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GAS

AS A

SOURCE OF

LIGHT, HEAT AND POWER.

BY

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R. C. W.

THE object of the following few pages is to throw a little light on the art of burning gas, to the end that it may be used to the best advantage as a source of light, heat and power.

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GAS BURNERS AND GLOBES.

GAS has been used during so many years for lighting our houses, so that we can secure all the light we desire without the attendant dangers and disagreeable accompaniments of oil and candles; for illuminating our stores so that buying and selling may be continued after nightfall; for lighting our mills so as to permit the operator to continue his labors without the aid of daylight, and, finally, for lighting our streets, so robbing them of the dangers which darkness begets, that it is unnecessary for us to say anything by way of introducing gas as a lighting agent to the public. Nevertheless, as familiarity breeds contempt, it is incumbent on us to show how gas for lighting purposes can be both used and abused; for this mode of lighting has been in vogue so long, has become so familiar to us all, that many think its use requires neither care nor attention, and working up to this theory they are more apt to misuse than to use the gas.

In order that we may the more readily show what precautions must, of necessity, be observed if it is desired to obtain in light an equivalent for the gas registered by the meter, we will speak briefly of three important adjuncts of the gas fixture, namely:

THE BURNER.
THE GLOBE.
THE GLOBE HOLDER.

We may as well consider these three divisions of our subject in the order in which we have mentioned them.

Of gas burners there are two kinds, each of which is capable of further subdivision; first, we have what are called flat-flame burners; second, the argands. It is the first kind which are used generally for lighting houses, stores and streets. This class owes its name to the thin flat flame the burners give. The argand burner is usually employed to read or write by, the steadiness of the flame making it very

valuable for such purposes; it is circular in form, and derives its name from its resemblance to the oil lamp burner invented about a century ago by Aimé Argand. We will speak first of the former class of burn. ers. In the earliest days of gas lighting a gas burner was an unknown article; a piece of iron pipe, or gun barrel, pierced with holes, was thought to be all sufficient. It has been said that this was the kind of gas burner employed by Mr. Murdoch—the originator of gas lighting when, in 1802, he lighted by gas the works of Messrs. Boulton & Watts, of Birmingham, England, on the occasion of the celebration of the Peace of Amiens. This was, however, a most wasteful method of burning gas, and gave but a scant return in light for the gas used. Recognizing this evil, inventors have, from time to time, devised various kinds of burners, so we have to-day burners which will afford an ample return in light for the gas passing through them. It is aptly illustrative of the lack of attention which the gas user gives to this subject, that we are able to say, in all truthfulness, that a very considerable proportion of those who burn gas employ not the most approved burners, which give such good results, but the old-fashioned scotch tip or iron ones invented over fifty years ago. Let us show how woefully this carelessness on the part of the gas consumer affects his pocket. Gas, as generally manufactured in this country, will run from 17 to 20 candle power—let us, for argument's sake, say it is 18. Now, when we speak of gas of 18 candle power, we mean this, that a burner from which gas is passing at the rate of 5 cubic feet an hour, is giving a light equal to 18 spermaceti candles of standard make. Consequently, if in a house or store it is wished to obtain from gas a light equal to say ninety candles, it would suffice to light five burners, provided proper ones were used; but, if by carelessness, poor burners are employed, it is probable the light given by each five feet of gas will not be more than nine candles; so, to obtain the ninety candle light, it will be necessary to light ten burners instead of five. This would be a serious item to the gas consumer in the course of a year, for he is literally wasting twenty five feet of gas each hour, and as there are about 1,450 lighting hours a year, the amount of gas lost during this period would be about 36,000 feet, and if we put the price of gas at \$2-a fair assumption—we find the consumer is throwing away \$72 a year. We grant this is a hypothetical case, but it pointedly shows the importance of the subject. As there are in every city, or village, in which gas is burned, a large number of gas users to whom the illustration applies with more or less truthfulness, it would be well for each consumer to examine into the matter and see if the shoe fits him.

The one main object of these few pages is, briefly told, to help him to ascertain if he is being wasteful in this matter.

In the following cut, Figs. 1 and 2 represent the old-fashioned iron burners which are unfortunately used considerably to-day, but gas users



Scotch Tip Burner.



Iron Burner.



Fig. 3.

Fig. 1. Fig. 2.

will do well to avoid them, as they give very little light for the gas burned. Instances are very common where it has been ascertained that such burners afford but half the light the gas is capable of giving. Therefore, we are tempted to say that such burners should be banished from the land, or, if this condemnation be too severe, it may certainly be said that the only place where they should be tolerated is in a draughty situation where a small steady light is required. Under such circumstances they will not flicker or smoke as easily as a higher grade burner; however, in most such cases, it is better policy to use a good burner and protect it by a globe and canopy from the breeze.

The common brass burner is shown in Fig. 3. This style, though being an improvement on the iron ones, is not to be recommended for general use.

Lest, however, the reader should think we are condemning all burners, we will hasten to describe the kind we would recommend. It will be found that all the burners we favor have what is known as the lava or steatite tip. The tip is the top part of the burner, the point from which the gas is consumed. As the steatite or lava is a non conductor of heat, while the iron or brass tips of those shown in Figs 1, 2 and 3, are good conductors, it follows that with the former the heat of the burning gas is not led away so much, or, in other words, the heat of the flame is better conserved, and this is one reason why this class of burners give better results than those made entirely of metal. Further, it has been found that the shape of the tip has a considerable influence on the amount of light given by the gas. In the following cuts of good burners it will be noted the tips are of one shape—technically known as the excavated hard tip. So, to recapitulate, the burners we recommend are furnished with the "excavated lava tip."

