATE _____

_____

_____

PLEASE ADVISE BELOW WHEN YOU WILL SHIP MATERIAL SPECIFIED ON OUR ORDER

DATE _____

OUR NO _____

YOUR NO _____

SHOP NO _____

OTIS ELEVATOR COMPANY

_____ OFFICE

REPLY (DO NOT DETACH FROM ABOVE)

DATE _____

THE ABOVE ORDER _____ SHIPPED _____

FROM _____ VIA _____

REMARKS:

SIGNED _____

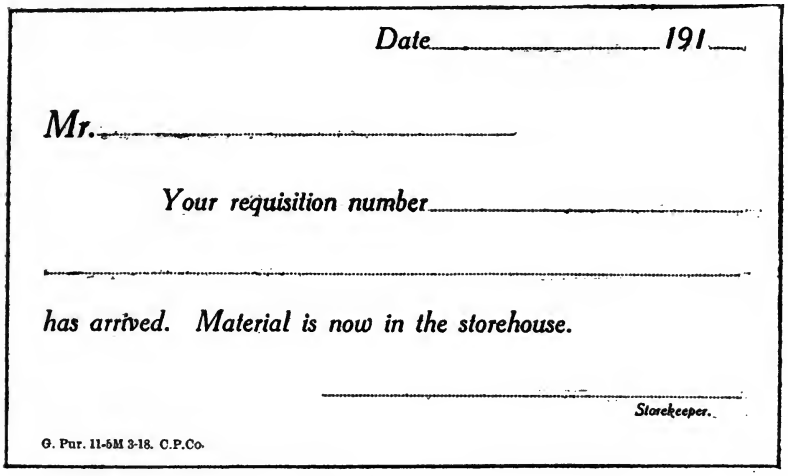
FIGURE No. 74

Form for requesting information regarding shipment of material.

Following up an order means that the intent and purpose of the order must be followed to their logical conclusion by the delivery of the goods. The storekeeper should be furnished with a copy of the purchasing agent's order, which should specify the time and place of delivery. There are two ways in which the storekeeper can handle these copies of orders. He can keep them in numerical sequence or segregate them under the dates on which deliveries are required, or are to be made. For instance, if he has some orders which call for delivery on the 20th of the month, he should place these in a folder or pigeon hole for attention a week to ten days in advance of that date. Possibly some orders may need more time than this. The main thing is to get some assurance of as positive a nature as possible as to shipment. A form can be used similar to Figure 74 for the preliminary inquiry. If this fails to bring the desired answer it can be followed by a similar form stamped "Second request, please answer." If the material is very urgently needed a courteously worded letter may be substituted for the second inquiry form; if a third inquiry is necessary it should always be used.

If the routine outlined is followed with discretion and useless and trivial inquiries eliminated, good results can usually be obtained. There are exceptional cases, however, which require exceptional treatment. In the recent strenuous times many large concerns have found it necessary to keep several men out traveling to the seller's factories to follow up orders and secure delivery. Some concerns are very free with promises, but give little regard to living up to them. The writer has before him now four letters

from a large manufacturing concern and signed by an officer of the company giving the most definite assurances regarding shipment of material. These letters are dated about ten days apart, all refer to the same material, all are facile and easy in style, and all name a different shipping date, which is usually specified



*Date*_____ *191*__

*Mr.*_____

*Your requisition number*_____

_____

has arrived. Material is now in the storehouse.

_____

Storekeeper.

G. Pur. 11-5M 3-18. C.P.Co.

FIGURE No. 75
Form for notifying departments that material has arrived.

as two or three days subsequent to the date of the letter. None of these promises were kept and in such cases some other source of supply must be found.

Receiving Material at Destination

All materials and articles on arrival at the purchaser's place of business must have a record made of their arrival. They must undergo some form of inspection or examination, and must be passed along to their temporary resting place in the storeroom or to the place where they are to be utilized for production work or otherwise, as the case may be.

Form Y-605 (Rev. 3-1-16)

PROGRESS REPORT

_____ 19____

_____

MATERIAL ORDERED BY YOU ON YOUR REQUISITION NO._____

OUR P. O. No._____, AS FOLLOWS:

WILL BE SHIPPED_____ FROM_____

VIA _____

REMARKS:

FIGURE No. 76

When material is requisitioned by outside storerooms and has to be purchased, a form similar to this can be used to advise shipment.

In some small establishments it may be found advisable to receive and inspect incoming material in the storeroom or in connection with the shipping room. Some concerns may have a separate receiving room, but have the inspection done in the storeroom. There is this fact to be considered, that many goods and particularly small articles are in some form of package or container, and the person receiving these can only record the receipt of so many barrels, boxes, bags, and so on as the case may be, unless they are opened and the contents counted, weighed, or measured, as might be necessary. In those establishments where the movement of goods is frequent enough to warrant it, it is certainly preferable to separate the activities of receiving, inspecting, and storing. Even in small establishments, if such work is all done by one man, the three functions are separated and distinct and will be discussed in that manner.

Owing principally to differences in accounting methods, some receiving clerks report to the accountant's office and others to the purchasing department. It is better for them to be independent of any department, because their work brings them into contact with the stores, purchasing, and accounting departments, and it is desirable not to have their movements controlled by any one of these departments. They can then serve them all with equal fairness.

The receiving clerk should be advised of what goods are coming in. The best way to accomplish this is to furnish him with a copy of all orders issued. It is contended by some persons that if the receiving clerk did not have this information he would more carefully check incoming material, but it is not good

policy to keep him in ignorance on this point, because he might receive material in excess of the quantity ordered or material not ordered at all, or which had been cancelled. When such occurrences do happen it necessitates referring the matter back to the shipper. This frequently results in long negotiations and involves expense in returning the materials, besides the inconvenience and disorganization entailed in making the adjustment. In those establishments formed on departmental lines it is essential for the receiving clerk to know to which department the material belongs, if it does not go directly into the storeroom.

It is, of course, essential for the receiving clerk to make some form of return either to the purchasing or accounting department to enable them to pass the invoices. There are several methods in vogue for doing this. One scheme is to give the receiving clerk a copy of each requisition sent to the purchasing agent. After the order is placed by the purchasing department it notes on the receiving clerk's copy of the requisition the name of the seller and the order number, but not the price, as it is not necessary for him to know this. The copy given to him bears on the reverse side a form for recording receipt of the material (see Figure 77). This receipt, when properly filled in, is returned to the purchasing or accounting department and attached to the invoice. This scheme has one big defect. Quite often the material specified on a requisition is ordered from more than one concern, or if ordered from one concern is sometimes delivered in several installments. There are some establishments, however, where it is used with success, but it cannot be recommended unless the material comes in in one shipment.

