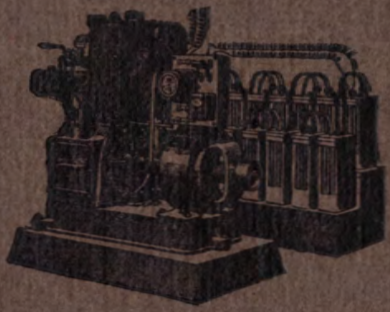
Genco Light

SALES MANUAL



GENERAL GAS-ELECTRIC COMPANY
HANOVER, PA.
U. S. A.

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GENERAL GAS-ELECTRIC CO.
HANOVER, PA.

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GencoLight

"The Most Reliable Farm Lighting Plant"

Brings All the Conveniences of the City to the Farm.

Pays Its Own Way.

Makes More Light—Less Work.

Saves and Makes Money on the Farm.

Gives More Power Service with Less Trouble.

Will Do It Mechanically as Well as Electrically.

SALESMANSHIP

is 5% Natural Gift
and 95% Hard Work

THIS MANUAL

Has Been Compiled and Edited for the Purpose of Enlightening and Helping Genco Light Distributors, Dealers and Salesmen on the Selling of

GENCO LIGHT

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PART NUMBER ONE

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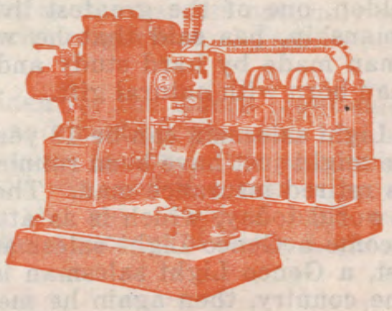


INTRODUCTION

This book has been brought out to equip the Genco Light Salesman with sufficient information to assist him in the sale of Genco Light Plants.

To a salesman with previous lighting plant experience, we do not claim that he should follow every suggestion outlined in it, but we think that he will learn sufficiently if he reads this book carefully, and will become a better salesman.

To a salesman without previous lighting plant experience, a careful stody of this book will put him in shape to talk intelligently about our plant, and it is mostly to answer an insistent demand of young and energetic men just entering the Lighting Plant field that we have written these lines.

We are convinced of the fact that a Genco Light Salesman should have an exact knowledge of what he is selling and a deep conviction of the superiority of his product, also be profoundly enthusiastic. He must feel, also, that when he sells Genco Light to a man, he not only gives him the best Lighting Plant that human brain can conceive and human hands can make, but that he is giving the farmer more comfort and helping him to enjoy life.

Edison has said that genius is 5% inspiration and 95% perspiration, and we are safe in stating that salesmanship is 5% natural gift and 95% hard work. We have heard so very often the expression that this or that man was a born salesman; if you would stop to investigate that man, you would find that he is a hard worker. Sheldon, one of the greatest living authorities on salesmanship, has said that he would rather have a salesman made by hard study and hard work than a salesman born with natural gift.

The Genco Light salesman can be 18 years old or he can be 65. He might just have been running a plow or he might be a retired insurance man. There is no vocation in the world today, which is as attractive to a man as to become a Genco Light salesman, for many reasons. First, a Genco Light salesman is out in the pure air of the country, then again he meets as prospective customers the most powerful and reliable institution in the world, "The American Farmer."

We note that some companies in this country state that a Lighting Plant salesman should be healthy. We wish to say that by becoming a Genco Light salesman, a run down man not exactly in a healthy condition can become a strong man.

The most important part for the Genco Light salesman is for him to spend the most time possible with his prospects, and the salesman's business ability is directly in proportion to the amount of time he can put in with his prospects as compared to the amount of time he is not with his prospects. We cannot say exactly how many hours a salesman should spend with his prospects, because the opportunity to talk Genco Light can arise anywhere and any time. We feel satisfied to say that the Genco Light salesman should analyze his prospects and call on them at the proper time, and spend at least half of his available time in coming in touch with his prospects, the quarter of the remaining time in calling on the customers he already has and the rest of his time at the office.

The farmer cannot be called on at the same time of the day in all seasons. The greatest care must be exercised in ascertaining exactly the farmer's busy hours in summer and in winter. Some over-zealous salesmen antagonize the farmer by inopportune calls. Try to go to your prospect when his work is done. Many sales have been made because the Genco Light salesman visited the farmer when he had his hour or two to himself. Learn also that there are many other people in the world in the market for Genco Light besides the farmer. The small garage, the country store, the church, the suburban residences, all need Genco Light and will get it sooner or later. The method of approaching such prospects naturally would be different, and such prospects can be seen when the farmer is very busy.

The main idea for the Genco Light salesman is for him to go out and meet his prospects and not wait until the prospects come to him. It is aggressive salesmanship which will win, and if a man is by nature ambitious, careful and not afraid of hard work, he will succeed in being a successful Genco Light salesman.

The Origin of Genco Light

We have every reason to believe that Genco Light was originated and built earlier than any other farm

lighting plant in the world. The first Genco Light plant was built 12 years ago, in Geneva, Switzerland, and was a 2 cylinder, 4 inch bore and 5 inch stroke, direct coupled through an electric clutch to a 110 volt generator. That plant was built and from that time its designer, Mr. E. T. Gilliard, has conducted careful experiments on it, and brought the designs into this country, revised those designs according to the demand of the American farms, with the final results that the Genco Light plant was put on the market by the General Gas-Electric Company late in 1916.

We have now thousands of Genco Light Plants in operation all over the United States and also abroad, and the results are such that we are in a position now to increase our operations and make Genco Light the biggest thing in the farm lighting plant field in the United States.

The Factory

It is well at this time to state that no other Lighting Plant Concern in the world is building as many parts entering into the construction of a Lighting Plant as the General Gas-Electric Company, of Hanover, Pa., builders of Genco Light Plants, making all the castings entering into the construction of the Plant. The engine is entirely built in our shops, the generator is also built and assembled, and in the middle part of 1918, Radiator and Storage Battery Departments were added.

The Factory covers now 5 acres under roof, and is well situated to handle shipments, owing to the fact that it owns its own sidings. Over one million dollars have been invested so far for the manufacture of the Genco Light, and the most up-to-date machines are used for every operation. Every part is inspected after leaving the machines, and the Genco Light Plants after being assembled, must run on test blocks for 48 hours without stopping before they are passed in the first test department. The Genco Light Plants are then painted and brought over to another department, where they run through a second test, a feature which we think is not used by any other manufacturer of Lighting Plants in the world.

THE PRACTICAL BUSINESS MEN BEHIND THE COMPANY

When the designs of the original Genco Light Plant were brought over by E. T. Gilliard, the experiment work was continued in York, Pennsylvania, from 1908 until 1916, at which time the ultimate plant was built and operated during the summer of 1916.

This plant attracted considerable attention, and the result was that a group of business men from Hanover, 18 miles away, drove in an automobile one day to see the plant they heard so much about. Thirty. days afterwards operation was started in Hanover, and the General Gas-Electric Company was formed.

The President, Mr. W. F. Kintzing, is a Mechanical Engineer and invented the Kintzing Wire Cloth Loom, which loom is used in at least 80% of the wire cloth factories in the United States and in use in foreign countries, and he is operating today one of the largest wire cloth manufacturing concerns in the United States.

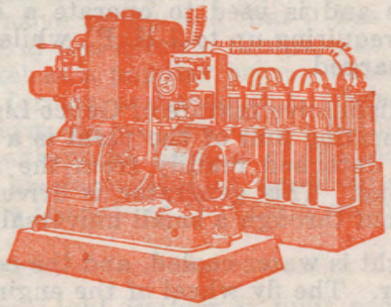
Mr. H. N. Gitt, the Chairman of the Executive Committee, has had many years of experience in the manufacturing business of various lines, and has been instrumental in bringing the industries to our City, which today are the most substantially established manufacturers in their lines in the country. He has been personally connected and closely associated with the following local industries, whose reputations are widely known throughout the world: The Hanover Shoe Factory, makers of the Hanover Shoe, The Long Furniture Company, the Hanover Cordage Company, The Hopkins Manufacturing Company, builders of automobile truck bodies for some of the well known automobile companies in the country, and The Hanover Glove Company, makers of the "Hanover Glove."

Mr. John J. Schmidt, the Vice President of the Company, is one of the successful business men of our City, and is Vice President of the Hanover Saving Fund Society, one of the oldest and strongest banking institutions in this section.

Mr. V. K. Jordan, the Treasurer of the Company, has been associated in business with Mr. Schmidt, the Vice President of our Company, as the junior partner of the firm of Schmidt & Jordan, and is recognized as one of Hanover's most substantial and influential citizens.

Genco Light

PART NUMBER TWO



THE GENCO LIGHT PLANT

Genco Light is a complete self-contained Electric Light Plant. It is also a self-starting gasoline and kerosene engine, and is composed of two principal units, first, a generating unit, second, a storage battery.

Generating Unit

The Generating Plant is composed of an internal combustion engine designed to operate on gas, gasoline, alcohol or kerosene as fuel. This engine drives the electric generator, which provides electricity either for the batteries or directly on the line. On the generator a switchboard is mountd, where can be found all the controlling apparatus and switches necessary for the operation of the plant. With the plant we furnish a 16 cell storage battery.

Storage Battery

When the generating plant runs, the light or electrical power is furnished direct to the lamps or motors, but when the generating unit does not run, the current is taken from the battery. Therefore, it will be seen that the batteries will have to be charged from time to time by the generating unit. In other words, you can secure electric light from a Genco Light Plant whether the generating unit runs or not, and at any time of the day or night.

The Genco Light Plant is easy to operate and it is durable, efficient and economical. Quite a number of exclusive or distinctive features can be found on the Plant. For instance, a pulley will be seen on the end of the generator. This pulley is not found on many other plants and is used to operate a line shaft for machinery, requiring up to 2 H. P., while the batteries are being charged.

Another distinctive feature of Genco Light is that the electric generating unit of the plant is a unit by itself and can be detached readily from the internal combustion engine. This generator is driven directly by the engine, but through a small universal joint.

Genco Light is water cooled, and the cooling is done by a radiator. The fly wheel of the engine is inside of a case, a very attractive feature, making the plant harmless when children are about. The fuel mixer is

built to be operated by women and a close study of the plant will show that it is built to last. The bearings will be found bigger than any other plant on the market, and the accessibility to the different parts has been studied and brought out.

A Genco Light Plant is a self-starting farm engine. There never was before in the history of the world a self-starting farm engine. Pressing a button starts it, and it can be run all day, producing one to two horsepower on the line shaft and charging the storage batteries with the excess power. When the batteries are fully charged the plant automatically stops.

What Genco Light Will Do on the Farm

As a self-starting gasoline engine, Genco Light will run a line shaft, which will operate a small circular saw, deep well pump and in general any machinery requiring up to 2 H. P.

Genco Light is, of cource, principally an electric lighting plant, and it will furnish electric light to the house, barn, garage and other buildings. It will also charge automobile batteries and produce sufficient electric power to run electric motors, which can be used on water pumps, cream separators, washing machines, grindstones, or any other machinery which was previously operated by hand or by small gasoline engines.

In order to successfully perform these different duties, it is evident that Genco Light has reached a state of perfection secured only by long years of study and experiments.

Genco Light is an expensive plant to build, and it is only by intensive production that it has been possible for the General Gas-Electric Company to put this plant on the market at a popular price. It is an additional asset to the farmer, and some day, when a man wants to sell his farm, he will list Genco Light in his list of equipment with pride, because of the fact that such a Plant is on his farm denotes his progressiveness and will facilitate the sale of that farm on that ground.

A Study of Genco Light Storage Batteries

The Genco Light Battery is built according to the type developed in the past five years for the exclusive use of independent lighting and power installations.

The plates and chemicals are contained in a glass jar with a sealed top and presents a very neat appearance. When the current generated by the power plant goes through the storage battery, it produces a certain chemical action, which is capable of reversing itself when some energy or current is required from the battery. In other words during the charge electric energy is transformed into chemical form and during discharge this chemical form reverses to its original state, producing almost as much current as it received at first. It is, therefore, clearly understood that a storage battery does not produce current, but it must be charged first before it is capable to give back that current after storing it for a certain period of time.

The Genco Light Storage Battery consists of 16 cells. Two sizes of cells being used. The type "A" Plant has a 110 ampere hour battery based on the intermittent discharge rate. The type "B" plant has a 167 ampere hour battery based on the same rate. The type "A" battery may be charged at from 15 to 17 amperes and the type "B" battery at from 18 to 20 amperes.

When the Genco Light Plant runs a line shaft and the plant must operate 10 or 15 hours a week, it is probable that the current entering the batteries will be from 5 to 10 amperes. This condition produces an ideal charging rate for the storage batteries.

A Genco Light Battery is composed of positive and negative pasted, lead plates and wooden separators between those plates. These plates rest on a rubber support and are held at the top by a hard rubber plate covered by sealing compound. A solution of sulphuric acid and pure water is put around the plates and this solution should test 1250 with a hydrometer when a battery is fully charged and 1150 when the battery is discharged.

The Genco Light Batteries have thick plates and have been designed according to the latest engineering knowledge. Glass jars are used, because it allows the user to see when the liquid goes below the top of the plate, at which time it is necessary to add a little distilled water or rain water.

The storage batteries have made possible the electric light in the city and also the telephone and telegraph.

It will be noted also that the largest electric lighted railway cars each carry its own set of storage batteries. Also every automobile equipped with a self-starter has a storage battery.

A Study of the Generating Unit

It is possible to get electric light and power directly from the Generator when the engine is running and when it is not running the Storage Battery will supply it.

The Genco Light Engine operating the Generator is built on the 4 cycle principle and is water cooled with a radiator. The piston is 3¼ inch bore and the stroke of the engine is 3 inches. The piston is made from high grade gray iron and is ground to within a one-half thousandth of an inch. The connection rod is 9½ inches long or in other words more than 3 times the stroke.

The Crank Shaft is of generous dimensions and has a fly wheel bolted inside of the crank case. Genco Light is the only Lighting Plant in the world today to have a fly wheel inside of the crank case or as close as possible to the connecting rod. This produces a perfect balance. The connecting rod bearing on the crank shaft is 1¾ inches in diameter and 2⅜ inches long and is composed of high grade Babbit metal. The Crank Shaft main bearings, which are two in number, are 1½ inches in diameter and 3 inches long.