The burners shown by Figs. 4 to 8, are excellent ones; they are fitted with the steatite excavated tip of which we have spoken, with the exception of the one represented by Fig. 8.

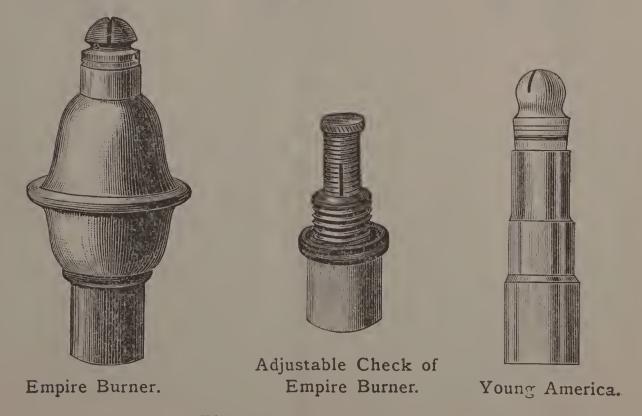
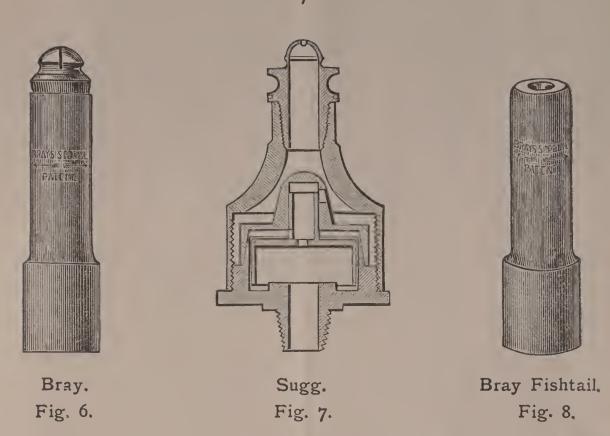


Fig. 4.

Fig. 5.



They are all furnished with some form of check which prevents the gas from issuing at the burner-tip with too much force. The poor burners, to which we have alluded have no such provision from holding back the gas, hence the imperfect combustion. The Empire burner has an adjustable check, which is shown in the cut, by means of which the quantity of gas passing through can be cut down to any desired quantity. Parties when purchasing this burner should make sure that this check is properly adjusted. The gas company has men who will attend to the matter on receiving proper notice. The Young America has a check consisting of a small diaphram of brass, pierced by minute holes. Both the Young America and Empire are cheap burners, so a consumer can afford to have them on all his fixtures. The Bray and Sugg burners give even better results than the other two of which we have been speaking, but their first cost is greater. As, however, there are in almost all households or stores, one or two burners which are used, we might say, continuously of an evening, while the remaining ones are only lighted for a limited time, it would amply pay to have a few of these high-priced burners, and on the balance of the fixtures use those shown in Figs. 4 and 5. The Sugg burner is what is known as a governor-burner, that is, it will pass a certain and unvarying quantity of gas, even though the pressure on the street gas pipes should change, whereas, with the other burners a large increase of pressure will result in the

burner blowing or hissing. En passant, it may be observed that when a burner makes a roaring or blowing noise, the consumer may rest assured that he is paying for gas without getting a full return in light. The immediate remedy is to cut down the gas at the fixture-cock till the noise ceases, the permanent cure, if it is a very bad case, as, for instance, on a high hill, where the pressure is heavy, is to put on governor-burners.

Where gas is burned inside of a very small globe, the shape of the flame given by an excavated tip is hardly suitable, and is apt to crack the globe; under such circumstances, a Bray fish-tail burner may be used. As will be observed by inspecting Fig. 8, the gas issues at the tip from two small openings instead of through a narrow slit, as in Figs. 4 to 7, the flame is, therefore, narrower and higher; however, it may be observed that for the ordinary size globes, the excavated tip will answer perfectly.

Even when a consumer has his fixtures fitted with improved burners, it will be necessary for him to see that they are kept clean, if he wishes a good light. A glance at a burner when it is lighted, will show quickly enough whether the burner needs cleaning. If the flame is ragged and uneven, shooting up higher at one point than another, then be assured either the burner should be replaced for a good one, or else the tip needs cleaning. It is well, but not absolutely necessary, that the consumer should have a suitable cleaner; this, for a burner having the excavated tip is merely a thin piece of brass with a handle; for fishtail burners, it is made in the shape of a small awl. Either style can be obtained from the gas company. A consumer can, however, get along without them, a piece of thin card board, or stiff writing paper, can be passed through the slit of the burner-tip, in lieu of the strip of brass, and the openings in the tip of a fish-tail can be cleaned by the aid of a pin.

It must also be remembered that even a good burner will not last forever. If the burner, though cleaned frequently, fails to give a smart flame, then it is probable the tip is worn out; in such an event, if the burner is of the type shown in Figs. 4 and 5, it will be found almost as cheap to replace the entire burner as to fit in a new tip. However,

should it be one of the more expensive styles, it will pay to have a new tip put in the burner.