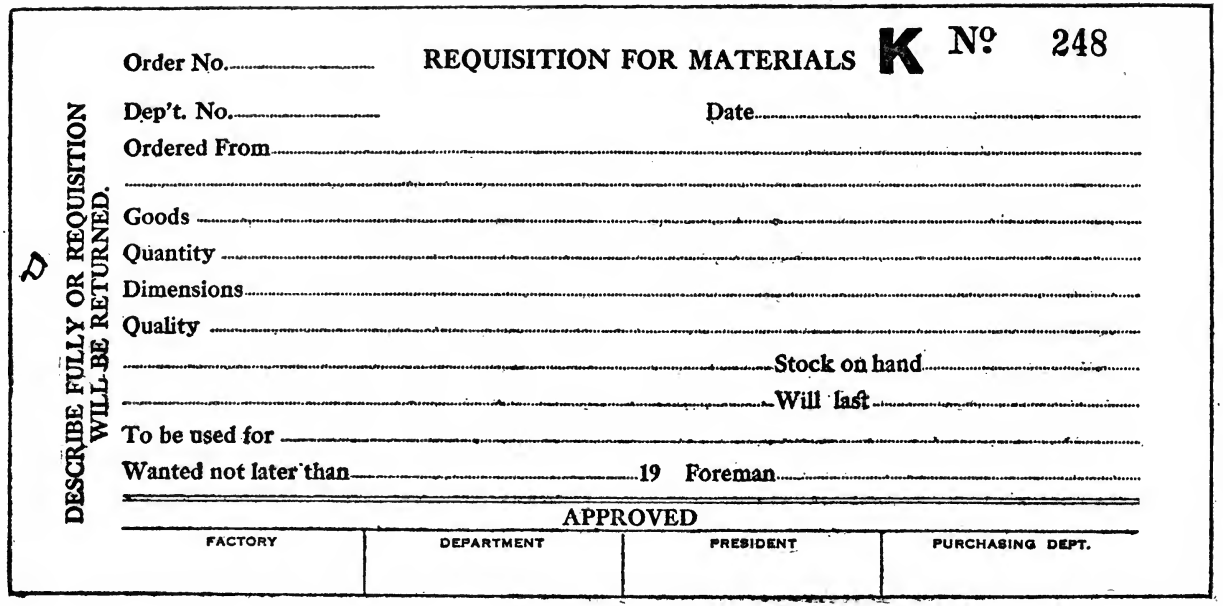


FIGURE No. 77

This requisition bears on the reverse side spaces for recording receipt of material.

NOTICE: A DETAILED REPORT OF THE GOODS MENTIONED ON THE OPPOSITE SIDE OF THIS SHEET MUST BE MADE IN THE SPACE BELOW. PARTIAL RECEIPTS SHOULD BE REPORTED ON FORM 423.

DATE	HOW DEL'D	QUANTITY	F. O. B. POINT	FREIGHT	CHARGED TO	CLASS	AMOUNT

RECEIVED BY_____

APPROVED_____

APPROVAL MUST BE BY MGR. OR SUPT. OR ONE DULY AUTHORIZED.

FIGURE No. 78

Reverse side of copy of order for recording receipt of material.

Another scheme is to furnish the receiving clerk with a copy of the purchase order to be used in a similar manner to the requisition described in the preceding paragraph. This also bears a form of

FORM 423 FROM

RECD_____ 19 _____

QUANTITY	MATERIAL	PURCHASE ORDER NO

_____ RECEIVING CLERK

QUALITY	F O B
QUANTITY	FREIGHT
PRICE	MFG NO
EXTENSIONS	REQ NO

JOB NO	CHARGE TO	CLASS	AMOUNT
APPROVED		TOTAL	

FIGURE No. 79

Supplementary form to Figure 78 for recording partial receipts.

receipt on the reverse side, as illustrated in Figure 78. This suffers from the same defect noted in regard to the requisition. There is, however, a point about this scheme worth consideration. The pur-

chase orders issued by a concern constitute a lot of floating obligations, and some establishments find it necessary to keep track of these and to have a reliable record as to when they are closed. This is effected by the accounting department, which receives a copy of the purchase order, and also obtains from the receiving clerk his copy when the receipt on the back is filled in. This method gives the accountant information as to all purchase obligations and he knows from the receiving clerk's copy when each obligation is closed. If an order should be delivered in installments it is necessary to use a supplementary form, as shown in Figure 79, for all deliveries except the last one. It is only when delivery is complete that the receiving clerk surrenders his copy of the order.

The use of either scheme outlined means some duplication of work for the receiving clerk, because he must make a record of incoming material anyhow, and this record can be made in duplicate, one copy going to the purchasing or accounting department for the purpose of checking invoices.

The system which is recommended for recording receipt of material is indicated in Figure 80. This form should be in triplicate and each delivery recorded on a separate sheet. The three copies are disposed of as follows. One is kept by the receiving clerk and filed in numerical sequence, which should also be the order of dating. The latter is important, because questions are frequently asked regarding receipt of material and it is generally the date which is given as a reference. The second copy goes to the purchasing department and serves as a notification of the delivery of material. Later it can be attached

RECEIVED ON ACCOUNT OF ORDER NO. DATE

FROM

VIA	F.O.B. POINT	FRT. CHARGES

QUANTITY	UNIT	DESCRIPTION OF MATERIAL

SIGNED_____
RECEIVING CLERK

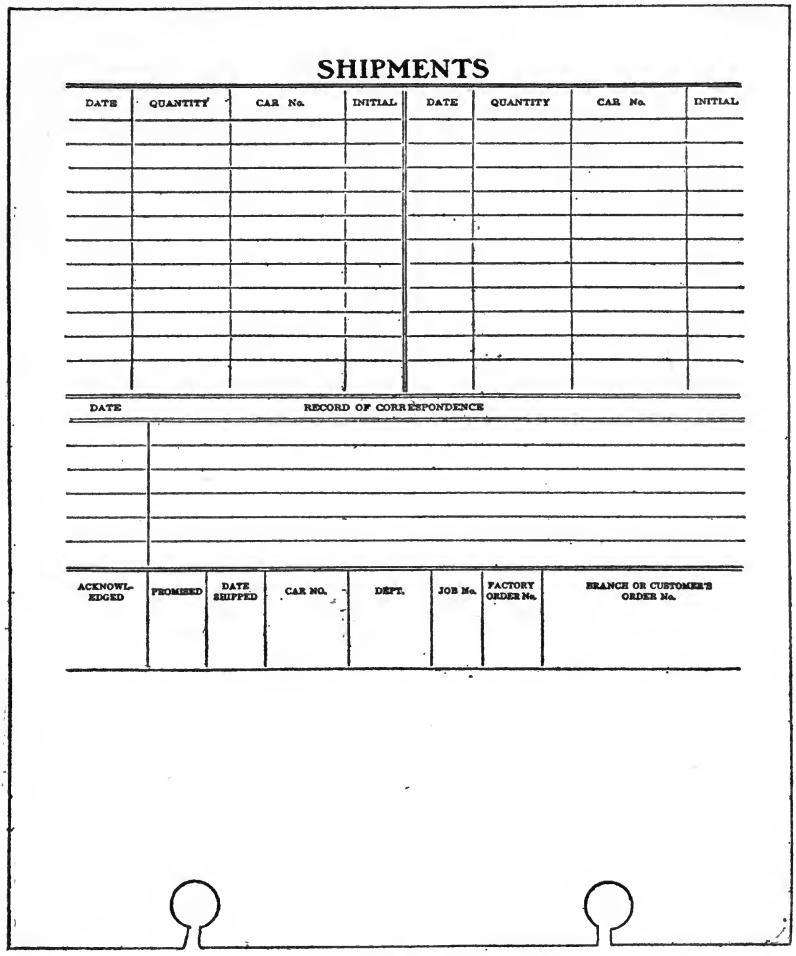
INSPECTION REPORT

SIGNED_____
INSPECTOR

RECEIVED INTO STORES	CHECKED WITH INVOICE
SIGNED_____ STOREKEEPER	SIGNED_____ INVOICE CLERK

FIGURE NO. 80
Receiving report in triplicate.

