A DESCRIPTION

OF THE

STEAM ENGINES

MANUFACTURED BY

D. A. WOODBURY & CO.,

ROCHESTER, N. Y.

CONTAINING

A MINUTE DESCRIPTION

OF THE

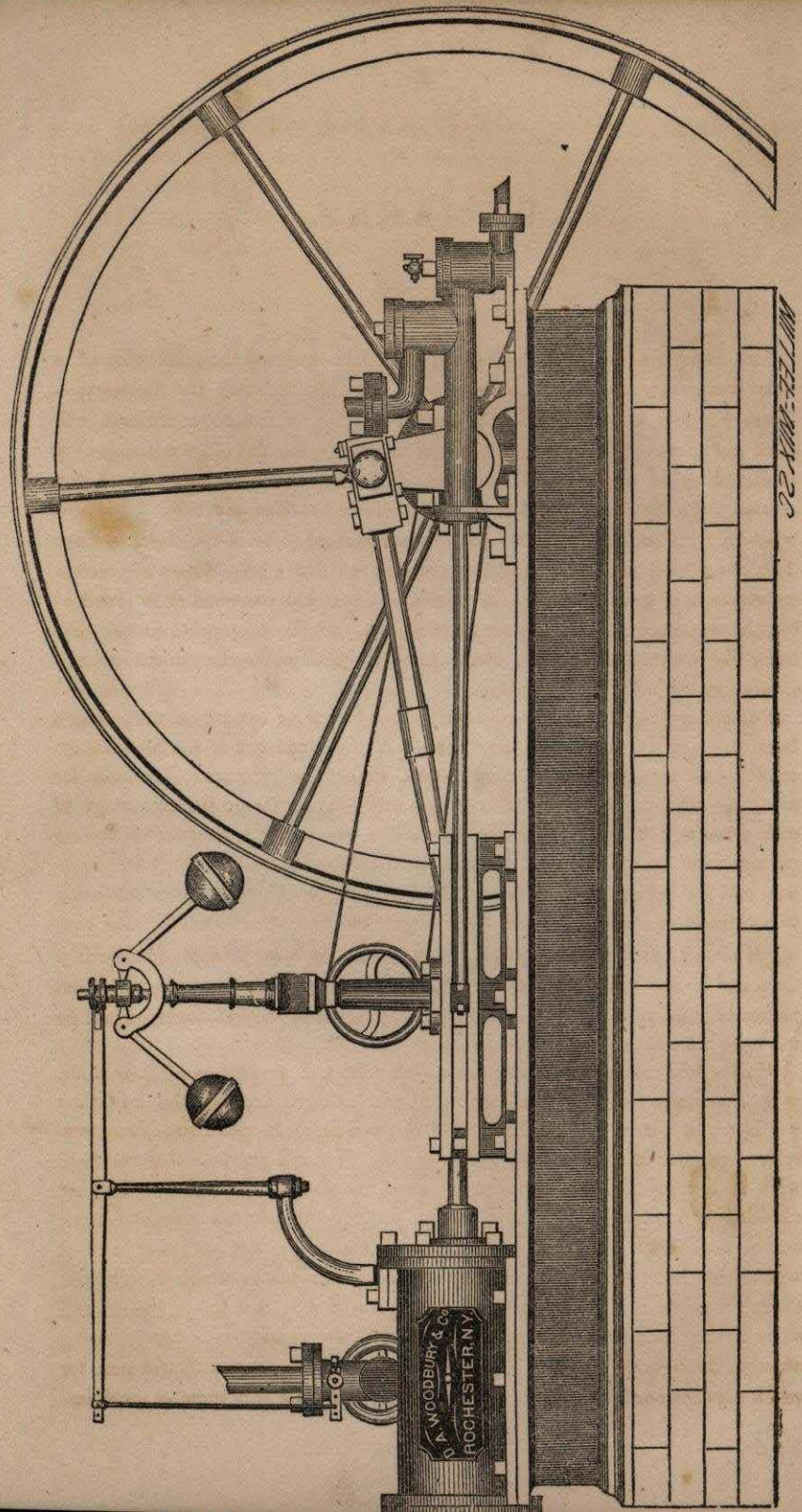
ENGINE, BOILER AND FIXTURES,

WITH THE PROPORTIONS;

ALSO, THE PARTICULARS IN REGARD TO

PRICES, TERMS, AGENCIES, &C.

A. STRONG & CO, PRINTERS, DEMOCRAT OFFICE.



REMARKS.

The numerous inquiries received by mail has rendered the publication of a clear, comprehensive and minute description not only desirable, but necessary.—These Engines and Boilers are expressly designed to furnish a compact, efficient and economical power for the shops of Mechanics, and other purposes of a similar character, and from all the forms in general use those were selected that seemed to be, all things considered, the best adapted to these purposes. To show what they are, and that they are what they are claimed to be, is the object in view. This is rendered the more necessary from the fact that a large share of customers reside at so great a distance as to render a personal examination impracticable, the only dependence being on a description, and the attempt to convey anything like a correct idea of the article by letter only proves the tedious and unsatisfactory nature of such a process.