Figure 9 shows the general appearance of a good gas flame; it will

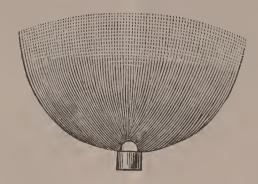
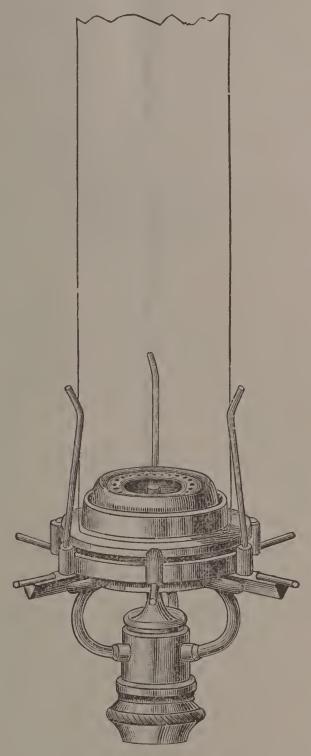


Fig. 9.

be noted the lines of the flame are even—there are no ragged points. If a gas consumer finds his burners do not give such a flame as is here shown, he can be sure there is something at fault, and should apply the remedy; either the burner is of a poor pattern, or it is worn out, or it needs cleaning. It is cheaper and much more satisfactory to right the wrong than to continue the wrong.

One word right here as to the size of burners, and at the outset let us explain what is meant when we speak of a burner of a given size, say five feet for example's sake. We mean this, that the burner, at standard pressure, will pass five cubic feet of gas an hour. A five-foot burner is well suited for general use, either in a store or dwelling. In a hall or passageway, where but a dim light is required, a three-foot burner will be found sufficient, but for general purposes of illumination it is poor economy to use small burners, because, when a very small quantity of gas is used at one opening, the amount of light obtained per foot of gas is less than where a larger quantity is burned. Thus, by way of illustrating, we would obtain more light from five feet of gas consumed through one burner, than we would from three burners each passing two feet.

Some people have the impression that it is not possible to obtain from gas a light sufficiently steady to read by. This is an erroneous idea. A first-class burner, inclosed in a proper shade, will give a light practically free from flickering; however, for reading or working by, it is well to employ an argand burner. The best burner of this class is the Sugg D, shown below, which when fitted with a governor will give



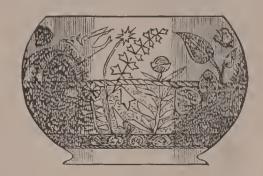
Sugg Argand D. Fig. 10.

a perfectly steady light, even under variations in the gas pressure. Such a burner, on a portable or drop-light, affords the best artificial light that can be obtained, to work, read, or write by. Next in efficiency comes the noiseless Gleason Argand, with steatite tip. It is to be noted that the amount of light given by a good argand is greater than by a flat-flame burner, such as is shown in Figs. 4 and 5; the drawbacks to the argand are, it requires a chimney, and is very susceptible to draughts.

GLOBES.

We have already intimated that there are good globes and poor ones, it would therefore be well for us to explain now what we meant by that remark. To make our meaning clear we show a cut of the old-fashioned globe (Fig. 11), an article which justly deserves to become obso-





New Style. Fig. 12.

The reason why we would joyfully consign it to the shelf to bear company with the old iron burners, is on account of the small opening at the bottom of the globe, which is about two inches in diameter. there is a large opening above and such a scant aperture below, the air which must needs enter at the bottom to take the place of the heated product passing away from the top, fairly rushes through the lower hole, chilling the flame and causing it to flicker badly. Further, as this opening is so small, the light in its passage to the lower part of the room is greatly obstructed. With a globe such as is shown in Fig. 12, these evils are obviated; it has a large opening at the bottom, measuring 5 inches in diameter, thus the light reflected by the sides of the globe is unobstructed in its passage to the lower part of the room, and as the air has an opportunity to enter the globe slowly, the gas burns with great steadiness. One word as to the kind of glass of which the globes are made. Glass, at the best is a great obstructor of light; ground glass has the unenviable distinction of being the worst in this particular, with the exception of the fancy colored glass. For parlors and sitting-rooms it is well to use either cut or acid etched globes, of such a pattern that the clear or figured part makes up a considerable portion

of the surface of the globe. Clear glass globes are very good for stores; the slight obstruction they offer to the passage of light commends them for general use, their appearance, which is decidedly plain, being their only drawback. The opal or porcelain globes are well adapted to libraries and dining-rooms; they give a particular softness and mellowness to the light. Colored or fancy globes are very productive of large gas bills, as they destroy a large amount of the light afforded by the gas; we therefore would not recommend them for general use; it is well enough to have one in the hall or entry, where but a dim light is required, but even there we would suggest that nothing darker than an amber be used.

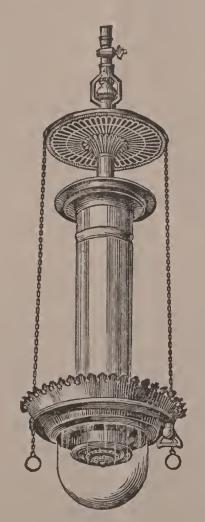
GLOBE HOLDERS.