to the invoice. If this is strictly followed no invoice could ever be paid twice, neither could an invoice be



SHIPMENTS

DATE	QUANTITY	CAR No.	INITIAL	DATE	QUANTITY	CAR No.	INITIAL

DATE	RECORD OF CORRESPONDENCE

ACKNOWLEDGED	PROMISED	DATE SHIPPED	CAR NO.	DEPT.	JOB No.	FACTORY ORDER No.	BRANCH OR CUSTOMER'S ORDER No.

FIGURE No. 81

Reverse side of order, used for recording shipments and correspondence.

paid for material not received. The third copy follows the material to the inspector, the storeroom, or other department, as the case may be.

If material on arrival is found not to be in accordance with the purchase order, it should be immediately reported to the purchasing department, so that it may take the matter up with the shipper promptly. All reports of incoming material should always be sent to the purchasing department and other interested departments promptly, because one of them may be following up delivery and it is essential for them to have the advice of its arrival as quickly as possible. All freight or express charges should without fail be noted on all receiving reports. This is important because when the invoice is checked it is necessary to know whether such charges are in accordance with the terms of purchase.

CHAPTER XI

Placing and Locating Material in the Storeroom

Inspection and Examination

ALL articles and materials received into an establishment must necessarily pass some kind of inspection. For instance, if a keg of nuts is received and the receiving clerk checks the weight and finds it correct, still there must be some sort of examination so that one may know that the nuts are the right size with the right thread and that they conform to the order in all respects, that is, if cold punched nuts are ordered one does not want to receive hot pressed nuts.

Some forms of inspection need be only very casual; that is, one can tell by a glance whether material of certain kinds is all right. Other material needs very careful examination; it may need to be measured or gauged, or both, or put to some simple tests. Still other material may have to be rigidly tested with some physical testing machine, or may have to pass a chemical analysis. When material is to undergo these forms of testing the purchase order should specify in what manner they are to be done, or the results which must be obtained from the tests.

Another form of inspection is that which takes place at the seller's place of business. This may be done during the manufacturing process, or when finished, but prior to shipment; or the seller may make

and submit a sample before proceeding to manufacture the bulk of the order. When such a sample is approved it should be properly identified with the order and turned over to the inspector who is to examine the material on arrival so that he can make exact comparisons with the bulk. The need of inspection is not fully realized by many concerns; it is too often the weakest link in the chain of activities connected with receiving and storing material.

Inspection before Delivery

Some large concerns have men on their permanent staff who are sent to the seller's factory or place of business to inspect material while it is going through the manufacturing process or when it is completed ready for shipment. In the latter case they may have to see it loaded on to cars. He should make his report in some such manner as indicated in Figure 82. This method of inspection is largely adopted in all important contracts for material which it is essential should be uniform in its characteristics. It should also always be done in those cases where payment has to be made before it could be inspected on arrival at destination, or when it has to be transported very long distances. A concern not having men on its staff fitted for this kind of work can always secure the services of a reputable firm of inspecting engineers to undertake this work.

Inspection after Delivery

The manner in which this can best be done will depend largely on the way the work is allocated in the establishment. It can be done by the receiving clerk, if he has the time and the necessary ability;

INSPECTION REPORT

ORDER NO._____ DATE OF ORDER_____ DATE MATERIAL WAS READY FOR INSPECTION_____

PURCHASED FROM_____

MATERIAL_____

PLACE OF INSPECTION_____

DATE OF INSPECTION_____ DATE REPORT SENT IN_____

DETAILS OF INSPECTION AND TESTS

SIGNED_____

COPIES OF THIS REPORT SENT TO

_____

_____

_____

_____

REPORT APPROVED BY

_____

DATE_____

FIGURE No. 82

Form used by inspectors for making reports.

it can be done by a member of the stores department, or there can be an inspection department independent of either. In any case it should be done promptly after the material arrives, because if in any particular the material should be found faulty the seller should be advised without delay. Another reason why inspection should not be postponed is that if a sudden call were made for the material for use in the shop and it was found to be incorrect, it would disorganize the routine and probably involve considerable expense in making hurried purchases of the right material.

The inspection referred to in the last paragraph means the examination for any defects, except those which it is necessary to prove through a chemical analysis, or those which are carried out by the technical staff. Any competent man accustomed to handling material can, with the exercise of care, discover superficial flaws and poor finish, or whether the material has suffered from exposure to atmospheric conditions, or from poor packing or rough handling. He can also detect irregularity in the size of small articles and can make measurements with the use of simple instruments such as gauges, calipers and micrometers. It is such inspection as this that is referred to here. The record of this inspection can be made on the form illustrated in the last chapter (Figure 80).

Inspection which calls for complicated physical tests or chemical analysis must be undertaken by some firm of inspecting engineers, if an establishment does not have the apparatus and staff to do such work itself. In these cases samples for testing purposes must be taken from incoming material and be prop-

erly marked or tagged with the order number. They should then be sent promptly for testing, accompanied by a form similar to Figure 83. This can be in triplicate or quadruplicate, as may be necessary. The purchasing, technical, and stores departments would probably each require a copy.

Receiving Material into Storeroom

During the preceding discussion we have followed the course of the material to a point where it is ready to pass into the stores or directly into the shop. It is of the utmost importance to efficient storeskeeping that all articles and material be placed in the receptacles assigned to them. If this is not done it is exceedingly difficult to keep the records accurate; material will get piled up until some more favorable opportunity presents itself for disposing of it. This means that it may get damaged or mixed with other sizes. If material is allowed to lie around the entrance to the stores, it is not unlikely that when deliveries are being made the material will be taken from there instead of from the regular bin or location. Such methods can only lead to confusion and inaccuracies.

It has been emphasized in earlier chapters that all manual operations must be maintained at an equal degree of efficiency with the clerical operations. The dual nature of storeroom work requires this. Any form of carelessness will lead to mistakes in manual work and probably the most common form is that of permitting delays to occur before placing articles in the locations assigned to them. When material is taken out of the bins delays will not be tolerated, because it is usually wanted at once and probably

REPORT OF TEST

PURCHASE ORDER NO._____ DATE_____

NOTE: REFER TO PURCHASE ORDER OR SPECIFICATION FOR NATURE OF TEST
THE MATERIAL LISTED BELOW IS SUBMITTED FOR TESTING PURPOSES

SIGNED_____
STOREKEEPER

DATE RECEIVED	QUANTITY	MATERIAL	CAR NO.