The valves are located in the head of the engine and receive their motion from a cam shaft actuated by the crank shaft through 1 inch face gears. The cam shaft operates the valves through push rods and rocker arms lubricated in a spray of oil.

The Cylinder is bolted to the crank case and is easily removable. All the bearings in a Genco Light Engine can be replaced and the Engine itself can be taken apart very quickly. A vacuum is maintained constantly in the crank case in order to prevent oil leaks.

The Crank Shaft is made of high grade carbon steel and is accurately ground all over. The Cam Shaft is case hardened, heat treated and also ground on cams and bearings. On the end of the Cam Shaft the timer producing the proper electrical contact for the spark coil will be found very accessible.

All the parts in a Genco Light Engine have been built for long wear. The Radiator is bolted directly to the cylinder, therefore eliminating the usual rubber hose which does not last long.

The Carburetor is adjustable to the different fuels and is so made that the proper charging rate for the storage battery can be regulated and extra power can be furnished in case direct mechanical power is required from the pulley.

One feature to be noted in the Genco Light Engine is that the piston speed is very low and under 600 feet per minute, a feature not found in any other Lighting Plant. The wear and tear on a gas engine is in direct proportion to its piston speed. The majority of other Lighting Plants have a piston speed of above 800 feet per minute.

The Electric Generator furnishing current, is driven directly from the crank shaft of the Engine and is bolted on the same base with the Engine, eliminating, therefore, the usual belt. This Generator is built according to the latest practice and ventilated by a forced draught fan.

The Armature runs on annular ball bearings carefully protected against dust. The appearance of the Generator is very neat. The Generator is shunt wound when used to produce current and it is compound wound when used as a motor to start the engine. The instrument board or switchboard is mounted on the Generator frame and it will be noted that all connections on the back of the board are protected in a junction box covered with a lid.

The wires going to the battery and to the lamps will be seen coming out on top of the board through bushings. This feature is only found on Genco Light Plants. On this instrument board can be found an ampere hour meter or battery gauge, which indicates at all times the amount of current stored in the battery and also shows when the engine is running, how much current is going into the battery, and if the engine is not running and some lamps or motors are operating, how much current is being taken from the battery. The ampere hour meter will also stop the engine when the batteries are fully charged. A switch will be seen in the right hand corner of the board, connecting the

storage batteries to the Generator, also to line fuses and one ignition circuit fuse. An automatic circuit breaker and starting switch will be observed on the right hand lower corner of the board. The purpose of this device is to automatically connect the storage battery to the generator when it has attained the proper speed and disconnect same when the engine stops. On this switch a push button will be seen. This is the starting button. By pressing it and setting the carburetor in the proper position the plant will start within a second.

An oil level indicator has been provided for, which indicates at all times the amount of oil contained in the crank case. This oil gauge will be found on the side of the coil.

ADVANTAGES OF THE GENCO LIGHT

As soon as an inspection of a Genco Light Plant is made, it is to be noted that the Plant is a bigger size than any other Plant sold at the corresponding price. The Engine looks very sturdy and accessible and besides it is to be noted that no running parts are shown on the outside. The fly wheel is enclosed. Besides, the mechanical end of the plant or engine is absolutely built separate from the electrical part of the Plant or Generator and switchboard.

It is cheaper to build a Plant in which the Generator hangs on the Engine, but when a Plant is made for the purpose of lasting a long time, then better results will be obtained when the electrical end of the plant is separate from the mechanical part. In a Genco Light Plant, the Engine is bolted on the base and forms one unit. The end of the Crank Shaft has a joint which drives directly the Generator on which the Switchboard is mounted. The complete electrical unit part of the plant can be removed and replaced in five minutes. Besides, by having the Generator away from the Engine all possibilities of oil entering the windings is eliminated and vibration is removed from the switchboard.

The Genco Light and Power Plant is a self-starting gasoline and kerosene Engine. It will do as much as any other Lighting Plant will do electrically. In other words, besides lighting all the lamps necessary in the household, it will produce enough current to operate

electrical motors, driving water pumps, cream separators, butter churns, washing machines, grindstones, etc., and it can also, through the pulley, operate a line shaft from which the same machinery can be driven at a lower cost.

SUPERIORITY OF DESIGN

The Genco Light Plant was not designed to meet a price. It was built up to the duty which was required from such a Plant and all the parts were made with a view of performing their individual work in a satisfactory way irrespective of their cost. It is cheaper to build an air cooled Engine or to put a fly wheel on the outside, or to use a water tank instead of a radiator, or to hang the Generator on the Engine, but it will not produce the same results on the farm.

A Cam Shaft can be driven in a Lighting Plant with 2 inch gears ½ inch wide, yet the Genco Light Cam Shaft gear is 7 inches in diameter and is 1 inch wide.

High grade automobiles, trucks and aeroplane motors are built with valves in head. This has been proved to be the most economical engine. The Genco Light engine has valves in head. On the other hand the valves in head Engines, which naturally operate the valves through rocker arms, have no provisions made for lubrication of its moving parts. The Genco Light Engine has all those parts enclosed in a bath of oil, and will stay adjusted longer and perform its duty better than any other Engine made.

EFFICIENCY AND COST OF OPERATION

The combination of lubricated valve in head design, water cooling, inside fly wheel, extra length of connecting rod and vacuum carburetor, produces an efficiency of operation which so far has been unsurpassed by anybody.

The Genco Light Plant will run 4¼ to 4½ hours on a gallon of gasoline or kerosene, producing while running a current of from 18 to 25 amperes or from ¾ K. W. hour to 1 K. W., or at a cost per kilowatt hour of slightly under 4 cents for kerosene and 8 cents for gasoline. If natural gas or city gas is used, the cost per kilowatt hour will be from 2 to 3 cents. One kilowatt hour being 1000 watt hour, it would take therefore a 20 watt lamp, 50 hours to consume a 1000 watt hour, or in

other words a 20 watt lamp can be lighted 50 hours for about 4 cents, or about 1/12 of a cent per hour if the current is taken directly from the Plant when the Engine is running. Of course, if the battery is charged first and discharged through a lamp, the cost of operation of a 20 watt lamp for one hour will be about one-tenth of a cent an hour. A ⅛ H. P. electric motor uses about 160 watts or approximately one-sixteenth of a kilowatt. It would take a ⅛ H. P. motor, therefore, about 6 hours to consume a kilowatt hour, assuming that a motor of that size would be run at full load for 6 hours. This would be, therefore, at the cost of two-thirds of a cent per hour. A one-fourth horse-power motor would cost to operate the rated load twice as much, and a one-half horse-power load would cost 4 times as much. A ⅛ H. P. motor could operate very small machinery, such as sewing machines. A ¼ H. P. motor can operate a shallow well pump, washing machines, butter churn, cream separator, grindstones and a ½ H. P. motor can operate a deep well pump and other machinery of larger size.

DURABILITY OF GENCO LIGHT

Owing to the fact that the piston speed is under 600 feet per minute, basing the operation of a Genco Light Plant from 6 hours to 10 hours per week, the plant should run 10 years without giving any trouble whatsoever. After that period of time a cleaning of the crank case would be necessary and the bearings of the connecting rod should be taken up.

The Storage Batteries, if operated according to the instructions sent with them, should last from 6 to 10 years, after which time they can be exchanged at a very fair price by the Genco Light Dealer.

IMPORTANCE OF GOOD INSTALLATIONS

It is of the utmost importance to make the proper installation for a Genco Light Plant. Not that the Plant requires a better installation than any other, but in order to secure the largest possible life from it. The installation of the Genco Light comes under three big divisions, as follows:—

1—INSTALLATION OF PLANT AND STORAGE BATTERY:

Location.
Foundation.
Battery Shelves.

Exhaust Line.
Correct Installation.
Demonstrating to user how to operate the Plant.
Explanation to user how to use instruction book.

2—HOUSE WIRING:
Location of Wires and Switches.
Method of Wiring.
Location and Size of Fuses.

3—OUTSIDE WIRING:
Load to Be Carried.
Anticipating Future Installations of Lamps and Accessories.
Size of Wire Necessary to Transmit the Load.

LOCATION

It is preferable to have the Genco Light Plant installed below the level of the ground, in order to prevent the frost from reaching the batteries.

If the Genco Light Plant is installed in an outside building, the engine will operate very successfully in freezing weather if the water is taken out of the radiator while the plant is not operating. It is also possible to put kerosene in the radiator. The rules of installation are the same whether the plant is installed in the cellar or in an outside building. In other words, it is of the utmost importance to have plenty of space all around the base in order to give easy access to all the parts and batteries.

Each Plant is sent with a chart showing exactly the size of the base and the position of the bolts. This chart should be laid on top of the concrete base, which dimension is indicated on same and printed instructions on the chart should be read carefully. This chart is generally called by our men, "template."

Foundation

The foundation should be made of good concrete and should be put in the ground according to information printed on the template. It is necessary to make a good foundation, in order to secure the best results. We do not recommend a wood foundation or any other kind except concrete.

Battery Shelves

When taking the batteries from the crates and connecting them together they should be installed on a shelf about 3 feet away from the concrete base. The

shelves having the shape of a stairway with two steps, one step being 8 inches higher than the other, and 8 cells being placed on the upper shelf and 8 below. This provides a short installation and gives the operator a chance to watch each cell when it is necessary to observe the level of the liquid above the plates.

Exhaust Line

The greatest care should be exercised in putting up the exhaust line. The muffler should not be put close to the engine and if possible the exhaust line should not be longer than 15 or 20 feet. This line should not, when going away from the engine, rise, as we very much prefer having the horizontal part of the line on a slightly down grade. This allows the water produced by condensation of the exhaust gases to flow away from the engine. The muffler should be put on the end of the line and should be head down, this to allow the drainage of the water. It is understood, of course, that the muffler should be on the outside of the building.

Correct Installation

After the batteries have been installed on the shelves and the plant on the concrete base, it will be very easy to connect the two wires which come out from the right hand side at the top of the panel board, which are marked as they come out of the panel board by a stencil, "battery positive and battery negative." The storage battery positive terminal has a long end and the negative terminal has a short end. When connecting the cells together, one short end is fastened to a long end with the results that one end of the battery has a short terminal and the other end has a long terminal. Simply connect the long terminal to the positive wire at the panel board and the short terminal to the negative wire at the panel board. At the left hand top corner of the panel board two other wires go out to the lamps and motors.

Demonstration to User

When the plant is installed and ready to run, it is advisable to demonstrate the following points to the user, in order to familiarize him with a Genco Light Plant:—

1—Put the hand over the pulley and turn the engine over to see if it turns freely. Then put the crank in the pulley and crank the engine, in order to ascertain whether it has good compression.

2—Operate the compression release device on the cylinder head and crank the engine again in order to know when the compression release is applied if the compression has disappeared entirely. Keep compression release in that position.

3—Look over fuel tank and put gasoline in it. See that there is oil in the crank case, the level of which is indicated by the oil gauge to the left of the coil.

4—Be sure that the fuel line from the fuel tank to carburetor is tight.

5—Examine all battery connections and remove the lid on the back of the switchboard. Open the bi-pole switch and see that all connections are tight. Replace the lid and close the switch.

6—See that the ampere hour meter is put on position 50.

7—Press on starting button and bring compression release back to original position. Open carburetor on start and as soon as the plant starts, put carburetor about on center position. If starting on kerosene, use priming can with gasoline.

8—After the plant has been running one-half hour and is warmed up thoroughly, observe the best position in which carburetor has to be set for the maximum ampere outfit and call the attention of the user to that position. Remove the glass lid of the ampere hour meter and move hand with finger showing how the needle of the meter automatically stops when reaching position 100. Explain that when this hand is in step it will automatically stop the plant when the batteries are fully charged. Show the user how to take specific gravity of the batteries and explain to him how to determine when the batteries and the ampere hour meter run in step and how to put them in step. Then put hand at 30, letting the plant run until it automatically stops, regardless of the fact that the batteries might gas 2 to 3 hours.

9—Disturb the handle of the carburetor and see that the user is trained to put it back into the proper place.

10—Explain how to test circuit fuse and ignition fuse.

11—Explain the operation of the timer points and how to make this adjustment by using the small

wrench which is furnished with this plant and a screw driver.

12—Remove the generator side covers and show the brushes and commutator. Show how to clean the commutator.

13—Explain the Oiling System of the engine, showing the grease cup of the fan and the two oilers of the generator.

14—Explain how to test for spark at the plug and how to clean and adjust the plug points.

15—Explain when it is necessary to add water to the batteries and be sure to be very specific about what kind of water to put in, pure rain water or distilled water; also nature of container.

16—Never add any acid or electrolyte in the storage battery except to take care of spillage, at which time electrolyte testing 1250 should be added until the proper level is reached.

17—Show how to locate loose or corroded terminals, by feeling them with your hand after current has been passing through for a few minutes. Poor connections become warm and must be attended to at once. Insist on the necessity of cleaning and tightening battery connectors from time to time. Use vaseline on those terminals to prevent corrosion.

18—Explain the gassing of the battery and show that it indicates a fully charged battery.

19—Tell the user to keep the battery fully charged.

20—Most important of all, go over the instruction book with him, explaining to him whenever necessary the meaning of different paragraphs.

Location of Lights and Switches

The location of the lights will be mostly determined by the wishes of the customer, but the location of the switches can be suggested through the experience of the dealer or salesman.

Method of Wiring and Size of Fuses

In wiring a house, it is generally advisable to use No. 10 wire for the main lines and No. 12 wire for the lamps. By a recent decision the National Board of Underwriters have condemned the use of No. 14 for 32 volt circuits. Whenever an iron is used, we recommend

a special main line of No. 8 wire, as it has been found that the No. 10 wire is too small.

Outside Wiring Load to Be Carried

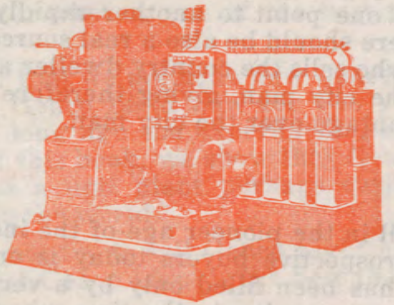
In outdoor wiring, it is necessary to figure the amount of amperes which will have to go through the wire and use the formula given in this book, figuring a voltage drop of 2 volts. It is also advisable when securing the size of the outdoor wiring, to arrange to put a wire having about 50% more circular mills than required for the present installation, in order to take care of some additional lamps or motors which might be put on in the future. When estimating outdoor wiring and giving the estimate to the customer, always be careful to notify the prospective customer that you are figuring this outside wiring with a possibility of 50% increase of load to be carried in order to give the proper points of comparison between your estimate and the estimate which might be given him by a competing concern.