We virtually promised to say a word concerning globe holders; this obligation we will now endeavor to meet, and will do it with all brevity. It has been the custom to make this part of the gas fixture very heavy and cumbrous, the effect being to reduce the area of the lower opening of the globe, and thus to further reduce the quantity of light which would reach the point where it is required. Happily a change is being made in this respect, and globe holders, the arms of which are made of brass wire or thin sheet brass, are coming into vogue. Let us suggest that if a gas consumer has any of the old style holders in use he will do well to throw them away. If a consumer who is in the habit of using an iron burner, surrounded by an old-fashioned ground glass globe (like that shown by Fig. 11), supported by a heavy cast brass globe holder, should substitute for this rig an improved burner, accompanied by a globe of the style represented by Fig. 12, carried by a wire holder, he would be surprised at the great increase of light he could obtain without using any more gas. In fact the increase in illumination would fully equal one hundred per cent.

We are confident that if a consumer will give heed to the remarks we have made on the subject of burners, globes, and holders, he will be very ready to admit he has the most satisfactory lighting agent to be found in this age. If those who use kerosene as an illuminant would change to gas and act on the suggestions we have made, they would, as a general thing, find the difference in expense but little and the gain in comfort very great. There are, it is true, but few places where gas is, at first sight, as cheap as oil, nevertheless when the cost of lamps, chimnys, and wicks, are taken account of, and allowance made for the laceration of spirit caused by the "oil giving out" at unpropitious moments, it will be found that gas can be used at a cost so little in excess of oil there should be no hesitation in substituting the former for the latter.

HIGH POWER BURNERS.

So far we have spoken only of burners suitable for the illumination of ordinary apartments, such as houses and stores; it may now be well, in closing this section of our story, to direct attention to the Lungren burner, shown below.



Design B.

Fig. 13.—Lungren Burner.

This burner is well suited for the lighting of large stores and halls, as it gives a light of great intensity. It is made in different sizes; one size burns about 12 feet of gas an hour, and gives a vastly more brilliant illumination for the amount of gas used than the ordinary burner, and the color of the light is much whiter, in fact greatly resembling the electric light, so that if a white light of high intensity is a thing to be desired, it can be obtained from gas as well as from the electric light. It must not be supposed that the burner illustrated is the only "high power" gas burner manufactured, for there are several styles to which this term applies. The Lungren was selected in the present instance because it was very simple and serves well as an example of this class of burners. The Siemens burner is one of the most powerful ones made; the one thousand candle power style would light a given area far better than two arc electric lights. The fact that from gas we can obtain, on the one hand, a light as dim as that afforded by the night rush-light, and, on the other hand, such an illumination as will completely overshadow the electric light, is wonderful testimony to the perfect adaptability of gas to meet all the varying requirements of a general illuminant.

GAS FOR COOKING.

Though gas as an illuminating agent required no introduction at our hands, it is necessary to make a few introductory remarks by way of presenting to the reader the next division of our subject, gas as a cooking medium. The advocates of gas stoves are continually met by two objections when espousing the cause of this new departure in household economy. The first is that the use of gas for cooking is too expensive, and then, as if to sweep the subject completely out of sight, it is added that viands cooked by gas taste of gas. In opposition to the first assertion it may be said that at ordinary prices gas for cooking alone is not more expensive than coal—that is, if the only object in lighting a fire in the range or cook-stove is to prepare the meals, then if gas is reasonably cheap and is used carefully, it is as cheap as, or cheaper than, coal. Of course in the winter season the range has an additional duty to perform in heating the kitchen, so we would not claim that in ordinary climates the gas stove can supplant the range all the year round, but we do say, during the summer it is as cheap as, or cheaper than, coal, if used with care. If the gas stove is allowed to remain lighted all day, regardless of whether cooking is being done or not, then the cost of the work will be abnormally increased, but when, to use an inelegant phrase, ordinary gumption is exercised—where the gas is turned off when not required—then in the summer months it will generally be found advantageous, even from a monetary standpoint, to use a gas stove. It has been said before now, where cooking is done by gas the fuel costs nothing. The explanation of this at first sight startling statement is, when cooking is done by gas the loss from shrinkage of the viands is so much less than where coal is the heating agent, the saving in this particular more than pays for the cost of the fuel. We would, however, prefer not to father so sweeping an assertion, not because we are sure it is at variance with the facts of the case, but we are held back by the fear that public opinion has not yet been trained up to the point where it would be accepted as true; and we are not willing to make a statement which might be received by the Frenchman's way

of expressing doubt-which is really more significant than words-a shrug of the shoulders. Yet it may be well to state that as the roasting and broiling is done in a gas stove by radiated heat—like the old fashioned fire hearth with its spit—there is much less loss by shrinkage of the viands than where a coal stove is employed. Now, actual experiments which have been made show that a joint, when baked in a coal stove, loses by the evaporation of its juices—the really nutritive portion of the meat—32 per cent. of its own weight, while if it had been roasted in a gas stove the loss would have been but 17 per cent. A blue fish baked in the old-fashioned way was minus 32 per cent. of its original weight when ready for the table, while a similar fish baked in a gas stove was short but 20 per cent. of its weight when placed on the platter. A chicken roasted in the range oven had lost 35 per cent. of its original weight when ready to be served, but a like bird roasted by gas and weighed required all but 14 per cent. of the weights to balance it on the scale. A beefsteak broiled over the hot coals showed a loss of 25 per cent., and a pound of mutton chops cooked in like manner came through the operation weighing 35 per cent. less than when raw, but when similar meats were broiled in the gas stove the losses were only 16 and 15 per cent. respectively. To summarize these results we find that when the viands were cooked in the ordinary coal stove they lost on the average 31 per cent. of the original weight in the operation of cooking, while when a gas stove was used the loss was only 16 per cent. If we were to assume a family used twenty-five pounds of roast meat a week, there would be a saving effected during that time, by the use of the gas stove, of $3\frac{3}{4}$ pounds of meat, which at 20 cents a pound would represent 75 cents per week, or about \$3 a month. As a gas stove will use about 1,500 to 2,000 feet of gas during this period. we leave it to the thoughtful reader to determine what his fuel would cost him.