RESULT OF TEST

COPIES TO

_____

_____

_____

SIGNED_____

DATE TEST WAS MADE_____

FIGURE No. 83

Form for reporting results of physical or chemical tests.

there is a messenger or runner waiting for it. Likewise, there should be no delays in placing it in the bins.

Placing Material in Receptacles

The most important rule to follow is to have a place for everything and keep everything in its place. These places should be properly numbered and the contents designated. That is, every article in the stores should have an address and this address should be entered in the stores ledger just as rigidly as if it were the address of a customer in the sales ledger. It should be possible for a person unacquainted with the storeroom to obtain the location of an article from the perpetual inventory, and then be able to go directly to that location without hesitation.

All shelves, racks, bins, or other receptacles should be numbered and all tiers or sections lettered or numbered. Metal flags can be used to good effect, particularly in numbering the sections or tiers. In addition there should be a card holder on each receptacle containing a card bearing the name of the article. No matter what the article may be, it has a name, a size, a weight or some distinguishing characteristics, and these should be inscribed on the card corresponding with the description in the perpetual inventory. The practice of taking small articles into the stores, approaching the bins where they are supposed to go, extracting one of its contents, matching it up with the new articles, and, if apparently found to correspond, dumping the new lot in with the old, cannot be too strongly condemned. The written description of the incoming material should be checked with the written description on the bin ticket.

Material Returned to Stores

If for any reason it is found necessary to return material to the storeroom it must follow the same course of procedure as new material. That is, it must be accompanied by some document and must be placed at once in the proper receptacles.

CREDIT REQUISITION

CREDIT IS REQUESTED FOR THE MATERIAL LISTED BELOW

DATE_____ CREDIT TO APPLY ON ORDER NO._____

QUANTITY	MATERIAL	SIZE

FROM DEP'T NO._____ FOREMAN_____

DELIVERED BY_____ RECEIVED BY_____

FIGURE NO. 84

Form for use when material is returned to storeroom.

It is principally in manufacturing establishments that it is found necessary to return material to the stores, the reasons being that after completing an order the shop may find it has a surplus, or it may have been decided to curtail the quantity being made. In all instances of this kind the material should not be allowed to remain in the shop, but should be returned to the stores accompanied by a form similar to Figure 84. The use of this form insures the

transaction being posted on the perpetual inventory, and also provides for proper credit being given to the shop order. If there are any supplies in the shop in excess of requirements these should also be returned. It is only, however, when supplies are withdrawn by irresponsible persons that more is taken out than is actually needed and this should not be permitted.

MEMORANDUM OF SCRAP SENT TO STOREROOM

TO THE STOREKEEPER DATE_____

THE SCRAP LISTED BELOW IS BEING SENT TO YOU

CREDIT SHOULD BE GIVEN TO DEP'T NO._____ ORDER NO._____

QUANTITY	DESCRIPTION	CONDITION

DELIVERED BY_____ _____ FOREMAN

RECEIVED INTO STOREROOM_____ STOREKEEPER

FIGURE No. 85

This form should accompany all scrap sent to storeroom.

Scrap Sent to the Storeroom

In some manufacturing plants scrap is quite an important item and if it has to be kept for any length of time for utilization in the plant, or if it has to be sold, it should be put in charge of the storekeeper so that it may go on his records. Some scrap has considerable value, and it may have to be kept some time

until a suitable market is found. The practice of sending scrap to the shipping room is not to be commended, unless it is already sold and is to be shipped immediately.

The rule to follow is to insist on all material in an establishment being on the stores records, except that which is in process of manipulation in the shop. This gives the stores accounts a definite meaning. Obsolete material comes under the same regulations as scrap, for it is virtually scrap as far as that particular plant is concerned. It is possible that the storekeeper might be charged with the sale of scrap, but preferably it should be the purchasing agent, as he is in closer touch with the markets. If the latter is the case, the storekeeper should advise him from time to time of the amount of scrap he has on hand for disposal on a form similar to Figure 86.

Storing Stationery

While in some establishments it may not be feasible for the general storekeeper to have charge of the stock of stationery, still there are many places where it could be done to great advantage. There is, perhaps, more waste with stationery than with any other form of supplies, and a great many houses keep no records whatever of stationery stock, but it is handed out on a verbal request from a cupboard or closet to which many people have access.

In many cases it would be found that very important savings could be effected by enforcing a rigid control, and if possible this control should be placed in the hands of the general storekeeper. He should have charge of everything, including all forms, ink, pens,

DATE_____

TO THE PURCHASING AGENT

THE MATERIAL LISTED BELOW IS NOW IN THE STORES AND IS TO BE SOLD AS EARLY AS POSSIBLE

QUANTITY	MATERIAL	CONDITION	REC'D FROM DEP'T NO.

LOCATION_____

_____
STOREKEEPER

FIGURE No. 86
Report of material or scrap to be sold.

pencils, carbon paper, desk pads, paper fasteners, etc. Office furniture should be standardized and given form numbers. Form numbers should also be given to inkstands, paper fasteners, pencils, etc. This is essential for identification, and the standardization greatly reduces the number of varieties in use.

If the storekeeper has charge of the stationery he would have to make requisitions to purchase fresh supplies, and to enable him to do this intelligently he should keep a copy of every printed form used. These should be pasted on loose leaves and fastened in a binder. The loose leaves should be large enough to enable the name and number of the form to be placed at the top of the page, with detailed instructions for its use at the bottom. A record such as this is extremely valuable, because it eliminates useless forms and prevents duplication. It also is very useful for the education of new employees in the proper use of forms they come in contact with. A duplicate can be made for use in the purchasing department as a help in buying. Very little work is involved in keeping such a record up to date, and its usefulness will amply repay the small amount of labor entailed in compiling it.

Storing Finished Product

The preceding discussion has been confined to raw material and supplies, but there is another class of material which has to be stored and that is the finished parts or finished product of a plant. In some establishments these are kept in storerooms entirely separate from the raw material, while in others they may be stored in the same or adjacent rooms. Practi-

cally every consideration from an economic viewpoint which applies to raw material, as discussed in Chapters Two and Three, applies equally to finished product.

The only difference between raw and finished material is in regard to the manner in which it should be handled or the location it should occupy. Finished material may be the product of a factory, such as screws or nails in regulation packages ready for shipment, or it may be completely assembled articles, such as desks, or typewriters, or again it may consist of materials which, together with other material, will ultimately be assembled to make a complete machine, such as an automobile or bicycle. The last class of finished material is usually designated "finished parts."

As far as storage problems are concerned there is no radical difference on either the manual or clerical work connected with storing raw or finished material. They must both have their entry and exit properly recorded and in a similar manner. There would in some instances be a saving in this work if all classes of stores could be under the same control, with the storerooms contiguous to each other. It should, however, be recognized that finished material may travel a different route, both in going in and out of the storeroom, and this must be considered in deciding on the location. Of course some factories send all finished parts to the assembling departments, but even so they have to be stored there until gathered together to form the complete articles or machine.