Service Department Instructions

For the use of the Salesman, Dealer and Service Man, the General Gas-Electric Company has issued a service book, which shows how to take care of every possible trouble which might develop during the operation of the Plant. We recommend that this book be read very carefully.

Genco Light

PART NUMBER THREE



THE GENCO LIGHT SALEMAN

The purpose of these few pages is to outline the qualifications which should be those of a Genco Light Salesman to produce results. Then, we will explain what equipment he should have, the purpose of the equipment and how it should be used.
The qualifications of a Genco Light Salesman must be:

FIRST, Desire to work in the open air and away from the shop.

SECOND, Enthusiasm in the possibility of the Lighting Plant Industry.

THIRD, Deep conviction that the Genco Light Plant is the best thing in that line he could sell.

FOURTH, Willingness to work.

FIFTH, Necessity of knowledge.

SIXTH, Constant desire to improve his selling methods.

Desire to Work in the Open Air and Away from the Shop

Man was not created to spend his life between four walls in the dust and other conditions which are generally not conducive to good health. There is an instinct in all of us, giving us a spirit of freedom, as soon as we escape from the City and go in the country. There is not a more interesting profession than selling Genco Light, as it brings the salesman constantly in touch with the farmer and therefore closer to nature.

The automobile has made the Lighting Plant Industry a possibility by giving the salesman means to transport himself from one point to another rapidly and economically. There should be also a real source of satisfaction to him, who sells the country dweller almost all the comfort of the city man, giving therefore the country man the advantage over the city man.

Enthusiasm in the Possibility of the Lighting Plant Industry

We are still in the pioneer age of the industry. The amount of prospective buyers today is enormous and the demand has been filled only by a very small proportion. We are coming to the time when the farmer has been convinced to his satisfaction that electric light is the thing on the farm. At first the wind mill came, then the cream separator, then the gasoline engine,

then the acetyline light, now the electric light has come and it will displace any other means of illumination on the farm as it has done on the automobiles and in the cities.

The future in the Lighting Plant Industry is great, and provided the salesman connects himself with the proper firm he can be sure of a business which will last for him a life time.

A Deep Conviction that the Genco Light Plant is the Best Thing in That Line He Could Sell

Having convinced himself of the possibility of the Lighting Plant Industry, it remains for the salesman or dealer to find out with all the possible help from trained people which is the best plant available to reward his efforts with success.

We are sorry to say that in many parts of the country today some good salesman or dealer, not realizing the value of Genco Light, have not connected with our organization and has given the chance to another man, perhaps not as bright as him, to sell Genco Light.

Assuming that territory is available, or if he desires to connect himself with a dealer's organization, as a salesman, then we suggest that the prospective Genco Light Salesman or Dealer should make an analysis of the features of our plant and battery, and while comparing these features with others, get all the possible information and advice from disinterested professional men, whether they be automobile men, electrical men, battery men or electrical contractors, the result would always be the same and the Genco Light Plant would be pronounced by all of them either the best plant on the market or one of the best plants on the market.

Remember that we are not a new Concern. We have been selling Genco Light now for two years, and we have passed long ago the experimental stage. In the early part of this book, we show that Genco Light was originated as a unit plant perhaps earlier than any other plant in the world.

Please do not try to sell Genco Light unless you are convinced that Genco Light is the best that can be had.

Willingness to Work

You cannot sell a Lighting Plant over the counter, neither can you sit at your desk with your feet up and

expect a customer to come up to you and say "I want a Lighting Plant." A Lighting Plant is very much like an insurance policy, it is the best thing a man can have, but sometimes he does not know that it is the best.

It is up to you to go out and meet the prospect in his home and outline to him the advantages and comforts derived from the use of a Genco Light Plant. Life is too short and the farmer cannot afford to go without such comforts as can be secured for such a small cost. But, of course, meeting the farmer in his home, explaining to him the value and advantages of a Genco Light Plant means hard work and we wish to state here again that although there is no question that bigger returns can be made today from the sale of electric lighting plants than any other selling articles, this class of work requires considerable application and hard work and most of all courage and back-bone.

Many a day, you will start under the most favorable conditions, work hard and will not be able to land an order, but just when you feel discouraged, the opportunity will present itself and if you have not lost your grit, you can put a sale over at that moment.

Remember, also, that the time for you to work the hardest is when you are putting over the biggest amount of sales. Too many salesman have a tendency to rest and take a vacation when orders come in thick and fast. Many a time Genco Light salesmen have put over a sale a day. To those men, we say try to bring in two sales a day.

Necessity of Knowledge

It is very advisable for the Genco Light salesman to make up his mind to study the fundamental principles of electricity and especially direct current generators and also storage batteries. Some salesmen are not studious, simply because they are not acquainted with the idea that study is a necessity and the best means to elevate their standard.

A salesman can get books to study Lighting Plant engineering. He can also get books to study salesmanship. This office will assist any salesman willing to study in securing for him the proper literature.

Constant Desire to Improve His Selling Methods

Every sale made is an added knowledge in the principles of salesmanship for the salesman who secured

the order. We have had some salesmen who could not make a sale for quite a long time and after going over the top once have steadily increased their record. On the other hand we have had some salesmen who have gone stale. This last class of men did not profit by the advantage given them from the knowledge gained by those sales.

Each sale is a victory, yet again we will state that the biggest incentive for advancement is sometimes a sale lost after a good hard fight. Whether the sale is made or lost, analyze the conditions which were a factor in your success or failure. You cannot expect to make all the sales, but you certainly are entitled to your proper share of them.

THE EQUIPMENT OF THE GENCO LIGHT SALESMAN

The Genco Light Salesman should have a

PORTFOLIO
SALES ALBUM
TESTIMONIAL SCRAP BOOK
KODAK
ORDER BLANKS
ADVERTISING MATTER
ACCESSORY CATALOGUE
SERVICE MANUAL
MAILING LIST REPORTS
BATTERY REPLACEMENT REPORTS
FOUNDATION TEMPLATE
TAPE LINE
FUSE PLUGS
SERVICE TOOLS

Portfolio

A good portfolio is very important to have in order to keep everything in good condition. It is very important to make a good impression with the prospect and taking a soiled catalogue from the side pocket of your automobile is not conducive to good results.

Portfolios can be secured at all book stores and should be big enough to contain the material and equipment outlined above.

Sales Album

The sales albums are furnished by the Company to the Distributor who in turn send them to their Dealers and Salesmen. This album is kept up to date from time to time and shows reproductions of photographs of different departments of the factory, explains how carefully the Genco Light Plant is built and tested. It also proves that the storage battery and generator and the engine are all built in one shop, which condition should be used by the salesman as being one of the most important of all.

Testimonial Scrap Book

A testimonial scrap book is a very important thing to have. The cover is furnished at cost by the Company to the Distributor and Dealers and the book has to be built by pasting on the sheets a photograph of either the installation or the outside of the house and right below a letter of recommendation given by the owner, also the information below this letter as to the proper address of the owner, in order to give a chance to your prospect to correspond with him. This brings this very important point to the salesman that it is of the utmost importance to him to visit from time to time his users and secure such testimonial letters as would express the opinion of the user about his Genco Light Plant.

When you can show a prospect signed letters of Genco Light users and some good pictures of installations or residences, it will go a long way towards convincing the prospect that the Genco Light Plant is naturally a good thing for him also.

This scrap book is recognized as being one of the most powerful arguments today in the field, simply because it is based on the satisfactory performance of previous installations.

A visit to owners of Genco Lighting Plants puts the user and the salesman in close touch. It gives the owner a lot of confidence in the Concern selling the Plant. It puts him in the proper frame of mind to recommend the plant to his friends and also affords the opportunity to the salesman to take orders for accessories and supplies.

After a man has become a Genco Light owner he is constantly thinking about increasing his equipment from time to time, because he fully realizes the comfort he is getting and naturally strives to secure more comfort. The user, therefore, needs the proper advice when he secures those supplies and very often some additional wiring must be done. Therefore, it can be clearly seen that regular visits to users are really the best investments salesmen or dealers could make.

Kodak

The kodak is the necessary equipment to secure photographs of installations and residences, and we strongly recommend the Salesman or Dealer to bring out every time the feature of a line shaft installation in which the drive is taken directly from the pulley on the end of the generator.

There is a real advantage for the prospect in buying a Plant with the pulley for mechanical drive, even if he does not for the present consider a line shaft installation and wishes to drive by electricity through motors. Remember this: GENCO LIGHT CAN DO ELECTRICALLY AS WELL AS ANY OF THEM OR BETTER, BUT IT CAN ALSO DO IT MECHANICALLY.

Order Blanks

A salesman should always have order blanks with him and should not be afraid to show them to the prospects. When you go to sell a man a plant you mean to secure his order by getting him to sign an order blank. Therefore, show him the blank as you talk and get him acquainted with the looks of it. We do not mean to tell you how many times an hour you should pull the order blank from your pocket and show it to your prospect, but we think it is a good idea to show it to him as often as you can.

Advertising Matter

By such advertising matter we mean catalogues, circulars and instruction book. The prospects have perhaps received already some of this advertising matter, but it will pay to look over with him the catalogue, for instance, and show him how nicely it is printed and how every part is explained. Bring his attention to the capacity of the plant, to the advantage of the pulley for direct power, to the fact that the plant is made to be accessible, etc. Make him read the instruction book and show him how easy the plant can be operated.

Accessory Catalogue

We do not make it a point to force our Distributors and Dealers to sell accessories as we think they should have all the chance to get those direct at the biggest possible discount. We mean to assist them in securing the biggest discount and advise them from time to time as to what accessories we think are the most reliable to be used in connection with Genco Light.

We do not believe in cheap accessories, but believe in articles which will match the plant. There are many reliable concerns on the market today building electric motors, irons, pumps, wash machines, etc., and willing to give the Distributor and Dealer a discount, which will allow them to make money. We would like to hear from the Distributor and Dealer on this subject, and will be always glad to give them our opinion.

Service Manual

The Service Manual has been edited for the purpose of showing everybody how to take a Genco Light Plant apart and rebuild it again and how to go after any trouble which may occur from time to time due to conditions arising from improper handling.

The Genco Light Plant is built to stay, but like all things made and used by man there is a possibility of defect, and this service book gives clear instructions how to remedy such defects.

A close study of this service book will be the best teacher as to the construction of Genco Light, and will allow the salesman to give the user any information that he may ask.

Mailing List Reports

These reports are the results of a follow-up system on the part of the Distributor or the Dealer and contain some information in reference to a prospect. For instance, it informs the salesman of the name and address of the prospect, the size of his farm, what he expects to operate with his line shaft, whether he has been approached already by lighting plant salesmen, what his objections are in case he has not bought a Genco Light Plant yet, and is of great value to the salesman in giving him the proper information before getting into contact with the prospect.

Very often one salesman can send such reports to another salesman, owing to the fact that one satisfied user has some friends or relatives living in territory not covered by the first salesman. The value of a Lighting Plant on the farm today is so established that if a farmer has money he can give only a very few excuses to the salesman as to his inability to give an order immediately. Those excuses and answers will be analyzed in the following section.

If the prospect is in the frame of mind to buy and does not know what kind of a plant to buy, it is purely a matter of salesmanship for the Genco Light Salesman to secure the order, because he has the best plant and because the price of the Genco Light Plant is well within competing prices.

Battery Replacement Reports

An effort is being made by the General Gas-Electric Company at this time with the co-operation of Distributors and Dealers, to ascertain the exact name and location of users of Electric Lighting Plants, irrespective of their make. A special report is given in those sheets as to the size and condition of the storage batteries used with those plants, and as the General Gas-Electric Company, manufacturers of the Genco Light Plant, are building their own batteries there is a daily possibility of taking orders from such owners for Genco Light Batteries.

It is only by co-operation that such a list can be made, and we call to the attention of the salesman the fact that we will greatly appreciate his help in the making of these reports, as the use of such reports will give him a chance to secure orders for batteries and eventually orders for plants.

Foundation Template

Owing to the fact that the old lighting plants were all belt driven and installation was quite a problem, besides they took a lot of room, the prospective user has no idea how compact a Genco Light Plant is, and the best way to convince him is to show him a base template, which also gives complete information as to the concrete foundation.

Very often a salesman will be consulted by a prospective user as to the proper location of the plant, and a base template will come in handy in figuring out such locations.

Tape Line

A tape line is very necessary when figuring the outside wiring and in ascertaining the exact distance between the different buildings and the plant. Guess work will not do, besides it is necessary in the calculation of the proper size wire to know the correct distances.

Fuse Plugs

Fuse plugs are sometimes necessary if too much current is taken from the batteries of the plant, as they will blow up when the limit is reached.

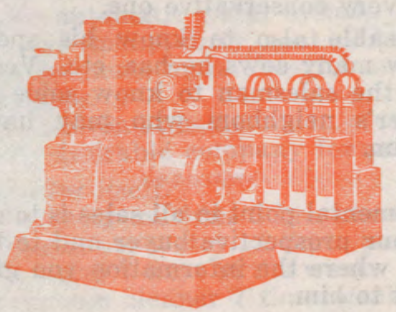
A spare fuse given a user will do very much in putting him in the proper state of mind to give you the names of prospective buyers.

Service Tools

We think that salesmen should be acquainted well enough with the Genco Light Plant as to be able to give small service assistance to the plant. A list of tools necessary for this service is given in Service Manual.

GencoLight

PART NUMBER FOUR



HOW TO MAKE GENCO LIGHT SALES

We will endeavor here only to give such suggestions and explanations as will be of some help to the inexperienced salesman. We know that no two salesmen are alike and it has been proved that a good salesman is a judge of human nature and it becomes necessary for him to approach each prospect in a different way. There are, however, some general rules which apply to each sale. In other words if a sale is to be made, it is necessary for the salesman to find out all about his prospective customer. This we will call the INVESTIGATION.

When the salesman visits the prospective customer after knowing as much as he can about him, it is up to him to get the customer's favorable attention and produce such a line of talk as will constitute a proper APPROACH.