The second objection urged against the gas stove is that viands cooked by gas acquire the taste of the gas. We can only say in regard to this remark, it is not founded on facts, and if any one is unwilling to accept our opinion on the subject he has only to get a gas stove and try it, when he will be speedily convinced of the superior quality of the work done by the stove. In the earliest days of the gas stove business,

when poor burners were used, which did not fully consume the gas, there may have been some grounds for this objection, but with the stoves now made, there is not a shadow of a foundation on which to rest such a story. In fact, the cooking done by a gas stove is of a quality far above that obtained by any other method. The roasting, broiling and toasting is all accomplished by radiated heat, the products of combustion do not come in contact with the viands.



Fig. 14.—Gas Cooking Stove, No. 7.

Thus in Fig. 14, the joint to be roasted, or the steak to be broiled, is placed in the lowest compartment of the stove underneath the gas flame. The work is, therefore, performed by the heat radiated from the gas flame, just as in the olden times the joint resting on the spit in front of

the fire was cooked by the heat radiated from the hot coals or wood; in fact, the stove shown by Fig. 15 is fitted with a spit. The best testimony which can be offered, as to the character of the cooking done by one of these stoves is, that most parties who have such a stove, use it in the winter season for roasting and broiling, even though the coal stove is lighted. It is worthy of remark that many a restaurateur who has acquired the reputation of being an adept in the matter of broiling a steak or grilling a chop, owe this distinction entirely to his adoption of the gas stove in his kitchen. Another point in favor of this new adjunct to the kitchen is in broiling a chop or a steak there is no dropping of fat into the fire, which with a coal stove is the means of notifying all in the house that they are to have chops or steak for breakfast.

The stove represented by Fig. 14 is a Goodwin No. 7, gas cooker. It has two burners on top by which all boiling operations can be quickly performed, it has what is known as the patent lid by means of which all the products of combustion can be carried into the chimney. It has a pet burner, that is a very small burner, which is extremely useful in making preserves where a low simmering heat is required. It will be noted the stove has an oven and a roasting chamber both heated by one burner. The roasting is done by the radiated heat, while the heated products of combustion pass around the oven—not through it—thus perfectly baking the goods placed therein. This stove is capable of doing the cooking for a family of six or seven persons.

Fig. 15 shows a No. 9 Economy Gas Stove. The stove has four top burners, an oven, and a roasting-chamber; it will be noted the latter has a spit, on which the joint to be cooked is placed.

It is well to bear in mind that with these stoves all culinary operations can be performed with a certainty and dispatch not possible with a coal stove. There is no waiting for a hot oven, no vexatious delays by reason of a poor draught, or because the wind is in the wrong direction. The cook can be sure that in five minutes after the stove is lighted the oven and roaster will be ready. If a very hot oven is wanted it can be had by leaving the burner open full; if only a moderate heat is desired it can be obtained by turning down the gas part way. One great recommendation for the gas stove is that any degree of heat can be had in-

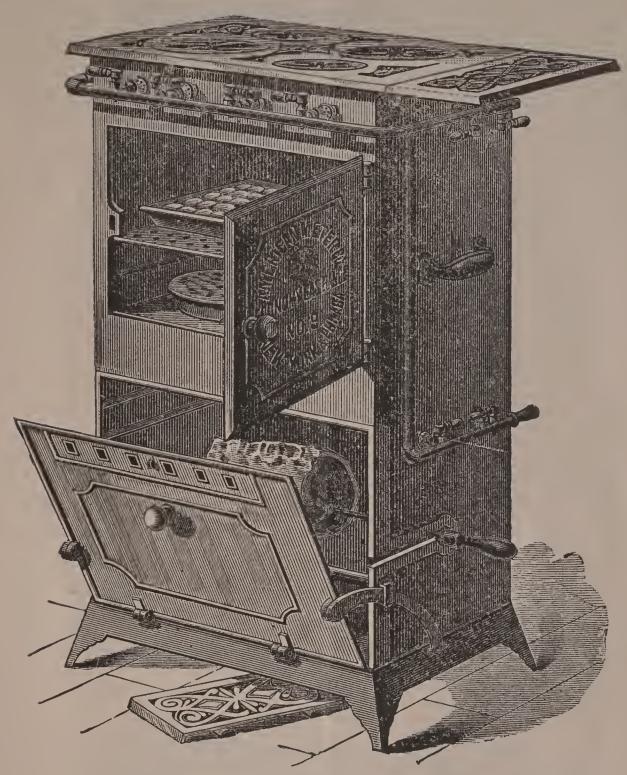


Fig. 15.—No. 9 Economy.

stantly. The No. 7 stove is the smallest size which can be recommended as capable of doing all the cooking for a family; smaller ones are made, but the oven is rather diminutive. Less expensive stoves are manufactured, having the boiling burners and the roasting apartment, without an oven, but a stove of the No. 7 size is much more satisfactory, as with it all the cooking for a moderate sized family can be performed. There are other styles intermediate in size between the 7 and 9; then there are some of larger capacity, ample to take care of the culinary work of a hotel.