CHAPTER XII

Deliveries from Storeroom

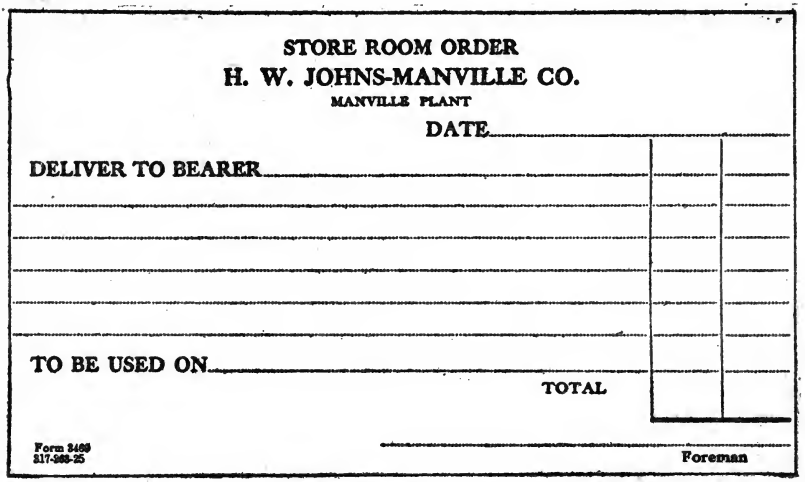
General Considerations

IT is usually important that material and supplies be distributed promptly by the helpers in the stores, particularly in manufacturing plants. The facility with which this is done will depend very largely on the manner in which the material has been placed in the racks and bins. Deliveries can be made easily and rapidly from a well-kept and well-arranged stock.

In the majority of storerooms the deliveries are much more numerous than the receipts. With the larger number of operations there is naturally more liability to make mistakes. The applicants for material must be served accurately and expeditiously and the transactions must be posted promptly on the records to enable close track to be kept of the stock. All these features render the problems connected with deliveries the most important in storeroom activities. In consequence of this the assistants making deliveries must be thoroughly conversant with the stock and be able to supply applicants without delay. They should be able to scrutinize requisitions and decide quickly whether they contain all the requisite information and are signed by a person duly authorized to draw material from the stores.

In the case of material required for production work there is, or should be, complete control over it

after it passes out of the storeroom into the shop, and any waste or withdrawals in excess of requirements should be quickly discovered. It is more difficult to control supplies, because these are not charged directly to a production order and, their use being more general, it is open to persons without a sense of responsibility to withdraw more than is needed. In connection with these it is essential there



STORE ROOM ORDER
H. W. JOHNS-MANVILLE CO.
MANVILLE PLANT
DATE

DELIVER TO BEARER

TO BE USED ON

TOTAL

Form 3469
317-500-25

Foreman

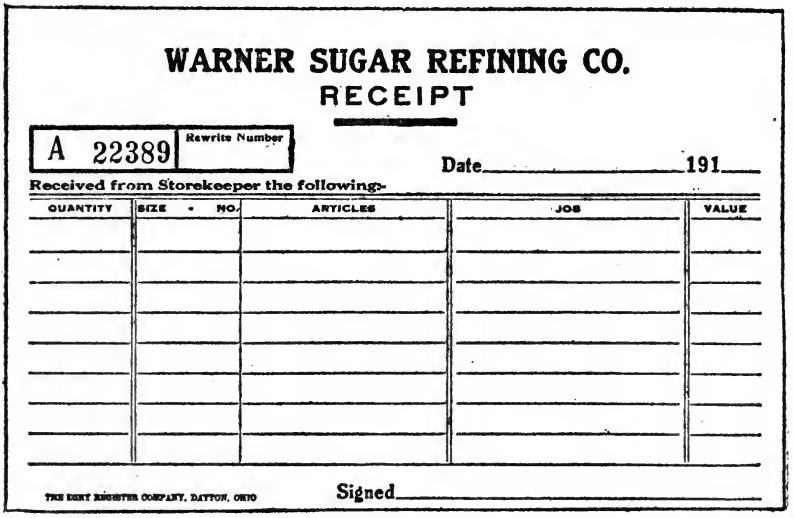
FIGURE No. 87
Requisition on storeroom.

should be some supervision, and it has been suggested in an earlier chapter that the chief storekeeper could well be given the authority to regulate the use of supplies. Prevention of overdrafts is much better than attempts to rectify them after being made.

Requisitions

Applicants for material should never be permitted within the storeroom. The practice of allowing them to pick out from the stock what they need is entirely

too common. Many storekeepers compromise by permitting applicants to go to the shelves and get what they need, checking the weight or count as the applicant passes out of the storeroom. Such methods as this should not be tolerated. If a storeroom is maintained, then it should be operated in the right way.



WARNER SUGAR REFINING CO.

RECEIPT

A 22389 Rewrite Number

Date_____ 191__

Received from Storekeeper the following:

QUANTITY	SIZE • NO.	ARTICLES	JOB	VALUE

THE RAPID REGISTER COMPANY, DAYTON, OHIO

Signed_____

FIGURE No. 88
Requisition on storeroom.

If a loose system prevails, either in receiving or delivering material, the storeroom records cannot be considered reliable.

The requisition presented to the storekeeper may take any convenient form, but it must contain certain essential features. These are:

1. The date; this may be stamped on the requisition when received if it has not already been inserted.
2. The name or number of the department from which it originated.

3. An explicit and unmistakable description of the material required.
4. For what purpose it is required.
5. It must be signed by a person duly authorized to draw material from the stores.

There are other features which may be necessary in individual cases; these will be governed mainly by accounting and cost-keeping methods. It is preferable, although not imperative, to have a distinguishing color for the requisitions from each department. This is of great assistance in segregating and filing. It is also advisable to number requisitions, as they can then be located readily whenever it is necessary to refer to them. Figure 89 illustrates a form of requisition for use in a manufacturing plant. After these have been duly entered on the stores records, it is customary for them to pass along to the cost accountant, who makes the proper charges from them against the shop orders. It is possible, therefore, that the cost accountant might wish the requisitions to be uniform with other documents used in this work.

Requisitions should correspond to the perpetual inventory in specifying quantities. For instance, if the inventory is kept in units of weight and the requisition asks for a certain number of the articles, it must be converted into units of weight before the articles leave the stores. The bin ticket should indicate in what manner the unit is expressed.

Issuing Articles in Sets

There are a great many things manufactured which require certain fittings when being assembled. For instance, nearly all furniture comes under this cate-

gory. If an order is started in the shop to make up one hundred office desks, it is not necessary to with-

FORM Y 53

MATERIAL REQUISITION

ORDER NO._____ REQUISITION NO._____ DATE_____

TO DEPT NO._____ DELIVER WITH THIS ORDER TO DEPT NO._____

TO BE USED FOR _____

SEC	BIN	BAL	

_____FOREMAN

FIGURE No. 89

Storeroom requisition.

draw the hardware from the stores at the same time as the lumber. For this reason the storekeeper should

know what orders are going through the shop, so that he may be prepared to supply what is needed when it is needed.