After the salesman has secured his customer's favorable attention, then the time has come for the salesman to outline his proposition. This we will call PRESENTATION.

Then when the story is all told, the time has come for the most important part of the transaction, which is the signing of an order blank. This we will call THE CLOSING OF THE SALE.

Investigation

It is necessary to find out before seeing a prospect as to how much land he owns, whether he has an automobile, a farm tractor and whether he is a progressive farmer or a very conservative one.

It is advisable also to know his special line of farming, how many cows he has, etc. Very often it is possible for the salesman to know some of the prospective buyer's neighbors who may have some influence on him.

Approach

The fundamental point in all sales is to gain the confidence of your prospective buyer and to bring him to such a point where the information you give him is of some interest to him.

Telling a farmer, for instance that such and such neighbor of his is using a certain improved method in the management of his farm, will immediately awake in the farmer's mind a competitive interest.

Soon after the conversation is started, the prospective user will begin to ask questions. This is the surest indication that he places in the salesman a certain amount of confidence and recognizes a certain amount of ability. As soon as this favorable attention is secured, no time should be lost in getting to the point of outlining the Genco Light proposition.

Presentation

In presenting the Genco Light Proposition to a prospective customer and after explaining the advantages of the Genco Light Plant over any others, it becomes necessary to appeal to his imagination and awaken certain emotions, which will bring to the point the closing of the sale.

This Genco Light appeal is divided practically in two big divisions:

FIRST—GENCO LIGHT betters living conditions.

SECOND—GENCO LIGHT pays for itself many times over.

It is not necessary to talk too much about the mechanical advantages of GENCO LIGHT, as it might convey the idea that the GENCO LIGHT PLANT is complicated. Tell him what Genco Light will do, how simple it is to operate, how much help it will be to the family. Here will be found below 22 reasons which will appeal to the imagination of the prospective buyer:

1st—It betters living conditions.
- Better Light.
- Safer Light.
- Provides Power.
- Provides automatic water system.
- Eliminates smoky, dirty, coal oil lamps.
- Makes the home more cheerful and comfortable.
- Saves Labor.
- Keeps children at home.
- Attracts desirable company for your family.

2nd—It pays for itself.
- Runs washing machine 5 hrs. per week.
- Runs cream separator 14 times per week.
- Pumps water 7 days in the week.
- Runs vacuum cleaner 7 times each week.
- Electric iron 4 times each week.
- Runs Electric Fan every day, if desired.
- Provides good light to do chores 14 times each week.

Runs milking machine 14 times each week.
Runs grindstone.

3rd—It modernizes your country home.
Furnishes water automatically.
For the lavatory.
For the bath
For the toilet.
For the kitchen.
For the sink.
Sprinkles the lawn.
Operates Electric vacuum cleaner.
Operates Electric Vibrator, Toaster, Coffee Percolator, etc.

4th—It provides convenience and comfort to those who may be unfortunately sick in your home.
Heats water quickly.
Heats hot pads.
Provides light all times of night or day.
Does not burn the health-giving oxygen in the room.
Assists the doctor in his call.
Provides current for call bell for sick room.
Assists the nurse in her duties.
Makes the sick room more bright and cheerful.

5th—It saves time and labor of house-wife.
Runs washing machine and wringer.
Saves many steps on ironing day.
Provides hot and cold water at sink.
Sweeps the carpets with vacuum cleaner.
Cleans carpets, rugs, tapestry, mattresses.
Eliminates the awfulness of house cleaning, as rugs, carpets, curtains and mattresses may be cleaned without removing.
Pumps water.
Furnishes heat for toast, coffee, etc.
Eliminates the labor necessary to clean lamps and lanterns.
Assists the house-wife in care of children at night.

6th—It saves time and labor for the farmer.
Runs milking machine, milking several cows at once.
Runs the fanning mill.
Runs small corn sheller.
Runs horse clipper.
Runs sheep clipper.
Runs small feed grinder.

Provides light throughout barn and outbuildings, saves much time in getting about the place at night.
Pumps water.

7th—It saves money.
Takes the place of one man or woman who usually spend the greater part of their time doing things which Genco Light Plant will do.
Saves at least $6.00 per week.
52 weeks in 1 year times $6.00—$312.00 per year.
Pays for itself in two to three years and betters living conditions.

8th—Keeps the children at home.
Boys and girls enjoy their home.
Invite company and enjoy having them.
Causes the young and old people to take pride in their home.
Provides pure white electric light for students at home.
Less hard work makes mother more cheerful.
Makes the Home a more desirable place to live.
Small boys can milk cows which would otherwise require several persons to milk, giving more time in field for older persons.

9th—Makes far more productive labor hours in field.
Farmers can remain in the field longer, as it is a pleasure to do chores with well lighted buildings and yard.

10th—Increases production on farm.
Saves labor.
Makes more time to do chores.
Runs cream separator more steadily.
Producing a better separating condition.
Takes the place of one person on farm and always on the job.
Never takes a vacation.

11th—Eliminates fire hazard.
Decreases fire risk.
Does away with dangerous lamps and lanterns.
Eliminates the carelessness in handling lanterns in and around the buildings.
Eliminates the danger of a child tipping over or dropping a lighted lamp, frequently burning property and injuring members of your family.
Electricity is the safest as well as the most convenient form of light.
Obtained at the push of a button.

12th—Genco Light Plant is so large in capacity, both mechanically and electrically, that it is in a class by itself.
Genco Light electrical capacity, 1000 watts.
An average of ten other leading plants on the market is approximately 750 watts, 250 watts greater than the average in favor of the Genco Light Plant.

13th—Genco Light is an improvement to the farm.
Increases the value per acre.
A valuable and permanent improvement.
Farm sells more readily with electric light.

14th—Solves the labor problem.
Makes the farm more attractive to those looking for employment.

15th—Keeps the family at home.

16th—Eliminates Blue Mondays:—Ask mother why. Washing, ironing, house cleaning, etc.

17th—Did you ever lose a good farm hand, or have one of your boys leave home because he was compelled to work all day in the field and then milk by hand a number of cows in dark barns?

18th—Did you ever sit in the house after dark and wonder where the boys or hire men were with the lantern?

19th—Have you read today in your paper an account of valuable buildings burning and lives being lost by use of lamps and lanterns?

20th—Did you ever read of a child being burned to death by fire caused from dropping a lamp?

21st—Did you read today or recently where a gas plant had exploded, completely demolishing the home and killing several persons?

22nd—Better living conditions, less drudgery, better health, better satisfied, more money made with less labor.

Closing of the Sale

It is not possible to give any salesman positive and printed instructions as to how to close a sale. There is always a time for closing a sale, and very often a salesman will talk himself into a sale and again talk himself

out of a sale, and the real salesman is the one who knows when the psychological time has come.

The order blank should be on the table or in the salesman's hand during the presentation of the proposition. The customer should get used to the appearance of the blank. Make up your mind that you are there to make a sale and tell your customer so.

It is not always possible to make a sale on the first visit. Some people are slow to make up their minds and very often they want to investigate the performance of Genco Light with some of their neighbors. It is necessary then for the salesman to put his attention to satisfying his prospective buyer that other people are well pleased with Genco Light.

We recommend when the time has come to close a sale that the most natural way for the salesman to do, is to tell his customer, "I want you to sign here."

WIRING AND ACCESSORIES

The selling of a Genco Light Plant is not all for the salesman. The installation is the most important part to consider. Many times a sale is not made until the price has been quoted for wiring and accessories, and we recommend that the salesman be very cautious and when taking an order should go in every detail as to the number of outlets in each room of the house, barn, etc., the exact number of feet of wire for outside wiring and whatever accessories which will be used with the plant.

In other words the prospects more and more want to buy a Genco Light Plant installed. This very often brings an order which amounts to more than twice as much as the list price of the plant.

A salesman should not make promises that this or that outlet will be put on, if it is desired, but the order for wiring should take the form of a positive contract, signed by the customer at the same time that be buys a Genco Light Plant.

It has been our experience that although the Genco Light Plant has performed very satisfactorily, some customers claim that certain salesmen made promises to them which were not kept at the time of the installation. For instance, when the wiremen go to that particular place their order sheets for wiring calls for so many outlets and when they arrived there the customer

says that he was promised two or three more outlets. This, of course, was a verbal promise made by the salesman but not put down on the contract.

It is always easy to sell accessories afterwards, but it is necessary to sell the wiring at the same time the plant is sold. Sometimes the prospective buyer has his house wired already in anticipation of the coming of a lighting plant, then in that case the sale converts itself into a plant sale, with perhaps the sale of some accessories.

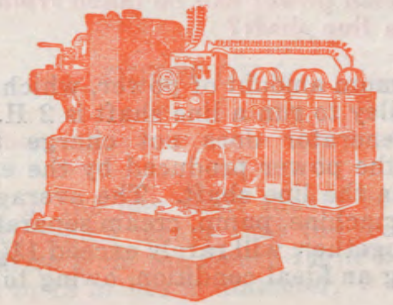
Capacity of Battery

It has been found that the battery is never too big on a farm, but it is sometimes too small. When a salesman has come to a point where his prospect is ready to buy and after he has talked all the time a type "A" plant, we think that the ability of the salesman which has brought the customer to the point of closing for a type "A" can turn the sale into a type "B." The results of such a change are such that the salesman will get a bigger commission, owing to the increased value of the plant, and the farmer will get just as much for his money as before.

We recommend that the type "B" Plant be used on every farm, as there is less possibility to overload the battery on discharge. The type "A" battery was built to meet the competition on prices. It is still 30% larger than the majority of batteries used with plants sold today, but it is in looking into the future of Genco Light that we make this recommendation, and it is also with the idea of giving the Genco Light salesman and dealer the greatest possible returns for his efforts.

Genco Light

PART NUMBER FIVE



USEFULNESS OF GENCO LIGHT TO THE USER

QUESTION 1

How many lights can be used on the battery alone?

16-20 Watt Lamps can be used on the type "A" battery for 8 hours continuously, or 6-20 Watt Lamps can be used on the same battery for 30 hours continuously.
27-20 Watt Lamps can be used on the type "B" battery for 8 hours continuously, or 10-20 Watt Lamps can be used on the same battery for 30 hours continuously.

QUESTION 2

How many lights can be used on the battery with the engine running?

From 46 to 67-20 Watt Lamps can be used for 8 hours continuously on type "A" battery, and from 61 to 78-20 Watt Lamps can be used for 8 hours continuously on type "B" battery.
The reason why the positive amount of lamps is not given when the engine is running, is due to the fact that the lowest amount represents the normal capacity and the highest amount represents the maximum capacity.

QUESTION 3

How much power can be taken from the pulley to run a line shaft?

The maximum amount of power, which can be taken from the pulley to run a line shaft is 2 H. P., at which time the generator does not charge the batteries because all the power produced by the engine at that speed goes in the line shaft. The average load taken by washing machine, pump, cream separator, etc., even if they run together, will rarely exceed 1½ H. P., thereby producing an ideal condition, owing to the fact that

the battery is being charged at the rate of about 6 to 8 amperes, which we know is always preferable to a battery charged too fast.

If the plant is required to run a line shaft every day, the batteries might get charged too much. In that case the charging rate can be reduced by moving the latch on the carburetor.

QUESTION 4.

I have a garage. What size air compressor can I use with Genco Light?

The size compressor, which can be used with Genco Light has a bore from 2½ to 3 inches and a stroke of from 3 to 4 inches. The speed of this compressor is about 200 to 300 R. P. M. and the power required is from ½ Horse to 1 Horse. It should be operated through a counter shaft with a tight and loose pulley.

QUESTION 5.

What is the size of the battery used with Genco Light?

Two sizes. The Plant "A" has a 7 plate battery, which has a capacity of 110 ampere hours (intermittent rating) and the Plant "B" has a 11 plate battery, which has a capacity of 167 ampere hours (intermittent rating).

QUESTION 6.

What should be the speed of the line shaft?

The speed of the line shaft should be from 200 to 300 R. P. M., which means that the main pulley receiving the drive from the Genco Light Battery should be 16 inches to 18 inches in diameter.

QUESTION 7.

How many days in the year will Genco Light be useful?

Genco Light is useful on the farm 365 days and 365 nights. Below will be found a list of improved farm machinery with a report of the amount of useful days on the farm:

	Average days in use per year
Tractor	60
Automobile	50
Walking Plough	19
Sulky Plough	15
Corn Planter (two rows)	8
Spring Tooth Harrow	7
Cultivator (2 rows)	6
Grain Drill	5
Land Roller	5
Disc Harrow	4
Spike Tooth Harrow	3
Mower	3
Hay Rake	3
Grain Binder	3

QUESTION 8.

Can I saw wood with Genco Light?

Yes, it is possible by operating the saw direct from the pulley on the generator or through a line shaft. It is not advisable, however, to use a saw bigger than 10 inches in diameter.

QUESTION 9.

How big a water pump can I run with Genco Light?

Electrically it is possible to run up to ½ H. P. Motors and by using the pulley on the end of the generator, it is possible to run a pump two to three times that size.

QUESTION 10.

How big an electric motor can I run with Genco Light?

Running on type "A" Batteries without the engine running, ¼ H. P. Motor.

Running on type "B" Batteries without the engine running, ½ H. P. Motor.

Running on type "A" Batteries with engine running, ¾ H. P.

Running on type "B" Batteries with engine running, one H. P.

QUESTION 11.

How many machines can I put on my line shaft at one time?

Genco Light operating a line shaft can run at one time a cream separator, washing machine and a pump, if necessary.

QUESTION 12.

How can you run Genco Light Plant with batteries fully charged?

This is possible by pulling out the switch on the side of the panel board right underneath the fan grease cup. By doing this the automatic cut off on the ampere hour meter is put out of action.

QUESTION 13.

How many hours a week must I run Genco Light to produce the necessary energy for my lamps only?

Assuming that the installation is ordinary size with about 30 lamps installed and 5 or 6 lamps used every day, one tank of fuel will run the plant 5 hours and fully charge the battery for one week of operation.

QUESTION 14.

What would be the average running hours per week if I light my place and run a line shaft?

If the line shaft runs a washing machine, a cream separator and other small machinery, the average running hours per week will be 8 hours, during which time the battery can be fully charged.

QUESTION 15.

Can I use a heating pad with Genco Light?

Yes, and it is not necessary to run the engine, providing the pad is not used more than two hours a night. A heating pad only requires 40 watts.