Fig. 16.—Goodwin Gas Cooking Stove. No. 6.

Fig. 16 illustrates a stove known as the No. 6 Goodwin. It has two boiling burners on top and a roasting apartment beneath. Such a stove will not prove as satisfactory as a full-fledged one, nevertheless it will be found very convenient in a small family, as it would do away with the necessity of lighting the coal stove for perhaps three days in the week. In the roasting apartment a fowl or small joint can be roasted, or a steak or some chops can be broiled, and the work will be well done.

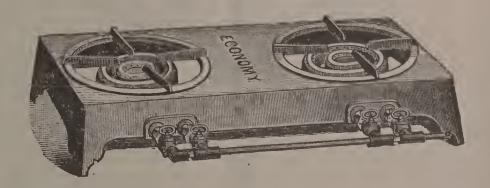


Fig. 17.—No. 4 Economy Furnace.

Fig. 17 represents a boiling stove, small, inexpensive, and very handy. They are made in several sizes, some having one burner, others five and six. Any work that can be performed on the top of a coal stove can be done with one of these heaters.

We might continue the illustrations of different kinds of stoves to such an extent that this pamphlet would become a good size book, but we have no intention of doing so, preferring to leave the reader to understand that these are merely samples serving to give a practical emphasis to the remark that they are made of all sizes and in every variety.

The question for the householder to decide is, which of these stoves he will adopt. No house should be without one of them. Of course, we recommend a stove of the No. 7 size or larger, as then the coal stove can be dispensed with in summer. As these stoves give off very little heat, they allow of the kitchen being kept as cool as any other room in the house during the heated term. Then there is no dust, no ashes, no bothersome fire to light; all that is necessary is to turn the tap and apply the match, when any degree of heat can be instantly obtained. When to these advantages is added the more important one, namely, the superior quality of the cooking, it would seem enough has been said to convince the reader that the gas stove is a thing to be desired.

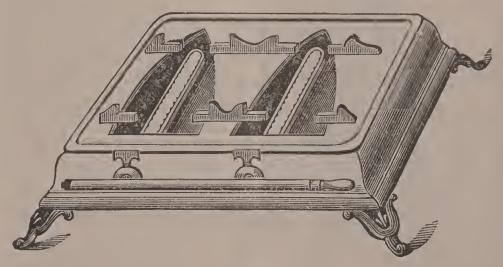


Fig. 18.—Iron Heater.

By Fig. 18 we show an arrangement for heating flat irons. This stove is also made in larger sizes suitable for a tailor's and hatter's irons. A flat iron can be heated in five minutes on one of these burners.

Fig. 19 represents a gas-heated griddle. Cakes can be baked on such a stove far better than by any other means.

There are many other forms of gas stoves, designed for special purposes, well worthy of being illustrated here, but it could not be attempted within the compass of this pamphlet. One of the newest

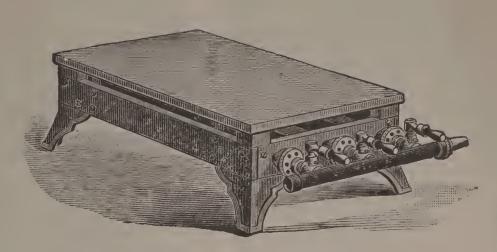


Fig. 19.—Cake Griddle.

things invented in this line is a large oven heated by gas, of ample dimensions for baking the bread for a large bake shop or hotel. Then there is a little confectioner's stove, made from the pattern used extensively in Paris; and a dish warmer heated by gas; also a waffle baker.

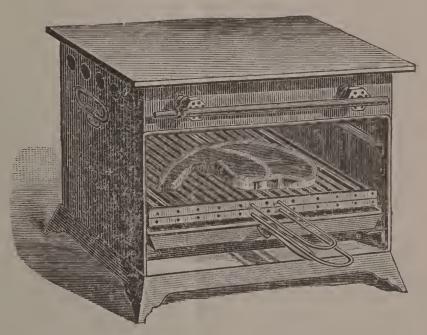


Fig. 20.—The "Restaurant" Gas Broiler.

Fig. 20 shows a restaurant broiler, something which should be found in every restaurant.

From these illustrations a consumer ought to feel that something suitable for any kind of culinary work can be found by applying to the gas company.

GAS HEATING STOVES.

We fear the price of gas—though it has been falling lower and lower for many years past—has not yet reached the point where it can be used economically for heating an entire house, or any part of it where a constant heat is required; nevertheless there are many instances where a gas heating stove may be employed to advantage. Thus, for the heating of bath-rooms, or any room where heat is wanted for but a few hours a day, gas can be used with economy; or for heating a sleeping apartment for an hour or so during the early morning in very cold weather; or for helping out when the furnace is obstinate and declines to send the desired amount of heat to a certain room. In such cases recourse can well be had to the gas stove.