The lumber for the desks having passed through the manufacturing stages up to the point where it is assembled, a requisition can then be made for the hardware. In writing this up it is not necessary to specify so many locks, drawer pulls, casters, etc. The requisition should call for 100 sets of fittings for standard desk number —. Before the messenger goes to the storeroom for them, telephone instructions should be given to get the sets ready, so that there will be no delay in delivery. In all cases of this nature the storekeeper should know what constitutes a set and he can if advisable keep his stock in sets, instead of having the articles separate and perhaps distributed widely through the storeroom.

Shop Orders as Requisitions

Figure 90 illustrates another method of requisitioning material from stores. This is a copy of the shop order and specifies the material which will be required in executing the order. It is particularly useful in jobbing work and can also be used when the material can all be withdrawn at one time. Manufacturing methods are so varied and so many problems are met with which are largely individual that no fixed rules can be laid down in a treatise of this character. The point which it is desired to emphasize is that material should not be drawn from the stores until actually needed for shipment, or, if it is to undergo manipulation in the shop, then it should go directly from the storeroom to the work bench or

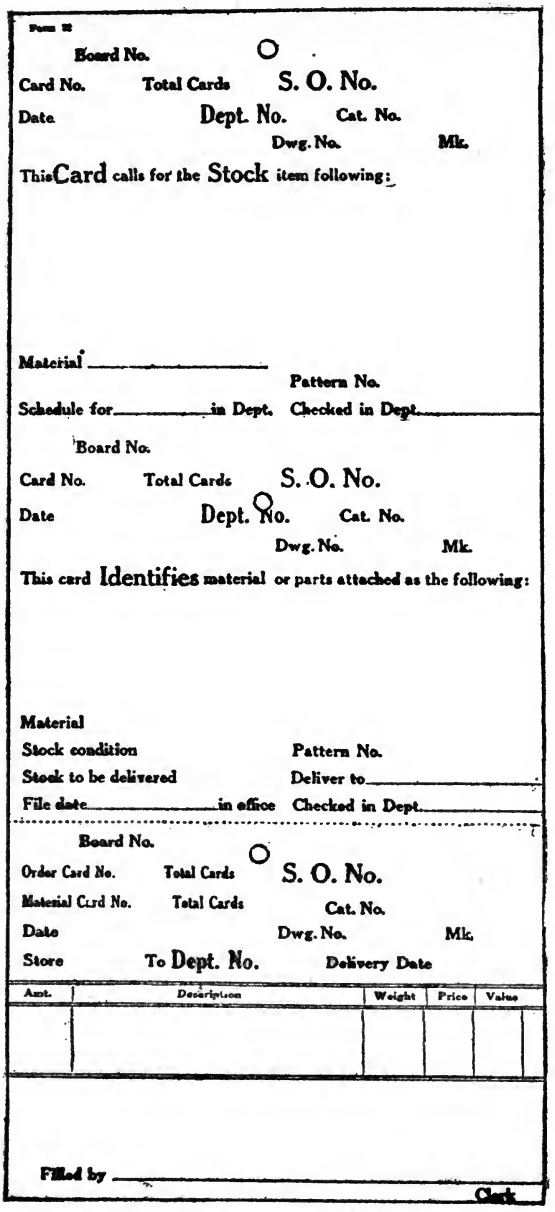

Form 12
Board No.
Card No. Total Cards S. O. No.
Date Dept. No. Cat. No.
Dwg. No. Mk.
This Card calls for the Stock item following:
Material
Pattern No.
Schedule for in Dept. Checked in Dept.
Board No.
Card No. Total Cards S. O. No.
Date Dept. No. Cat. No.
Dwg. No. Mk.
This card Identifies material or parts attached as the following:
Material
Stock condition Pattern No.
Stock to be delivered Deliver to
File date in office Checked in Dept.
Board No.
Order Card No. Total Cards S. O. No.
Material Card No. Total Cards Cat. No.
Date Dwg. No. Mk.
Store To Dept. No. Delivery Date
Amt. | Description | Weight | Price | Value
Filled by
Clerk

FIGURE No. 90

The last section of this is used for withdrawing material from stores.

machine, and not be withdrawn and permitted to lie around the shop.

To prevent the last-named condition when the rate of progress of an order through the shop is somewhat uncertain, and at the same time to prevent delays in delivering from the storeroom, many storekeepers lay out the material specified on the shop order and place it in tote boxes. These boxes are kept in a section of the storeroom with the order number marked on them. By adopting this course the material is retained under the storekeeper's control until ready for use, and at the same time no delay would occur in delivering it from the storeroom.

Shortages

Throughout the preceding discussion of deliveries from stores it has been assumed that the storeroom had the material ready to hand out at any moment, but many instances occur in which delivery cannot be made at once or can be made only in part. Owing to the difficulties experienced in getting material from shippers in the recent strenuous times many storerooms have run short of regular stock. In the case of jobbing orders which may call for various odd lots of material and articles seldom called for, it is not to be supposed that they can all be carried in an ordinary storeroom.

When a shortage exists the storekeeper can furnish such material as he has on hand and issue a shortage ticket, as illustrated in Figure 91, for that which he cannot supply at once. This shortage ticket should be in duplicate, one copy being retained in the storeroom as a reminder to follow up delivery and obtain

FORM V 47

NOT IN STOCK

DATE_____

ORDER NO._____

PART NO._____

REQUISITION NO._____

THE ABOVE SPECIFIED ITEMS AS CALLED FOR BY ABOVE NOTED REQUISITION ARE NOT NOW IN STOCK

HOLD THIS SLIP UNTIL REQUISITION IS FILLED THEN RETURN SLIP TO STOCK ROOM

OTIS ELEVATOR COMPANY

FIGURE No. 91
Shortage ticket.

quickly the material to make good the shortage. The other copy of the shortage ticket goes to the shop, where it serves the following purpose. In keeping track of the progress of an order through the shop there are certain employees who are sometimes known as "chasers," their duty being to follow up the orders. When the chaser finds an order is at a standstill for lack of material the shop must have a shortage ticket showing that it has applied to the storeroom, but has been unable to procure the material. The chaser, on discovering this condition in the shop, will bring pressure to bear on the storekeeper to supply the deficiency. The storekeeper will likewise press the purchasing agent until the shortage is made good. In the discussion of maximum and minimum limits in Chapter Three the danger of shortages in the storeroom was pointed out. In the case of jobbing orders calling for unusual and seldom-called-for material, they are unadvoidable.

Apparent Shortages

When the production department of a factory gives the storeroom a schedule of dates on which material will be needed, or furnishes an estimate of the probable rate of consumption, that is for the storekeeper's information and should enable him to keep his stock at just the right level to meet these requirements. The actual withdrawal of material from the stores would be through the medium of a requisition, as explained earlier in this chapter.

A somewhat different condition exists when no schedule of the rate of consumption is given to the storeroom and when the storeroom is furnished with

copies of the production orders. These production orders take the place of requisitions and they may

Form 461.

SHORTAGE REQUISITION

Order No._____ Requisition No._____ Date_____

To Dept. No._____ Deliver with this Order to Dept. No._____

To be used for_____

This Requisition must be Approved by Shop Superintendent before Material can be drawn from Stock Room.