QUESTION 16.

Can I use an electric iron with Genco Light?

Yes, but it is to be noted that an electric iron takes 600 watts and we recommend that the plant be run during the time which the iron is operating; this will save the batteries and the iron will be warmer, owing to the fact that the voltage will be raised from 32 volts to 35 when the Plant runs.

QUESTION 17.

How big a water pump can be run with Genco Light?

Running electrically with a ½ H. P. Motor, the Genco Light Plant will run a pump which will deliver 150 gallons an hour from a depth of 150 feet. If the pump is run from the pulley, the capacity of same can be increased to 450 gallons an hour.

ENGINE

General Construction

QUESTION 18.

What is the bore and stroke of Genco Light?

3¼ inch bore and 3 inch stroke.

QUESTION 19.

What is the speed of Genco Light?

1150 to 1250. The speed will vary with the throttle opening and also with the condition of charge in the battery.

QUESTION 20.

What is a four cycle engine?

A cycle is practically one half of a revolution or one travel of the piston in one direction. A 4 cycle engine is an engine in which the explosion of the gas occurs only every fourth half of a revolution or every second revolution. In a 4 cycle engine during the first cycle, the piston goes down and takes in the explosive mixture. During the second cycle the piston goes up and compresses the mixture. During the third cycle, the piston goes down under the impulse of the mixture, which has been ignited and when the fourth cycle takes place the piston goes up again, chasing the burned gases into the exhaust pipe.

QUESTION 21.

Why is Genco Light water cooled?

Because it is the most reliable way to cool an engine. This has been found so in the automobile field, farm gasoline engines, trucks, tractors, and aeroplanes.

QUESTION 22.

Why is a radiator used for the cooling?

By using a radiator it is only necessary to use two gallons of cooling liquid.

QUESTION 23.

Why is a valve in head engine used?

This type of valve produces the greatest economy for a certain power to be developed.

QUESTION 24.

Why is the fly wheel in the crank case?

To produce better balance and to prevent accidents resulting from an exposed position.

QUESTION 25.

What is the purpose of the cam shaft?

To operate the valves at the proper time.

QUESTION 26.

What operates the cam shaft?

The pair of gears situated in the front part of the engine and running in oil.

QUESTION 27.

Why are three rings used in the piston?

Three rings have been found to hold compression better than two rings, although it is a more expensive construction. Yet four rings are not necessary.

QUESTION 28.

Why are right hand and left hand rings used?

Under the influence of the explosion of the gases, the rings have a tendency to turn, and a left hand ring will turn in the opposite direction from a right hand ring.

In the Genco Light Piston two right hand rings are used on top and bottom and one left hand ring between. This construction prevents the opening of the rings from registering together.

QUESTION 29.

How are push rods and rocker arms lubricated?

The crank case extends well over the head of the cylinder and the splash lubricating system supplies the proper amount of oil to the push rod and rocker arms.

QUESTION 30.

How can push rods be adjusted?

By removing the cylinder head cover, the adjustment can be made with great ease.

QUESTION 31.

Why do Genco Light Plants use so little lubricating oil?

Because of the short stroke and the great length of the connecting rod, also the length of the piston skirt

and also the fact that a low clearance can be used between the pistons and the cylinders, owing to the fact that Genco Light is water cooled.

QUESTION 32.

Why is it not necessary to grind valves on Genco Light engines?

Very little oil being used and the valve seat well cooled, together with a very valve spring pressure, make it possible for the Genco Light to run year after year without grinding the valves.

QUESTION 33.

What is the purpose of the inspection plate?

To inspect the inside of the crank case from time to time and also allow the taking up of the connecting rods when necessary.

QUESTION 34.

When do connecting rod bearings need taking up?

If Genco Light runs 5 hours a week, the rods need taking up every 6 years.

QUESTION 35.

What is the purpose of a drain plug for the crank case?

To drain the oil every 6 months when running on gasoline, and every 2 months when running on kerosene and replace it by fresh oil.

QUESTION 36.

Can kerosene be used in the radiator?

Yes, but only when temperature is constantly below 32 degrees Fahrenheit.

QUESTION 37.

How does Genco Light run on kerosene?

Genco Light runs well on kerosene and shows a small increase of power over gasoline with the same throttle opening and it does not carbonize any more than gasoline does.

QUESTION 38.

Why does Genco Light produce more power on kerosene?

Because the fuel is all burned clean and therefore the engine gets the benefit of the fact that kerosene contains a little more heat units than gasoline.

QUESTION 39.

Why do push rods need so little adjustment?

Because all working parts are hardened and lubricated constantly by internal splash instead of being exposed to the dust.

QUESTION 40.

Why is a vacuum maintained in the crank case?

To prevent oil leaks.

QUESTION 41.

How are the internal moving parts of the engine lubricated?

The connecting rod has an extension, which dips in the oil and this oil is sent into pockets, which lubricates the main bearings. The connecting rod bearings and cam shaft bearings and valve tappets receive this same splash.

QUESTION 42.

What happens if the engine should run out of oil?

The engine will stop owing to the increased heat caused by the expansion of the piston and in many cases without any injury to the plant.

QUESTION 43.

How is the crank shaft counter-balanced?

The counter balance weights are integrally forged on the crank shaft, and one side of the crank shaft has a disc on which the fly wheel is bolted. This fly wheel also acts as a counter balance weight.

QUESTION 44.

Why is a cast iron piston used?

It is the only construction which has shown reliable results. Aluminum pistons are not reliable, as they have a tendency to make the rings tight in the grooves.

QUESTION 45.

How many bearings has the crank shaft?

Two bearings made of Babbitt metal, the size of those bearings being 1½ inches in diameter and 3 inches long.

QUESTION 46.

How much oil does the crank case hold?

The crank case will hold 3 quarts of oil.

CARBURETOR AND FUEL SYSTEM OF ENGINE

QUESTION 47.

Why is the fuel tank below the carburetor?

To conform with instructions and specifications of National Board of Fire Underwriters.

QUESTION 48.

Why does the carburetor take the air from the top of the cylinder head?

To produce a vacuum in the crank case and also to get air which is already warmed up.

QUESTION 49.

How does this produce a vacuum in the crank case?

The air is allowed in the crank case through a 3/16 hole at the top of the cylinder head and the size of this hole has been worked out to produce this vacuum.

QUESTION 50.

What do the figures on the dial of the carburetor show?

The figures on the dial are there to help the user of the plant as to the proper position on the needle valve for the most economic operation.

QUESTION 51.

How can the needle valve be adjusted?

The needle valve has a slot and by loosening this valve from its arm it can be placed in the proper position. The needle valve arm is slotted for that purpose.

QUESTION 52.

For what purpose has the carburetor a priming hole?

When starting on kerosene, it is necessary to inject some gasoline through the priming hole. The purpose of this hole is also a gas saver, as the fresh, cold air entering this hole and mixing with the warm air and the fuel, produces a perfect mixture.

QUESTION 53.

What different kinds of fuels can be used in Genco Light Plants?

Gasoline, Kerosene, Alcohol, City Gas and Natural Gas.

Ignition

QUESTION 54.

What is the purpose of a timer?

To produce the proper contact and interruption of the current going through the coil.

QUESTION 55.

What is the purpose of a coil?

To utilize this current and transform it into high tension spark.

QUESTION 56.

How is the timer operated?

The timer is operated at one-half the speed of the crank shaft and is driven by a slot which is on the end of the cam shaft.

QUESTION 57.

What is the timer gap?

It is the opening of the contact point in the timer.

QUESTION 58.

How much should this gap be?

This opening should be about twenty one-thousandths of an inch.

QUESTION 59.

How can timer be removed?

By loosening the two set screws on the hub of the time gear case.

QUESTION 60.

Is it possible to put it back in the wrong position?

No, because the horizontal set screws fit in a counter sunk hole into the hub of the timer.

QUESTION 61.

Where is the high tension terminal on coil?

On the side of the coil and in front of it.

QUESTION 62.

How can ignition be produced with 4 dry cells?

Ignition can be produced by fastening the terminals of a battery of four dry cells to the two special terminals placed on the side of the coil right above the high tension terminal.

Cooling

QUESTION 63.

How does the radiator operate?

The water which has been heated in the cylinder jacket circulates through the copper section of the radiator and there comes in contact with a current of air. The water circulates upward in the cylinder jacket and downward through the radiator section.

QUESTION 64.

What is the purpose of the fan?

To produce the necessary current of air, which in going through the radiator cells absorb the heat from the water.

QUESTION 65.

How can fan belt be adjusted?

The fan support slides vertically in the radiator and is held in position by a cap screw right behind the fan.

QUESTION 66.

What is the purpose of the shutter on the radiator shield?

To cut down the amount of air going through the radiator and maintain a high temperature of the water during cold weather.

QUESTION 67.

Why is an overflow pipe used?

To take care of any expansions of the water. This construction is very similar to the one used in automobile radiators.

QUESTION 68.

Why does water circulate?

When water becomes heated, it expands and its specific gravity increases, or in other words, it becomes lighted. This water is going through the opposite cycle in the radiator and becomes cooler and heavier. This is the principle of the Thermo-siphon system of cooling.

QUESTION 69.

How much water is contained in the radiator and engine jacket?

From 7 quarts to 2 gallons.

Lubrication

QUESTION 70.

What kind of oil is to be used in the Genco Light Engine.

Medium type of oil in summer and light type of oil in winter.

QUESTION 71.

Where is the oil to be put in?

The oil is put in at the cylinder head by removing a special plug and using a funnel.

QUESTION 72.

How much oil is contained in the crank case?

It is possible to put in a gallon of oil in the crank case, but the average capacity is 3 quarts.

QUESTION 73.

How much should be put in at one time?

Not over one quart.

QUESTION 74.

How does the oil reach the top of the cylinder?

Through a special channel, which has been provided, on the side of the cylinder.

GENERATOR

QUESTION 75.

What is the function of a generator?

A generator is a machine, which transforms the mechanical energy into electrical energy.

QUESTION 76.

What kind of bearings are used in the generator?

The bearings used are called self-contained annular ball bearings, in which the balls are held by separators.

QUESTION 77.

How many bearings are used in the generator?

Two bearings support the armature. The normal load capacity of those bearings being 300 pounds at 1200 R. P. M. for each, which shows the great amount of safety at that point.

QUESTION 78.

How is dust prevented from entering into the bearings?

On each side of the bearings there are two pressed steel washers, between which a felt washer is compressed. It is absolutely impossible for dust to enter the bearings, and owing to the fact that the generator is away from the engine heat, the other cause of trouble is totally eliminated.

QUESTION 79.

What is the difference between a compound wound generator and a shunt wound generator?

The current in the generator is produced by the armature rotating between pole pieces. Those poles are magnetized by coils through which some current passes. If the pole coils are wound with fine wire, taking only part of the current, which is generated in the brushes, the generator is called shunt wound. If in addition to this shunt winding the coils are composed of a few turns of heavy wire through which the current made by the generator passes, then the combination of fine wire and heavy wire field coils makes a compound wound generator.

QUESTION 80.

What is the generator output?

The output of a generator is the amperes produced by that generator under a certain voltage.

QUESTION 81.

What is the output of the Genco Light Generator?

The output of the Genco Light Generator is from 17 to 27 amperes at a voltage of 37½ volts.

QUESTION 82.

What is the average charging voltage of a Genco Light generator?

The charging voltage of a Genco Light generator is from 35 volts to 40 volts, according to the charging rate and the amount of electricity already in the battery. In other words, if a type "A" battery is charged at the rate of 17½ amperes, the generator voltage will be 35 volts when the battery is completely discharged and will go up to 40 volts when the battery is gassing.

QUESTION 83.

Why must the generator voltage be above 32 volts?

The storage battery, which consists of 16 cells connected in series has a load voltage of 32 volts. Therefore, the generator voltage must be greater than the battery voltage in order to be able to charge the cells.

QUESTION 84.

What is the normal and maximum wattage of a Genco Light generator?

A Genco Light charging battery "A" will produce 17½ amperes at 35 volts, or 612 watts. When charging a "B" battery, the amperage will be 20 watts

and the voltage 36 and therefore the wattage will be 720 watts.

With the carburetor latch completely removed, the Genco Light Plant will pull 27 amperes and 40 volts, or 1080 watts. The two former charging rates are normal loads and the last one is a maximum load consistent with good performance of the plant.

QUESTION 85.

Why is a universal joint used in the drive of a Genco Light generator?

In order to allow for the small variation of alignment and to make possible a quick removal of the generator for service reasons.

QUESTION 86.

Why is a ventilator used?

To keep the generator cool.

QUESTION 87.

How long will the brushes last?

The brushes should last a lifetime at the rate of 6 hours a week.

SWITCHBOARD

QUESTION 88.

Why is the switchboard mounted on the generator?

There are several reasons why it is advisable to have the switchboard mounted on the generator. It pro-

duces a compact plant and insures its location in the most convenient place. It also gives a chance for the operator to be right close to the plant when starting it. It reduces the cost of installation.

The generator on the switchboard being permanently wired at the factory, it becomes impossible for the user to make the wrong connections.

QUESTION 89.

Why is the Genco Light switchboard all enclosed on the back?

The Genco Light switchboard is all enclosed, because it gives more protection to the connections behind the panel board. This construction is only found in Genco Light and is more expensive than the open type of board.

QUESTION 90.

Why are the wires coming out from the top of the Frame?

By getting the wires out at the top of the frame, it is unnecessary to open the switchboard back connections and loosen any nuts. This has been done for the convenience of the user and to jrevent any mistake in connecting the plant on the wrong side of the battery.

QUESTION 91.

Why is the polarity of the wires indicated by a stencil?

The polarity of the battery wires is necessary to make the proper connections. The polarity of the house line has been given in case the user wants to use a battery charging outfit.

QUESTION 92.

Why is an ignition fuse used?

To protect the coil and timer from any possible short-circuit.

QUESTION 93.

What is the purpose of a bi-pole switch?

To connect and disconnect the battery with the generator and when having the switch open to remove all current from the generator parts in case of service inspection.

QUESTION 94.

What is the capacity of the line fuses?

30 Amperes.

QUESTION 95.

What is the purpose of the ampere hour meter on battery gauge?

To show at all times the amount of current stored in the batteries and also to show how much current is entering the battery when the plant is running and how much current is leaving the battery when the plant is not running and lamps or other appliances are used.