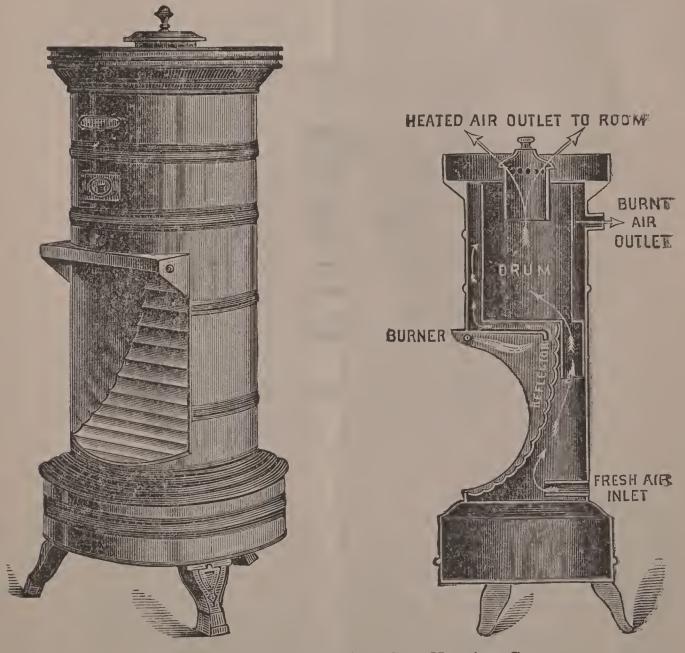


Fig. 21.—Goodwin Reflecting Gas Heating Stove.

We would, however, recommend that where possible the stove be connected with a flue, so the products of combustion may be carried out of the room.

For such purposes as we have indicated, the stove shown by Fig. 21 answers very well. The gas burning above the copper reflector gives a very cheerful appearance. The cold air enters at the bottom, becomes heated in passing through the stove, and escapes into the room from the top, while the products of combustion pass away to the chimney.

A somewhat different style of stove is shown in Fig. 22. It is



Fig. 22 - Economy Open Fire Place Heater.

called an open fire-place heater. It has a corrugated copper reflector, above which the gas is burned in luminous rays, the effect bearing a strong resemblance to a grate fire; on this account the stove is generally preferred for the parlor or sitting room. They are also made with their sides and top inlaid with tiles, which adds much to their appearance and also to their cost.

Gas heating stoves, like the cookers, are made in a variety of styles. Those illustrated are two of the forms which have come into very general use of late. There are also different styles of gas logs and incandescent fires, so arranged that the burning gas gives the appearance either of burning logs of wood or of incandescent coal.

GAS ENGINES.

Though the gas stove has proved a valuable adjunct to the gas companies' business, it has, in many instances, been fully equaled by the gas engine trade, which has in the last few years assumed very large proportions; nor is this to be wondered at when the convenience, safety, and cleanliness of this motor are taken into account.

The motive power comes directly from the explosions of the gas and air which take place in the cylinder back of the piston head. The action is similar to what takes place in the cylinder of a steam engine, the explosive force of the gas and air standing in place of the pressure of the steam; the gas engine, however, possesses a great advantage over the latter, in that it does not require a steam boiler, and dispensing with the boiler also means that the engineer can be discarded. The engine requires but a moment to start it, and is then able to take care of itself for the day, save that it will want oiling occasionally. Further, the engine can be stopped the moment the work is finished, thus putting an end at once to all running expenses for motive power; not so with the steam engine, for the boiler and engineer are sources of expense all day long. From these considerations it is apparent that the gas engine is suited in an eminent degree for providing the motive force where work is carried on intermittingly. If work is to be carried on for only a few hours a day, the running expenses of the engine will be simply in proportion to the number of hours the work is conducted. Further, the gas engine puts an end to all danger from boiler explosions, a very important consideration, particularly in crowded buildings, where it often happens several small boilers are in use. The number of gas engines introduced during the last few years is very large; they have in many cases displaced the steam engine, and in other instances

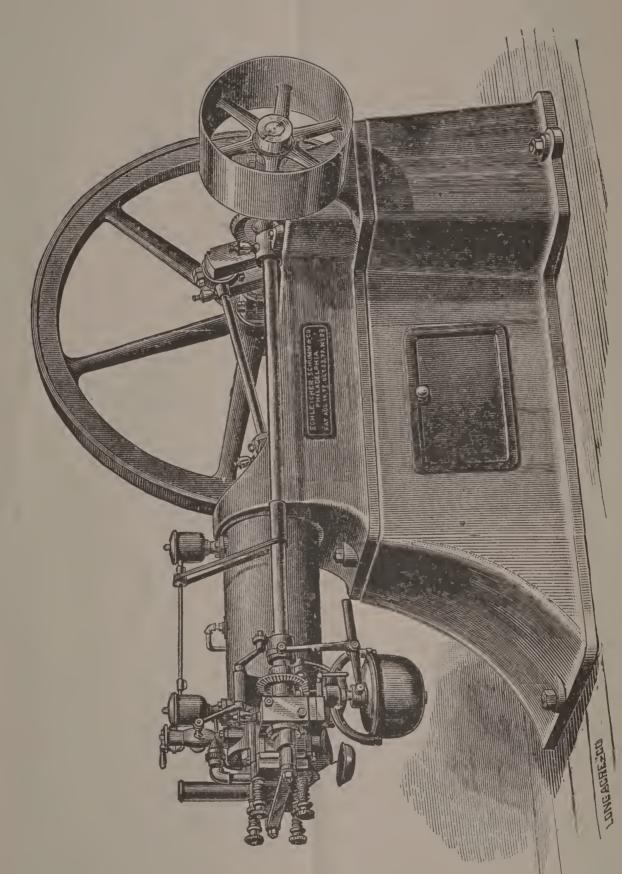


Fig. 23.-Otto Gas Engine.

have been adopted where a steam engine could not be profitably employed. They are made of all sizes, from one to one hundred horse power, they are therefore adapted to all possible uses, such as running elevators, printing presses, lathes, grain elevators, and for a host of other purposes.