SEC	BIN	BAL	DESCRIPTION

Approved_____ Signed_____

Superintendent Foreman

FIGURE No. 92

Used when insufficient material has been drawn from stores.

accumulate to such an extent as to involve quite a problem in handling them. For instance, the pro-

duction orders may be issued many months in advance of the actual time the material may be needed. This creates a condition where the storeroom has recognized and authenticated applications for material without a sufficient quantity being in stock to fill them. There is, therefore, an apparent shortage. There is not an actual shortage, because the material is not always needed immediately the production order is issued. If it should not arrive in the storeroom before the production department called for it, then there would be a real shortage.

The manner in which this problem should be handled would very largely depend on to what extent it occurs. Earlier in this chapter reference was made to shop orders, and it was suggested that the material for these could be taken out of the bins and placed in tote boxes. Now it may happen that the quantity so set aside may reach undue proportions and the storekeeper may feel justified in abstracting material from the boxes, if he needs it for other orders, and placing shortage tickets in them to show that he has done so. He would keep a record of these transactions through the copy of the shortage ticket, which he would keep in his office.

The result of this is that the material has been charged out twice, but actually delivered only once, creating an "apparent" shortage. This method can only be adopted where there are few such transactions and then only when the articles are small and can be stored in tote boxes.

It is better to have a systematic bookkeeping scheme to take care of it. This can be done by having a supplementary sheet attached to the perpetual in-

ventory sheet, or an additional column to record these particulars. For instance, suppose he has 1000 units of a certain article in the stores and his records show that production orders have been issued which will absorb 1500. There is here an apparent shortage of 500, but there is not a real shortage, because the shop may not need the articles for these particular orders for some weeks, or even months.

FORM 520 (REV. 4-2-17) EXPENSE MATERIAL REQUISITION

ORDER NO._____[X_____]REQ. NO._____DATE_____

TO DEPT. NO._____DELIVER WITH THIS ORDER TO DEPT. NO._____

TO BE USED FOR_____

	QTY.	PAT. SYM. NUMBER OR SIZE	DESCRIPTION
			FOREMAN_____

FIGURE No. 93
Requisition for supplies.

Issuing Supplies

Everything delivered from the storeroom which is for expense account, that is, everything which is not for resale or does not become a component part of the finished product, should be requisitioned on a form differing from that used for raw material. This covers everything needed for repairs to buildings and upkeep of machines, also all articles used for general shop expense.

The storekeeper is, perhaps, the best man to have

control of these throughout an establishment; that is, requisitions for them should be subject to his approval. The department needing the supplies should be specified, and whenever possible the exact purpose for which they are required. The closer these lines can be drawn the greater will be the saving in this class of overhead expense.

Routine Clerical Work

The discussion of routine work up to this point has covered the following features:

1. The receipt of material.
2. The various forms of inspection.
3. The placing of material in properly designated receptacles and places.
4. The delivery from the storeroom to authorized recipients.

All of the transactions enumerated must have, as has been shown, some documentary evidence of their accomplishment. Samples of these documents have been illustrated in the two preceding chapters, and it now becomes necessary to show in what manner they are permanently recorded. In Chapter Eight the perpetual inventory was fully discussed. This is the complete stores record or ledger. By referring to the illustrations given of perpetual inventories (see Figures 60, 61, 62, and 64) it will be noticed that the form can be simply a record of receipts and deliveries, or it can cover many other features, such as quantities ordered but not received, quantities requisitioned but not delivered, etc.

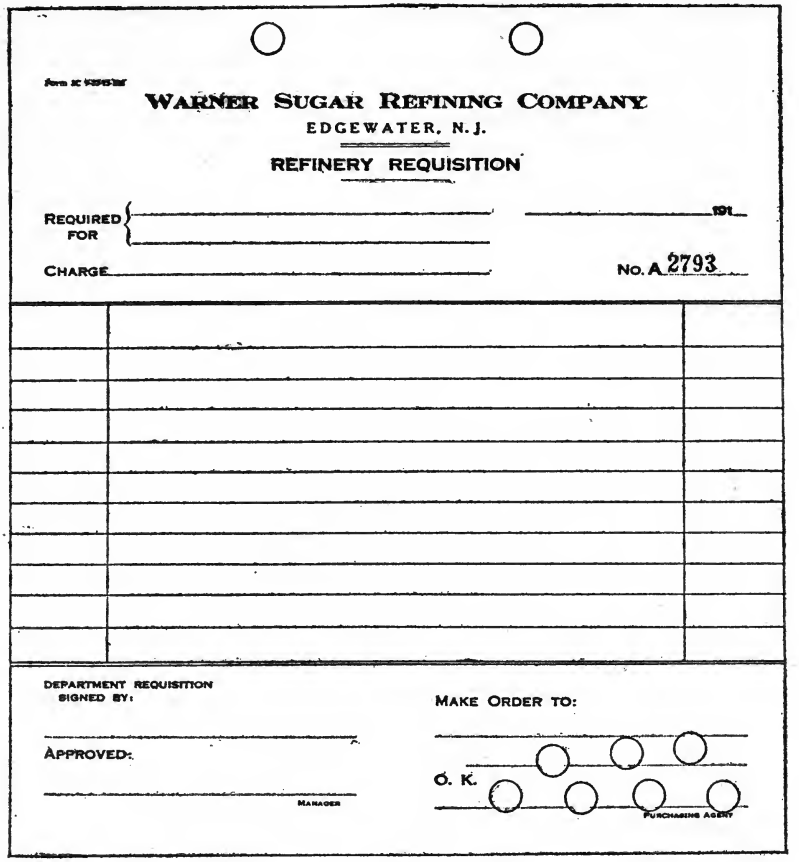
Every entry on the inventory must have a document to show for it. For instance, the receiving clerk's

slip would be used to post the quantity received, the requisitions would be used to post the quantities delivered, a copy of the purchase order would indicate the material ordered. There are some other forms which will be alluded to later. What it is desired to emphasize is that all these documents must be jealously safeguarded until recorded. Even after this they should be kept in suitable binders until such time as there is no possibility of any need to refer to them. There are few factors which would tend to disorganize the keeping of the records; the main one is, perhaps, lost or misplaced documents. If these are carefully preserved and duly entered on the inventory, there cannot be much go wrong with the stores bookkeeping.

Overlooking the Minimum

This is, perhaps, the bugbear of a majority of storekeepers, and yet many of them allow their stock to run below the safety mark. Many schemes have been devised to prevent this contingency, but none of them are infallible and most of them simply make more clerical work. It would seem that in posting the entries on the inventory that one could not fail to observe the approach towards the minimum, but the clerks engaged on this work may not balance the accounts frequently, they may have their attention called to other duties, or they may not enter the items promptly and allow this work to accumulate. There must be sufficient clerical assistance on the inventory desk to make the postings immediately the documents arrive. With sufficient clerical help at this point there should never be any question of running past the minimum.

All the auxiliary schemes, such as bin tickets and markers, are simply makeshifts. They are all started with the purpose of relieving the work on the perpetual



WARNER SUGAR REFINING COMPANY
EDGEWATER, N. J.