QUESTION 96.

How does Genco Light shut down automatically?

When the upper needle of the ampere hour meter reaches a fully charged condition it automatically opens the ignition circuit and prevents current from going through the coil, causing the engine to shut down.

QUESTION 97.

How can Genco Light be run after the batteries are fully charged?

After the batteries are fully charged the plant will stop running and in order to be able to keep the plant running, in case it is necessary to run a line shaft after the batteries are fully charged, the ignition current through the coil must be re-established. See answer to Question 98.

QUESTION 98.

What is the little switch on the left of the frame right underneath the fan grease cup for?

This switch is used for the purpose of, and will short circuit the automatic ignition cut off on the meter when this switch is pulled away from the board.

QUESTION 99.

What is the switch on the outside of the frame for?

If it becomes necessary to crank the engine to start when the current is still strong enough to light the lamps, but not strong enough to turn the engine over, all that is necessary is to prime the carburetor, crank the engine and press the switch. This will produce ignition, which otherwise was cut off by the automatic cut out when the engine stopped.

QUESTION 100.

What does the upward needle of the ampere hour meter indicate?

The percentage of charge of the batteries.

QUESTION 101.

What does the lower meter show?

The amount of current going in or out of the batteries.

QUESTION 102.

What is meant by putting the meter and the battery in step?

A battery is supposed to be fully charged when the meter needle shows 100, therefore the meter needle and the battery are in step. If for any reason the meter would show full charge and the battery would not be fully charged, then they would not be in step.

QUESTION 103.

How is it done?

If, for instance, the meter shows 100 and the battery shows a gravity of 1200, it would indicate that the batteries are half charged, although the meter shows fully charged. Put the meter on zero and run the plant until the battery gasses freely for one-half hour, then set the meter needle at 100, the battery and the meter needle will then be in step.

QUESTION 104.

Where is the starting switch?

The small push button in the right hand lower corner of the switchboard operates the starting switch.

QUESTION 105.

Where is the automatic circuit breaker or cut out?

The circuit breaker or cut out is also contained in the same box. The purpose of this circuit breaker or cut

out is to connect the batteries with the generator when the engine has reached the proper speed and also to disconnect same when the engine has slowed down and stops. At the same time this is done, the ignition contact is made, and when the cut out disconnects the battery when the engine slows down, the ignition contact is broken.

QUESTION 106.

Why are two different contacts used to start the engine and afterwards to connect the generator to the battery?

The starting switch makes a contact through which about 55 amperes passes at the start, and this only for about one second. The cut out contact makes a contact through which about 20 amperes pass and this for 4 or 5 hours at a time. The duties of these two contacts are entirely different and call for a different construction, and it is a mistake to use only one contact.

QUESTION 107.

Are other plants using only one contact?

Most of the other plants are using only one contact.

STORAGE BATTERIES

QUESTION 108.

What is the purpose of storage batteries?

To store electrical energy and hold this energy for a length of time and give it back when required.

QUESTION 109.

What is the capacity of the storage batteries?

The capacity of a storage battery is represented by the amount of electrical energy it can store. It is very

similar to the capacity of a liquid container. For instance, a barrel has a capacity of 50 gallons of liquid.

QUESTION 110.

Is the capacity in proportion with the size and number of plates?

Yes, the capacity is directly in proportion with the number and size of the positive plates of the battery.

QUESTION 111.

Is the capacity in proportion with the number of cells?

No.

QUESTION 112.

What is the voltage of a cell?

The voltage of a cell of the pasted plate type such as used in Genco Light is two volts.

QUESTION 113.

Does the voltage change with the size of the cell?

No.

QUESTION 114.

Is the voltage in proportion to the number of cells?

Yes, the voltage is directly in proportion with the number of cells coupled in series. When battery cells are connected together, so that one positive terminal of one cell connects with the negative terminal of another cell, this coupling is called series coupling.

QUESTION 115.

Why is a glass cell storage battery used?

Because the cell is transparent and therefore gives the user a chance to see whether the electrolyte or liquid around the plate is, at is should be, always above the plate.

QUESTION 116.

Why are the cells sealed on top?

This construction allows the manufacturer to ship the batteries completely charged and filled with liquid. After the batteries have been installed, the sealed top prevents evaporation of the water of the electrolyte and therefore does not make it necessary to add water as often as if the top of the cell were exposed. The sealed top also prevents any dust or foreign material from entering the battery.

QUESTION 117.

Why are the plates supported on the bottom?

To insure the proper strength of the cells, so that they can be shipped without damage.

QUESTION 118.

What is the difference between a 110 ampere hour and a 160 ampere hour battery?

The 110 ampere hour battery, or type "A," has 3 positive plates and 4 negative plates, and the 167 ampere hour battery, or type "B," has 5 positive plates and 6 negative plates.

QUESTION 119.

If the capacity of a 110 ampere hour, 16 cell battery is 110 ampere hours, what is the capacity of a single cell?

The capacity of a single cell is exactly the same as the capacity of 16 cells, because those cells are coupled in series.

QUESTION 120.

How many plates are there in the Genco Light battery?

The type "A" having 7 plates per cell has therefore 112 plates for 16 cells and the type "B" battery having 11 plates per cell have therefore 167 plates for 16 cells.

QUESTION 121.

What is the size of the plates?

The size of the Genco Light battery plate is $5\frac{3}{4}$ x $6\frac{3}{4}$.

QUESTION 122.

What is corrosion?

It is the result of the action of acids on metals.

QUESTION 123.

What effect does a loose terminal have?

It will prevent the current from passing through the battery and will cause the lamps to burn bright.

QUESTION 124.

What causes corrosion of battery terminals?

The terminal bolts are copper lead covered. If the terminals are not covered with vaseline, then the acid will creep into the copper bolts and nuts and create corrosion.

QUESTION 125.

What is a separator?

A separator is composed of insulating and porous material placed between the positive and negative plates to prevent them from coming in contact with each other. Separators are generally made of treated wood and are smooth on one side and grooved vertically on the other side.

QUESTION 126.

How are separators placed in the battery?

When separators are placed on the batteries the vertically grooved side is towards the positive plate.

QUESTION 127.

Why is it that Genco Light batteries do not have rubber separators in addition to wood separators?

Rubber separators are only used in addition to wood separators when the batteries are working under overloaded conditions.

QUESTION 128.

Why are separators treated?

To prevent further action from the electrolyte on the separators after they have been placed in the cell.

QUESTION 129.

What is specific gravity of a battery?

When the battery is charged or discharged, sulphuric acid is forced from the plate into the electrolyte, or returned from the electrolyte into the plate, and as sulphuric acid weighs more than water, it can be clearly seen that the electrolyte will have a variable weight during the charge and the discharge.

It has been found that the observation of this weight will give the nearest indication as to the state of charge or discharge of the battery. This weight of the electrolyte or specific gravity is taken by an apparatus which is called hydrometer.

QUESTION 130.

How can it be observed?

The hydrometer is a glass container in which a calibrated float sinks more or less in the electrolyte. By inserting the hydrometer in the battery above the plates, a certain amount of this electrolyte is admitted in the hydrometer barrel and the specific gravity is indicated on the calibrated divisions of the float.

QUESTION 131.

What is the specific gravity supposed to be when the batteries are charged?

A Genco Light battery fully charged will indicate 1250 degrees on the hydrometer.

QUESTION 132.

What is the specific gravity supposed to be when the batteries are discharged?

A Genco Light battery normally discharged will indicate 1150 degrees on the hydrometer.

QUESTION 133.

What is the specific gravity supposed to be when the batteries are half-charged?

A Genco Light battery half charged will indicate 1200 degrees on the hydrometer.

QUESTION 134.

What is battery gassing?

When the battery reaches a fully charged condition and cannot be charged any more the electrical energy going through the battery will decompose the electrolyte and produce an abnormal quantity of hydrogen gas. This gas works to the top of the battery and gives the cell a milky appearance. This is called gassing.

QUESTION 135.

Is it injurious to have the battery gassing?

It is considered that a moderate amount of gassing is very healthy for the battery, but an abnormal amount of gassing will have a tendency to loosen the active material of the plates.

QUESTION 136.

How often is it necessary to put the meter in step with the battery?

If the plant is run 6 hours a week, we recommend that the meter be put in step with the battery once a month.

QUESTION 137.

How long can a battery be left in a fully charged condition?

It has been found that batteries left in a fully

charged condition could stay without any injury up to a period of 4 months without being used, but it is advisable as soon as the battery is put in use again to give it a complete charge of at least 5 hours and make it gas for at least half an hour.

QUESTION 138.

How long can a battery be left in a discharged condition?

It is not advisable to leave the battery in a discharged condition more than one week.

QUESTION 139.

What is electrolyte composed of?

Commercially pure sulphuric acid and pure water.

QUESTION 140.

What should be put in the battery if the level of electrolyte goes below the top of the plate?

Nothing but distilled water or rain water which has been caught from a clean roof into a glass container or an earthen jar.

QUESTION 141.

Why does electrolyte sometimes go below the top of the plate?

This is due to evaporation of the water contained in the electrolyte or due to abnormal gassing.

QUESTION 142.

Does the acid part of the electrolyte evaporate?

During the evaporation of the water contained in the electrolyte the acid part of the electrolyte will stay in the cell.

QUESTION 143.

What will indicate a discharged battery?

If the specific gravity is 1150 or below.

QUESTION 144.

Why is it necessary to have a big jar and plenty of electrolyte?

We have explained above that the discharged gravity is 1150 and the fully charged gravity is 1250. The difference between the two is therefore 100 points.

It is not advisable to have a gravity under fully charged conditions above 1250, as it will shorten the life of the batteries. On the other hand it is not advisable to have a discharged gravity below 1150, as it would allow the battery to freeze in the discharged condition. If the glass jar were smaller in Genco Light battery and if the gravity under fully charged conditions would be 1250, the discharged gravity would be 1120 and this would not be advisable.

On the other hand, if the discharged gravity would be put at 1175, then the fully charged gravity would go up to 1275. This condition is produced in automobile starting batteries in which the life of the battery is not the utmost consideration.

QUESTION 145.

What is the advantage of having the plates supported from the bottom?

It gives a better support to the plates and separators.

QUESTION 146.

What is the purpose of the vent plug?

To allow the escape of gas during charging conditions.

QUESTION 147.

Why is it that on a Genco Light battery one terminal is longer than the other?

The positive terminal of the Genco Light battery is long and the negative terminal is short. This has been made to prevent mistakes in coupling the cells in series.

QUESTION 148.

What is the advantage of thick plates?

To increase the life of the battery.

QUESTION 149.

What is specific gravity?

The specific gravity of a liquid or substance is its weight compared with an equal volume of water. The specific gravity of water being taken as a unit and being called one.

QUESTION 150.

What happens in the plates of the batteries when they are getting charged?

During the charge the sulphuric acid is forced out of the plates and goes back again in the electrolyte, causing the electrolyte to have an increased specific gravity.

QUESTION 151.

What happens in the plates of the batteries when they are getting discharged?

During discharge, part of the sulphuric acid of the electrolyte combines with the lead of the active material in the plates, thereby forming lead sulphate. This disappearance of part of the sulphuric acid from the electrolyte causes a lowering of its specific gravity.

QUESTION 152.

How are the plates built?

Plates are made of two principal parts, a grid, which is an alloy of lead and antimony, forming a cage and support for the active material which is pasted on.

QUESTION 153.

What is the active material?

The active material in the fully charged positive plate is an oxide of lead and the active material in the fully charged negative plates is lead chemically pure, but in a physical condition called sponge lead.

QUESTION 154.

What is the purpose of the active material?

The active material during the charge of the battery and under the influence of the electrical energy, undergoes a chemical change. During discharge the active material returns to its initial state.

QUESTION 155.

Is the capacity of a cell in direct proportion to the active material used?

The proportion of active material in a cell is about the nearest indication of the capacity of that cell.

QUESTION 156.

How should batteries be charged?

Storage batteries should not be charged too fast and they should not be discharged too fast. We do not recommend to charge the type "A" battery faster than 12½ amperes at the beginning of the charge and 15 amperes at the finish of the charge, and the type "B"' battery 20 amperes at the beginning of the charge and 18 amperes at the finish of the charge.

QUESTION 157.

Why is it injurious to charge batteries too fast?

If a battery is charged too fast, the formation of sulphuric acid in the positive plate is too intense, the result being a loosening of the active material from the grid.

QUESTION 158.

Why is it injurious to discharge batteries too fast?

In case of a heavy discharge the reverse action takes place and the positive plates are absorbing the sulphuric acid of the electrolyte too fast up to a point where the active material of the positive plates contain only pure water. This having for result a heavy increase of internal resistance of the battery, with corresponding low efficiency and heating.

QUESTION 159.

What is the 8 hour rating?

Storage batteries have different capacities, whether they are discharged fast or slow. For instance, our type "A" battery has a capacity of 80 ampere hours, if discharged in 8 hours. On the other hand it has a capacity of 110 ampere hours if discharged intermittently on loads not exceeding 3 amperes.

In order to create a point of comparison between different batteries, the 8 hour rating has been established and we call the attention of the reader to the difference between the 8 hour rating and the intermittent rating.

QUESTION 160.

What is the intermittent rating?

The intermittent rating represents the condition under which a storage battery will be used on the farm and would correspond to a discharge of the battery from fully charged condition to normally discharged condition for the service of 5 hours a day and 7 days a week for one week, or in other words 35 hours.

QUESTION 161.

How many 20 watt lamps can be used with a 80 ampere hour battery (8 hour rating) if those lamps are burning continuously for eight hours?

If an 80 ampere hour battery is discharged at 8 hours the output will be 10 amperes, and if a 20 watt lamp takes ⅝ of an ampere the answer will be 16-20 watt lamps.

QUESTION 162.

What would the capacity of the above battery be if lamps would be used intermittently?

The capacity would then be 110 ampere hours.

QUESTION 163.

What is the proportion between the 8 hour rate and the intermittent discharge rate?

If the intermittent discharge rating would be 100%, the 8 hour rating will be 70%, or in other words the 8 hour rating of a storage battery is seven-tenth of its intermittent rating.

QUESTION 164.

What would the capacity of a 80 ampere hour (intermittent rate) be if it was taken at the 8 hour rating?

70% of 80 ampere hours is 56 ampere hours, which would be the 8 hour rating of that battery.