In the following figures we show two styles of gas engines now being used extensively.

Figure 23 illustrates an Otto engine, while Figure 24 gives a view of a newer machine known as the Clerk engine. They are both excellent engines, using only about twenty-one feet of gas per hour per horse power, the amount varying somewhat with the quality of the gas.

In the foregoing pages we have attempted to show a few ways wherein gas can be used as a source of light, heat, and power, to the mutual advantage of the gas consumer and the gas purveyor; but it cannot be forgotten that for whatever purpose gas is used, the pecuniary obligation of the former to the latter can be arrived at, only, by the gas meter; therefore, in closing, we would say one word in favor of this much abused meter.

There is a feeling on the part of some gas consumers that the gas meter works in favor of the gas company and against the consumer. The idea is absurd. There are no scales, nor measures used for weighing or measuring the articles entering a house, which is so correct as a gas meter. Briefly described the meter consists of a series of measuring chambers, mathematically designed, of a certain capacity, and they are so arranged that every time they are filled and discharged the portion of a cubic foot which they hold is recorded on the dial. It is the action of the filling and emptying of these measuring chambers which causes the hands on the dial to move. That is, the motive power which causes the index hands to move is the gas passing through the meter and an analogy may be drawn between it and the steam engine, as in the latter steam is the force which causes the engine to move, so in the former the impelling power is the gas, therefore the hands of the meter cannot move without gas passing through the meter any more than the

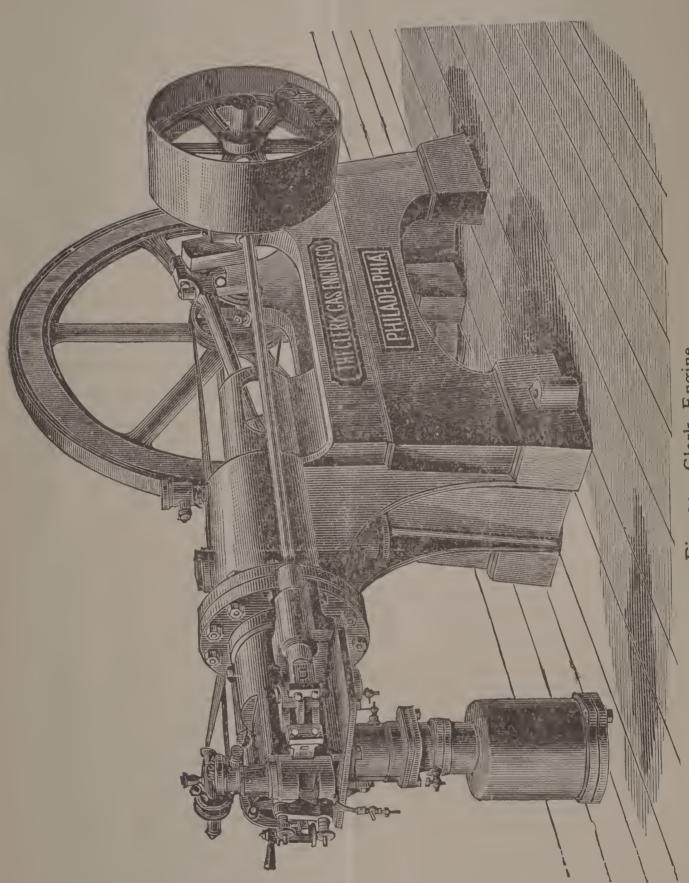


Fig 24.-Clerk Engine.

steam engine can be started up without admitting steam to the cylinder. Before a meter leaves the factory it is tested by one of the sworn inspectors of meters, then if a meter is made in one State for use in some other State it is tested again before it can be used by a gas company. Thus, if a gas company in the State of Massachusetts purchases its meters from New York, these meters are passed on by the inspector of the latter State, and are then inspected by the Massachusetts inspector before they can be used. From these considerations it would appear the consumer ought to have confidence in a new meter at least. After one of these instruments has been in use for a number of years it may get out of order, just as a set of scales may need adjustment after years of service, but the nature of its construction is such that if it does get out of gear it is much more likely to tell in favor of the consumer than against him. Still, if a gas user thinks his bills are too large he can have his meter tested by the inspector of meters, when he may be sure he will obtain a just verdict. The gas company will, upon application, have a meter inspected, and will also show any one how to read a meter; thus a gas user can readily determine if the index is read correctly, and also if the meter itself is recording the quantity of gas passing through it, hence it is in his own hands to verify his gas bill. If he finds there is no error, but still thinks he is paying for too much gas, let him have the pipes and fixtures thoroughly examined by an official of the gas company, or some competent gas fitter. It often happens small leaks in the pipe, allowing gas to escape night and day, should take the blame for large gas bills. By attention to these details a gas consumer will be brought to feel that for every dollar he pays the gas company he obtains an ample return either in light, heat, or power.