REFINERY REQUISITION

REQUIRED FOR _____ _____ 191_
CHARGE _____ No. A 2793

DEPARTMENT REQUISITION SIGNED BY:
_____
APPROVED:
_____
MANAGER

MAKE ORDER TO:
_____
O. K.
_____
PURCHASING AGENT

FIGURE No. 94
Requisition on purchasing agent.

inventory, but this work is the important work; nothing else can take its place and it cannot be slurred or neglected. It is better to recognize this fact and devote one's energies to accuracy in maintaining it.

Purchase Requisitions

When many clerks are employed posting the perpetual inventory it is advisable to suspend the work at a fixed hour every day, preferably late in the afternoon, and the clerks can then write up the purchase requisitions for such material as the records show has reached the minimum. This is the only safe way. If the clerks are permitted to make these requisitions at any time during the day convenient to themselves, they may or may not write them up.

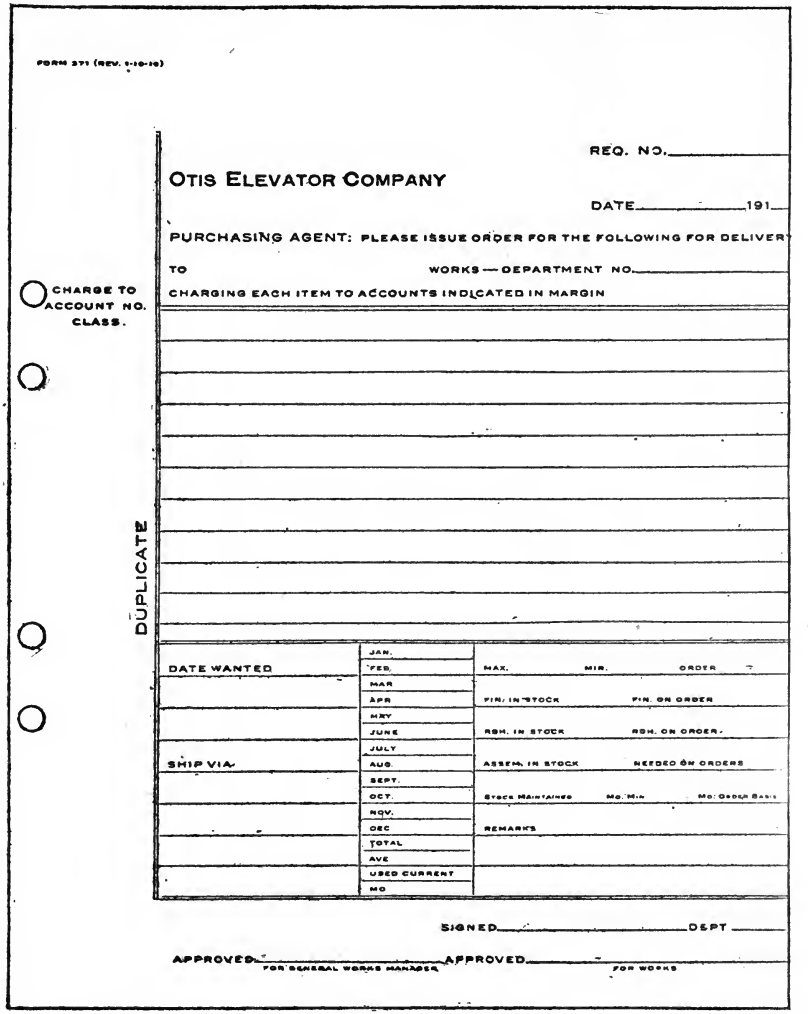
An illustration of a purchase requisition is given in Figure 95. All the particulars should be filled in by the clerks in the spaces shown. They should then be collected and given to the chief storekeeper for his signature, after which they are passed along to the purchasing agent. This method eliminates all delay, because the requisitions can be in the hands of the purchasing department ready for his action at the opening of his office the following morning.

Some storekeepers make a practice of sending requisitions to the purchasing agent once a month. There may be some isolated instances where such a system could be followed, but it is not recommended as a general practice. If it is permissible it would be more applicable to requisitions for supplies than for materials. If any advantages are secured to the purchasing department by adopting this system it would have some weight in deciding the matter.

Summary

The man who knows least about his business is the man who usually fails, and the man who knows most seldom fails. To advance one's knowledge of the

condition of that portion of one's investment represented by the stock of goods and materials in the stores there is nothing of greater importance than a well-kept perpetual inventory.


FORM 371 (REV. 1-10-10)

REQ. NO.

OTIS ELEVATOR COMPANY

DATE 191

PURCHASING AGENT: PLEASE ISSUE ORDER FOR THE FOLLOWING FOR DELIVER

TO WORKS — DEPARTMENT NO.

CHARGE TO ACCOUNT NO. CLASS.

CHARGING EACH ITEM TO ACCOUNTS INDICATED IN MARGIN

DUPLICATE

DATE WANTED

SHIP VIA

JAN. FEB. MAR APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC TOTAL AVE USED CURRENT MO

MAX. MIN. ORDER

FIN. IN STOCK FIN. ON ORDER

RSH. IN STOCK RSH. ON ORDER

ASSEM. IN STOCK NEEDED ON ORDERS

STOCK MAINTAINED MO. MIN MO. ORDER BASIS

REMARKS

SIGNED DEPT

APPROVED FOR GENERAL WORKS MANAGER APPROVED FOR WORKS

FIGURE No. 95

Storekeeper's requisition on purchasing agent.

FORM 470
REVISED
MAY 1913

OTIS ELEVATOR COMPANY

REQUISITION ON
PURCHASING DEPARTMENT

REQ NO

DATE

DATE WANTED

SHIP VIA

DELIVER TO

CHARGE TO

JOB NO

P O NO_____ DATED_____

ISSUED ON

_____ DEPT

BY_____

FIGURE No. 96

Form of requisition on purchasing agent from departments.

Perpetual inventories require perpetual attention. Authorities in accounting methods are practically united as a unit in their favor. The necessity for their accurate compilation is recognized. Lack of attention on the part of employees, or insufficient help, is the only reason for the difficulties some people claim to have with them. The keeping of accurate records can be covered by a few simple rules.

First: Nothing should be permitted to enter the storeroom unaccompanied by some form of advice, such as the receiving clerk's report (Figure 80) or the credit requisition (Figure 84). These documents are used to make the debit entries.

Second: No material should be allowed to leave the stores without a properly drawn requisition which should clearly indicate the quantity taken from the storeroom. The requisition should be signed by the recipient of the material.

Third: Accuracy in receiving and delivering the quantities specified and accuracy in posting the entries are all absolutely essential.

Fourth: Perpetual inventories should be treated as cash is treated. Cash is verified often, or should be. A perpetual inventory should be verified as described in Chapter Eight.

Fifth: The documents indicating the incomings and outgoings should be preserved a sufficient length of time to cover the period when they might be needed to check back; that is, until a physical count is made. If this should uncover any discrepancies, these documents would be needed for reference.

INDEX