LAMPS

QUESTION 165.

How many amperes does a 32 volt, 20 watt lamp consume?

If you multiply volt by amperes you get watts. Therefore, if you divide watts by volts you get amperes. 20 watts divided by 32 volts is ⅝ of an ampere.

QUESTION 166.

How many hours will a 20 watt lamp burn in order to consume 800 watt hours?

800 watt hours divided by 20 watts equal 40 hours.

QUESTION 167.

How many hours must 10-20 watt lamps be used in order to consume 1000 watt hours?

10x20 equal 200 watts used by 10 lamps. 1000 watt hours divided by 200 watts equal 5 hours.

QUESTION 168.

How many kilowatt hours are used in burning 10-20 watt lamps 16 hours?

10x20 equal 200 watts used by 10 lamps in one hour. 100x16 hours equal 1600 watt hours or 1.6 K. W. H.

QUESTION 169.

How much does it cost to light 5-20 watt lamps for 4 hours if current costs 6 cents a kilowatt hour?

5-20 watt lamps use 100 watts in one hour in 4 hours they use 400 watts or .4 K. W. H. If a K. W. Hour cost 6 cents four-tenth of a K. W. Hour will cost 2.4 cents, or about 2½ cents.

QUESTION 170.

If 2-10 watt lamps and 3-20 watt lamps and one 40 watt lamp are burning at the same time what is the amperage in the line?

The total wattage used will be 120 watts, which at 32 volts will be 4 amperes.

QUESTION 171.

How many 20 watt, 32 volt lamps must be lighted at the same time to use 10 amperes?

One 20-watt, 32 volt lamp uses five-eights of an ampere. In order to use 10 amperes it will be necessary to light 16 lamps.

QUESTION 172.

How many 32 volt 20 watt lamps can be lighted of the current generated by the engine?

Assuming that the generator of the Genco Light Plant produces 20 amperes, it can light direct from the generator 32-20 watt lamps.

QUESTION 173.

What are the different sizes of lamps used and their rating in candle power?

The list is given below of the different sizes of lamps in watts and candle power capacity and the current in amperes used:

Rate size of lamps in watts	Candle power of lamps	Current in amperes consumed per hour per hour
5	4	.17
10	8	.34
20	16	.67
40	32	1.34
50	50	1.7
75	75	2.5
100	125	3.4

MOTORS

QUESTION 174.

What will a ⅛ H. P. motor use in amperes?

Approximately 4 amperes.

QUESTION 175.

What will a ¼ H. P. motor use in amperes?

Approximately 8 amperes.

QUESTION 176.

What will a ½ H. P. motor use in amperes?

Approximately 15 amperes.

QUESTION 177.

What is the meaning of normal load?

By normal load we mean the amount of power that the motor will be able to give without undue heating. Below will be found a table showing the Horse Power of the motor, the maximum efficiency of those motors and the maximum amount of watts taken by the motors. The amperes taken at 32 volts and the hours that the motor will run if put direct on a fully charged storage

battery, which has an 8 hour rating of 80 ampere hours or an intermittent rating of 110 ampere hours:

Horse Power	Minimum Efficiency	Maximum Watts	Maximum Amperes	Hours Operation of Type "A" Battery	Various Capacities of Type "A" Battery According to load
1	75%	933	30	1-½ hrs.	45 A. H.
7/8	74%	825	26	2 "	52 "
3/4	73%	711	23-1/4	2-½ "	58 "
5/8	72%	599	19	3-¼ "	62 "
1/2	70%	485	15	4-¼ "	64 "
3/8	68%	390	12-1/4	6 "	75 "
1/3	67%	331	10-1/3	7-½ "	78 "
1/4	65%	252	8	11 "	88 "
1/5	63%	206	6-1/2	14 "	91 "
1/6	60%	174	5-1/2	18 "	98 "
1/8	57%	134	4-1/5	24 "	101 "
1/10	54%	109	3-1/2	30 "	105 "
1/12	50%	94	2	55 "	110 "

QUESTION 178.

Under what conditions do electric motors operate on the farm?

Very often small motors will operate on a farm under conditions below their normal load, or in other words under very favorable conditions and only for short periods of time.

QUESTION 179.

If current costs 6 cents a kilowatt hour how much will it cost to operate a ¼ H. P. motor at normal load per hour?

According to previous table a ¼ H. P. motor takes approximately 250 watts or at the rate of 6 c a K. W. H. the motor will cost 1-½c an hour.

QUESTION 180.

If a 32 volt motor uses 8 amperes how many watts is this equal to?

32x8 is 256.

QUESTION 181.

If a 32 volt motor requires 8 amperes and is running for 6 hours how many kilowatt hours are used?

256 watts x 6 is 1.536 K. W. H., or approximately a 1-½ K. W. Hour.

WIRE SIZES

QUESTION 182.

What is a circular mill?

The circular mill is the unit of measurement and represents the area of a wire which would have a diameter of one one-thousandth of an inch. Therefore the area of a wire having a diameter of two one-thousandths of an inch would be 4 circular mills, and if the diameter was ten one-thousandths of an inch the area would be 100 circular mills.

QUESTION 183.

How many circular mills do the ordinary size wires contain?

The different sizes of wires with their circular mills are indicated in the table below:

Table of Wire Sizes

Size		
No.	14	4107 Cir. Mills
"	12	6530 " "
"	10	10380 " "
"	8	16510 " "
"	6	26250 " "
"	4	41740 " "
"	2	66370 " "
"	1	83690 " "
"	0	105500 " "
"	00	133100 " "

QUESTION 184.

What is voltage drop on the line?

In transmitting electrical energy from one point to another through wires, there is a loss of voltage proportionate to the distance of transmission. In other words the voltage of the plant or battery will always be greater than the voltage in the lamps, as the lamps or motors are a distance away from the plant or battery.

QUESTION 185.

What is the maximum drop allowed?

In figuring wire sizes, it is advisable to consider a certain maximum voltage drop. The greater the drop the smaller the wire should be, but of course the dimmer the lamps will burn. On the other hand, if a very small drop is allowed, it will be necessary to use very big wires and this would entail a greater cost of installation. In practice a maximum voltage drop of two volts is allowed when figuring wire sizes.

QUESTION 186.

How can wire sizes be figured?

In securing the wires for an installation three things must be known.

FIRST, the current in amperes to be carried through the wires.

SECOND, the distance in feet from the Plant to the place where the current is to be utilized.

THIRD, the voltage drop or greatest loss which can be permitted between the plant and the place where the current is utilized. This drop has been figured out in the lighting plant business and should not be over two volts. In the formula below, we will take for granted that the maximum permissible drop is 2 volts. If number one and two items are given, then the rule to

find the area of the wire in circular mills is Amperes x distance (one way) x 11 = Circular mills.

By "Distance one Way," we mean the distance from one point to another—

Example:—What size wire should be used between Plant and barn, where 10-20 watt lamps are to be used. The barn is 200 feet away from the Plant?

Ten 20 watt lamps will consume 200 watts at 32 volts or 6 amperes.

The formula is then:—

6 x 200 x 11 = 13,200 Circular mills.

This calls for No. 8 wire, weather-proof.

The maximum carrying capacity of wires allowed by the Underwriters is according to the following table:—

Size Wire	Area in C. M.	Amperes Allowed by Underwriters: Rubber covered.	Amperes Allowed by Underwriters: Weather-proof
18	1,624	3	5
16	2,583	8	10
14	4,107	15	20
12	6,530	20	25
10	10,380	25	30
8	16,510	35	50
6	26,250	50	70
5	33,100	55	80
4	41,740	70	90
3	52,630	80	100
2	66,370	90	125
1	83,690	100	150
0	105,000	125	200
00	133,100	150	225

GENERAL INFORMATION

QUESTION 187.

What is the meaning of volt, ampere and watt?

Electrical current can be compared to water being distributed through a pipe, this water being under a

certain pressure. For instance, the water in the city service might come from a tank, which is 100 feet higher than the point at which it is utilized. It can be clearly seen that the water would escape from a spigot much quicker if it has a 100 ft. elevation pressure than if it had only a 50 ft. elevation. Likewise, the electrical current of 100 volts exerts more pressure than electrical current having 32 volts. In other words, the height of the water over and above the point of utilization can be compared to the voltage of electrical current. On the other hand, water under a 100 ft. head might pass through a pipe at the rate of 20 gallons per second, yet it would pass through another pipe of a greater size under a 50 foot head at the rate of 40 gallons a second. This amount of gallons per second in the pipe is compared to the amount of amperes in the electrical wire. The amperes being the amount of electricity passing through that wire in one second.

The amount of energy that water is capable of furnishing when sent into a water wheel, a turbine or a hydraulic elevator would be measured by the pressure of the water and the amount of water passing through in one second. What the electric current is capable of giving is measured by multiplying the pressure of the current or volts by the amount of current going through in one second in amperes. This produces the unit of energy which is called a watt. Therefore, one watt is equal to one volt multiplied by one ampere.

If a 32 volt lamp takes 32 watts, this lamp will take one ampere. Therefore, a regular 20 watt lamp used on farm lighting plants of 32 volts consumes 20 watts divided by 32 volts or $\frac{5}{8}$ of an ampere.

Electrical motors, fans, and heating apparatus have a name plate on which the voltage and the amperes are marked. By multiplying one by the other the wattage is easily found.

QUESTION 188.

What is the meaning of ampere hour, kilowatt, kilowatt hour?

If a lamp uses one ampere and burns for one hour, the amount of current going through that lamp for one

hour is one ampere hour. A kilowatt is 1000 watts. A kilowatt hour is 1000 watts for one hour.

QUESTION 189.

What is the meaning of foot pound?

If a one pound weight is lifted to the height of one foot, energy developed to do this work is one foot pound. Of course, this amount of energy could be developed in one second or in one minute, but if a pound is lifted to one foot in one second, this unity of energy would be a foot pound per second.

QUESTION 190.

How many foot pounds to a horse power?

A horse power is a sufficient amount of energy to lift 550 pounds to a height of one foot in one second.

QUESTION 191.

How many horse powers to a kilowatt?

One kilowatt is equivalent to 1.36 H. P.

QUESTION 192.

What is the difference between direct current and alternating current?

Direct current always travels in one direction, or in other words always goes from the positive pole of the generator through the lamps and back again to the negative pole.

Alternating current travels in one direction and then reverses itself and travels in one direction, the change being called "Frequency." This frequency in most installations is generally 60 a second. Storage batteries cannot be charged with alternating current.

QUESTION 193.

What do the terms positive and negative pole mean?

The positive pole of any generator or battery is the pole from which the current is flowing when this generator or battery is sending current to lamps or motors.

QUESTION 194.

What is the relation between volt, ampere and watt?

A volt multiplied by ampere equals watt. Watts divided by amperes equal volts, and watts divided by volts equal amperes.

QUESTION 195.

What is the difference between a deep well pump and a shallow well pump?

When the surface of the water is not more than 22 feet vertically from the top of the ground, this water can be elevated by straight suction and the pump can be mounted at the surface of the ground, the pump is then called a shallow well pump. When the surface of the water is more than 22 feet vertically from the top of the ground, the cylinder and plunger of the pump must be placed below the surface of the water and the pump is called a deep well pump.

QUESTION 196.

How deep can a shallow well pump be successfully operated?

22 feet vertically from the surface of the water.

QUESTION 197.

How much power does it require to operate a pump producing 150 gallons an hour and taking the water from a depth of 75 feet?

At the depth of 75 feet, pumping 150 gallons an hour, the power required will be ¼ H. P.

QUESTION 198.

Is Genco Light a direct current plant?

Genco Light is a direct current plant.

QUESTION 199.

How can this be easily ascertained?

This can be easily seen by looking at the pulley side of the generator where a commutator is used. Only direct current generators use commutators.

QUESTION 200.

Why is it advisable to run a line shaft when charging batteries?

Because when running a line shaft a certain amount of energy is absorbed by the belt and the machinery and the charging rate of the battery is reduced, producing thereby the best conditions for long life.

QUESTION 201.

What is the relation of a watt to a candle power?

The amount of watts used in lamps for the candle power produced is a standard, established since the 32 volt Tungsten lamps have been brought to the present high state of efficiency. Tungsten lamps will produce about one candle power for each watt consumed.

QUESTION 202.

Why can Genco Light be operated on kerosene?

Because, the Genco Light Plant being water cooled, has a very low piston clearance and thereby prevents part of the kerosene from going into the crank case.

QUESTION 203.

Why does kerosene pull slightly more than gasoline?

Because the kerosene is burned clean and thereby the increased amount of heat units contained in the kerosene over the gasoline are fully utilized.

QUESTION 204.

What are the different appliances that can be used with Genco Light?

Air compressors
Burglar alarms
Barber supplies
Cash registers
Churns
Chafing dishes
Coffee mills
Cream separators
Curling irons
Dish washers
Dental appliances
Door bells
Drink mixers
Dumb waiters
Egg beaters
Egg testers
Fanning mills
Fans
Floor polishers
Foot warmers
Grinding stones
Grinding machines
Hay cutters
Horse clippers
Incubators
Ice cream freezers
Ice machines
Lard dispensers
Massage work
Meat grinders
Milking machines
Milk shakers
Motion pictures
Percolators
Pianos
Portable wireless

Flat irons
Scales (illuminated)
Sheep shears
Signs (illuminated)
Soldering irons
Sewing machines
Storage batteries
Pumps
Toasters
Vacuum cleaners
Vibrators
Vulcanizers
Warming pads
Washing machines

QUESTION 205.

What are the over all dimensions and weight of the Genco Light plant not including batteries?

The Genco Light plant is 36 inches long, 33 inches high and 17 inches wide. It weights uncrated 467 pounds and crated ready for shipment 500 pounds.

Type "A" battery crated weights 480 pounds and "B" battery crated weighs 780 pounds.

QUESTION 206.

Does the current always flow direct from the generator when the plant is in operation, or does it go through the batteries?

When the engine runs, the current flows direct from the generator to any lamps or motor that may be used, up to the extent of the amount of current required by those lamps or motors, and the storage battery is charged with a certain amount of current equal to the difference between the current made by the generator and the current used by the lamps or motors on the line.

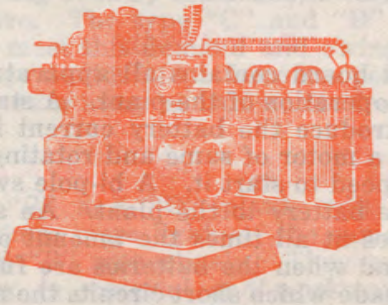
For instance, if the engine is running and generating 18 amperes and no lamps or motors are operated, the battery will receive 18 amperes. If 16-20 watt lamps are turned on, those lamps will take 10 amperes, and if the generator is producing 18 amperes, the battery will be charged at the rate of 8 amperes. This amount of 8 amperes will be indicated by the lower needle of the ampere hand meter, which always shows what the battery is receiving or discharging.

SUPPLEMENTARY

Genco Light

110 Volt Types "C" & "D."

PART NUMBER SIX



DESCRIPTION OF TYPES "C" AND "D" GENCO LIGHT. 110 VOLT PLANT

Types "C" and "D" Plants are about three times larger than the types "A" and "B" Plants. They have been especially designed to meet the demand for large country residences, big farms, communities, villages, etc., or in other words, to supply the proper power plant for installations which are really too big for the types "A" and "B" Plants. Types "C" and "D" have the capacity sufficient to light small towns, communities, compact villages, etc., not requiring greater capacity than is shown in table further on.

Engine

Two cylinder, 3¼ in. bore, 4 in. stroke, 4-cycle, valve in head, radiator cooled and runs at 1200 R. P. M. The normal capacity at this speed is 6 H. P. Carburetor of same construction as that used on types "A" and "B." The ignition, however, is by magneto and the plant can be easily started by hand if the batteries are entirely discharged by priming the carburetor with gasoline and turning it over by hand with a crank fitting on the pulley end of the plant. The valves are situated in the head and the cam shaft, push rod, rocker arm and valve stems are lubricated by internal splash.

Generator

The generator is driven directly from the engine through a universal joint and bolted on a common base. The fuel tank is in the base and the fuel is lifted to the carburetor by vacuum.

The generator is shunt wound when charging the battery and compound wound when acting as a motor to start the plant.

Control Board

The control board contains all apparatus necessary to the proper operation of the plant. A starting switch is used to introduce the battery current in the generator making a motor of same and rotating the engine at sufficient speed to start it. A bi-pole switch is used to connect the battery to the plant. An ampere hour meter indicates at all times the amount of current in the battery and when the batteries are fully charged, a contact is made which short circuits the magneto and

stops the plant. A cut out connects the generator with the battery and disconnects same when the plant stops. Two fuses are also on the control board and protect the line going into the house against any short circuit.

Type "C" and "D" Batteries

Type "C" Battery is composed of 54 cells, each having 7 plates 5¾ x 6 ¾. These cells have glass jars and sealed top. Capacity under intermittent rating, 110 hours. Type "D" battery has 54 cells, each cell having 11 plates 5¾ x 6¾. Capacity under intermittent rating, 167 ampere hours.

Power Pulley

The pulley has a capacity of 4 horse power. It can be used to run a small machine shop, or a heavy deep well pump, or a big air pump for garage purposes. It is advisable to install a clutch pulley in the line shaft in order to cut down the starting load on the generator. When the plant runs line shaft utilizing up to 4 H. P. the batteries will be charging at a very slow rate, which we recommend highly. Size of pulley being 5 inches and speed of plant 1200 R. P. M. We recommend a 20-inch pulley on line shaft in order to bring line shaft speed to 300 R. P. M.

Purpose of Types "C" and "D"

(The voltage of the type "C" and "D" plants is 110). Type "A" and "B" will provide sufficient light and power for the ordinary size farm, but the voltage of these types being 32 it is not practical to do any wiring for buildings which would be further away than 500 feet from the plant. Also the type "A" and "B" being designed with the idea of supplying light and power for the average size farm would not be big enough for a big country residence, a large church or a country store. The type "C" and "D" plants have been built to meet this demand and owing to the fact that the voltage used is 110, it becomes possible to wire other houses as far away as half a mile from the power plant.

Capacity of Types "C" and "D"

The type "C" and "D" plants will furnish just exactly 3½ times more lights of the same wattage as type "A" and "B" respectively. They are built with the same care in material and workmanship as the

type "A" and "B" plants and we have had plants run 1,000 hours at the factory at the rate of 100 hours a week without a stop.

We have some of our plants installed on street lighting requiring up to 1800 watts and taking care besides of about 15 homes. However, we do not advise the use of these plants on installations where the number of homes is more than 10 and the street lighting is over 1500 watts.

The normal capacity of the "C" and "D" plant is 20 amperes at 125 volts. On type "C" the carburetor is set so that the generator produces 18 amperes, but on type "D" the carburetor is set so that the generator produces 20 amperes. These different adjustments are made by moving a small shutter which uncovers additional air holes on top of the carburetor near the flange used to fasten the carburetor on the cylinder. When two thirds of the hole nearest the cylinder is open by the shutter the plant will pull 18 amperes and will be set to charge a battery of type "C". When that particular hole is open entirely the plant will pull 20 amperes and will be set to charge battery of type "D".

When the two additional air holes are open we have what we call a maximum load condition at which time the plant will pull 24 amperes at 125 volts, if it is necessary to charge the battery at that rate which we do not recommend, however if an extra heavy lamp load is on the line and the voltage is kept at 110 volts it will be seen that the amperes will go up to 27½.

Where Type "C" & "D" Should Be Sold

The type "C" and "D" plants have been developed to fill the demand for installations which would be too big for type "A" and "B" plants, but we wish to warn the Genco Light salesman not to recommend type "C" and "D" plants for load conditions above their capacity.

In other words, the type "C" and "D" plants are not made to run 24 hours a day every day in the year, as central station plants have to operate. This word of advice applies particularly to city lighting—when types "C" and "D" are used in store, church, big country residences, on big farms, etc., the load conditions will be generally very favorable and the average number of running hours for each week for the power plant will be about ten hours. But when it is proposed to light a small town, it becomes necessary for the

Genco Light salesman to establish a chart of loads and make sure that these loads shall not exceed the capacity of the plant.

FIRST:—**Street Lighting.** In city lighting loads, two distinctions must be made. In the case where the plant is to be used for street lighting only, it is easy for the salesman to figure exactly the lamp load required a certain number of hours every day. For instance, suppose that the street lighting system of a small town should call for 30, 100 watt lamps, the lamps to be lighted at 7 p. m. and remain lighted until 10 p. m. each day, all that would be necessary would be to supply a "C" plant, set the plant to pull maximum load, and have the battery in reserve for starting or for emergency conditions. The plant, therefore, would have to run 3 hours a day and would be in charge of a man who would become acquainted with it. The load could also be supplied by letting the engine pull the "C" load or 18 amperes and charging the battery two hours before the time of lighting the street lamps, and using part of the energy contained in the battery on the lamp load. We recommend this method.

SECOND:—**Combination Street and House Lighting.** In figuring out an installation of this kind, the salesman, after figuring the street lighting load, must ascertain how many houses will be on the line, and find out whether the total load exceeds the rated capacity of plant, and in such case then he should recommend two plants complete or two power plants and one set of batteries.

Coupling Two Plants on One Battery

It is sometimes advisable to operate two plants on one battery. This becomes necessary where, for instance, a small town load becomes too heavy during certain hours of the day or night for one plant only. Owing to the fact that this overload will occur at well defined times during each day it is not necessary to furnish two batteries and it is possible to connect two plants on one battery with good results.

Wiring diagram showing how to connect two plants and one battery will be furnished by the GENERAL GAS-ELECTRIC COMPANY on request.

Installation of Type "C" and "D" Plants

We recommend plenty of ventilation in buildings where "C" and "D" plants are installed. Cold air

should be allowed to enter the building at the lower part through an opening not less than two square feet, and warm air should escape through a roof ventilator having an opening of not less than three square feet.

The temperature of the building after the plant has run two hours, should not exceed 80 degrees F. During hot weather it is advisable to operate plants early in the morning or in the evening after sunset.

Why We Use 54 Cells

Owing to the fact that a constant charging rate is used in type "C" and "D" plants, 54 cells, batteries are recommended in order to keep to a minimum the increased voltage taking place when the batteries are fully charged. This voltage, under certain conditions, is injurious to lamps, but the low charging rate together with 54 cell batteries produce a condition of operation which gives the best results. By eliminating voltage controllers and throttle carburetors, the "C" and "D" plants retain the simplicity of the "A" and "B" types and have yet over three times their capacity.

Why De We Use a Magneto?

On the "C" and "D" plants a magneto is used for the reason that no reliable battery ignition for 110 volts has yet been produced. Besides a magneto simplifies the wiring of the plant and allows cranking of the engine by hand when the batteries accidently become entirely discharged.

Figuring Wires for 110 Volt Systems

The well known formula applies here or

$$\text{Circular Mills} = \frac{\text{Amperes x by distance one way x 22}}{\text{volts drop}}$$

The voltage drop allowed in 32 volts circuits is 2 volts, however, in 110 volts circuits the drop allowed is 10 volts, the formula therefore becomes as follows for 110 volts:

Circular Mills = Amperes x distance one way x 2, 2.

Following are given tables showing proper size wire to use to carry a given load a given distance one way:

PROPER SIZE WIRE TO USE TO CARRY A GIVEN LOAD A GIVEN DISTANCE (One Way).

Following is a wiring table calculated for 32 volts allowing a 2 volt drop. This should be the maximum drop allowed.

Amperes To Be Transmitted	No. 12	No. 10	No. 8	No. 6	No. 4	No. 2
	630 ft.	1000 ft.	1590 ft.	2530 ft.	4000 ft.	6400 ft.
1	316	500	796	1265	2000	3200
2	210	332	530	844	1333	2130
3	160	250	398	632	1000	1600
4	126	200	318	506	800	1280
5	105	166	266	422	666	1066
6	90	145	225	362	572	916
7	79	125	198	316	500	800
8	70	111	176	282	444	712
9	63	100	159	253	400	640
10	57	91	144	230	364	582
11	52	83	132	210	334	532
12	48	77	122	198	308	492
13	45	71	113	180	286	456
14	42	66	106	168	266	426
15	40	62	99	158	250	400
16	37	59	93	149	236	376
17	35	56	89	140	222	356
18	33	52	84	133	210	336
19	32	50	79	126	200	320
20						

PROPER SIZE WIRE TO USE TO CARRY A GIVEN LOAD A GIVEN DISTANCE (One Way).

Following is a wiring table calculated for 110 volts allowing a 10 volt drop. This should be the maximum drop allowed.

Amperes To Be Transmitted	No. 14	No. 12	No. 10	No. 8	No. 6	No. 4	No. 2
	1980 ft.	3150 ft.	5000 ft.	7950 ft.	12650 ft.	20000 ft.	32000 ft.
1	990	1580	2500	3980	6325	10000	16000
2	600	1050	1660	2650	4220	6666	10650
3	495	789	1250	1990	3160	5000	8000
4	396	630	1000	1590	2530	4000	6400
5	330	525	832	1330	2110	3333	5330
6	283	450	715	1114	1810	2860	4580
7	248	394	625	993	1580	2500	4000
8	220	350	555	882	1410	2222	3560
9	198	315	500	795	1265	2000	3200
10	180	286	455	722	1150	1820	2910
11	165	262	416	662	1050	1670	2660
12	152	242	384	611	972	1540	2460
13	141	225	358	568	903	1430	2280
14	134	210	333	530	843	1330	2130
15	124	197	312	497	790	1250	2000
16	116	185	294	467	745	1180	1880
17	110	175	278	441	703	1110	1780
18	104	166	263	418	667	1050	1680
19	99	157	250	397	632	1000	1600
20		150	238	378	603	952	1520
21		143	227	361	575	910	1450
22		137	217	345	550	870	1390
23		131	208	331	528	834	1330
24		126	200	318	506	800	1280
25			192	306	487	769	1230
26			185	294	468	740	1180
27			179	284	452	715	1140
28			172	274	436	690	1100
29			167	265	421	666	1066
30				256	408	645	1030
31				248	396	625	1000
32				240	383	605	970
33				234	372	588	942
34				227	361	572	915
35				221	351	555	890
36				215	342	540	865
37				209	333	526	842
38				204	324	513	820
39				198	316	500	800
40							

Condition of Maximum Load

The plants are shipped with the carburetor set to pull either 18 amperes for type "C" and 20 amperes for type "D" and we only advise the opening of the extra air hole to obtain the maximum rating when a line shaft is run on which some heavy machinery is used or when an extra heavy lamp load is necessary and it is far preferable to operate the plants set as they are when they are shipped from the factory.

Kilowatt Rating

The normal KW rating of type "C" and type "D" is 2½ KW. The maximum rating obtainable and guaranteed to be produced by each "C" and "D" plants is 3 KW. If for instance the voltage on the line is 125 volts, the plant will pull under maximum conditions, 24 amperes. If the voltage on the line due to heavy lamp load is 100 volts the plant will pull under maximum condition 30 amperes.

Size and Weight of "C" and "D" Plants

The weight of the type "C" and "D" power plant uncrated is 955 lbs. These plants are 20 inches wide, 54 inches long and 43 inches high. The size of the concrete base on which the plants should be installed should be 49 inches long by 27 inches wide.

Table Showing Capacity of Type "C" Battery and Plant

Battery Capacity Engine not Running.

55—20 watt lamps..... 8 hours
28—20 watt lamps.....20 hours

Combined normal load capacity of generator running and battery discharging—(Generator output 18 amperes.)

155—20 watt lamps..... 8 hours
128—20 watt lamps.....20 hours
100—20 watt lamps..... continuously

Combined maximum load capacity of generator running and battery discharging—(Generator output 27½ amperes at 110 volts.)

205—20 watt lamps..... 8 hours
178—20 watt lamps.....20 hours
150—20 watt lamps.....continuously

Table Showing Capacity of Type "D" Battery and Plant

Battery Capacity Engine Not Running.

93—20 watt lamps..... 8 hours
44—20 watt lamps.....20 hours

Combined normal load capacity of generator running and battery discharging—(Generator output 20 amperes.)

204—20 watt lamps..... 8 hours
155—20 watt lamps.....20 hours
111—20 watt lamps..... continuously

Combined maximum load capacity of generator running and battery discharging—(Generator output 27½ amperes at 110 volts.)

243—20 watt lamps..... 8 hours
194—20 watt lamps.....20 hours
150—20 watt lamps..... continuously