Publishing prices, &c., has provoked a good deal of opposition and censure from others in the same business; but such is the confidence of the Manufacturers that an article equal in every respect cannot be procured elsewhere for anything like their prices, that they are unwilling to forego the advantage of such a course, but on the contrary believe it is but justice to themselves and no infringement on the rights of others to let the public know what they are making, and their prices for the same. And as they devote their entire attention to building three particular sizes, (four, eight and twelve horse power,) and having Machinery and Tools expressly for these, and building a large number at a time, and in this way being able to afford them at rates that would not pay expenses in building one at a time with ordinary facilities, they of course expect to sell more than their share of these sizes.

They would call particular attention to the size and proportion of their work, as a great many Engines in use are rated two or three times higher than they will bear; that is, an Engine that should be rated at about one or two horse power, is often rated at three or four, and even five. Nor is a guaranty that they will work up to a given power sufficient, for an engine should be capable of working considerably higher than its rated power; consequently a much smaller Engine can be worked up to a given power when its capacity is not sufficient to do it without much crowding, and at the same time it would not be strong enough, even though it might hold for a time. Neither is it sufficient that the Cylinder and some of the other parts be large enough; but there should be a corresponding strength throughout. Nor is it enough that the parts be of sufficient size, for much depends on the quality of the stock used, and what is of quite as much im-

portance as either; the work must be well fitted up. Taking all these things into consideration with the prices, the Manufacturers invite an examination and a comparison with others in the market.

It is true, that the Engines made by some builders, particularly those who make all sizes, may be found stronger in some parts than these. This is explained as follows: Builders who make all sizes cannot afford to make and keep in order a complete set of patterns for each, but use some patterns belonging to a larger size with some belonging to a smaller, making about an average strength! As no one would like an article made too light, neither would any one wish to pay for stock of no other use than to make an article clumsy, awkward and unwieldy.

Another matter intimately connected with a description, is that of answering the objections sometimes raised by purchasers, for many persons, no matter how limited their knowledge of steam power may be, have some prejudices either for or against some particular forms, and as a natural consequence will raise objections to anything that seems contrary to their previously formed opinions. As the Manufacturers profess to have adopted the forms that seemed to them to be the best, it will be necessary to give some of the reasons for so doing; and as such it will be necessary to state some of the objections to other forms in use.—These will be given in some of the last pages.

In the description, it is stated that some of the parts are made of brass. Common brass is made of zinc and copper. This metal is made of tin and copper; it is much more durable and expensive. The cocks and oil cups are made of the best steam-metal instead of ordinary brass.

First in order is a description of the Engine.

THE ENGINE.

The Engine is built on a substantial cast-iron frame, the middle size, or eight horse power, being eight inches deep. These frames are flanged both at the top and bottom, the latter being in the form of an ogee moulding; the top of these frames are planed off the entire length, so that in putting together any piece (being made as nearly alike as possible,) will fit any frame; consequently, should it ever be necessary to replace any of the parts, any piece of the kind will come "in line" without any "fitting down."

The Cylinder is bored out in a mill made expressly for the different sizes, and in a manner that ensures the most perfect work possible. The Cylinder heads are turned and polished, and are fitted to the cylinder and ground on so as not to require packing to render them steam-tight.

The Piston is furnished with metalic packing rings, and is packed with hemp inside of these rings. The friction, or wear, comes entirely on these rings, so that the Engine may be run for months without the packing being disturbed, and is less liable to leak than when packed in any other way. The piston-rod is made of cast-steel.

The Steam-chest is built on one side of the cylinder instead of the top, making what is usually termed a side engine. This enables the excentrie to be connected directly with the valve, avoiding the complication of joints often employed. The common D valve is used. A good amount of lap is given, cutting off the steam a part of the stroke, and at the same enabling the parts to be thrown quickly open to avoid "wire-drawing the steam." The form of "guide," or "slide," used is the same as that employed on the latest style of Locomotives. It requires greater accuracy of workmanship in building, but are less liable to get out of order. A large amount of bearing surface is given, so as seldom to require tightening up.

The connecting rod is a single or straight rod, made of wrought iron, turned and polished. The straps are firmly bolted to the rod, and the boxes are tightened up by a key. This is substantially the same method that is employed on most Locomotives, and is less liable to get disconnected than that employed on most engines, it being almost absolutely impossible for both bolts to get out unnoticed, and so long as one remains it will perform its work, even should the key that tightens the boxes be thrown out. Composition (brass) boxes are used.

The crank-pin, or rist of the crank, is made of cast-steel.

The main box, or that one in which the main journal of the crank shaft runs, is made in four pieces instead of two, as commonly practiced. It consists of the main part of the box and cap as usual, and in addition to these there are a couple of pieces, one on each side, to receive the horizontal strain. Provision is made for "setting them up" as they wear. These pieces are made of brass, strengthened by bars of wrought iron. This is one of the best late improvements on the steam engine, and should be applied to every horizontal engine. It is difficult to make this matter intelligible to those not conversant with the steam engine. Suffice it to say, that in the horizontal engines in general use there is little or no provision made for the horizontal or lateral strain which in this form of engine is far the most important, comprising as it does the entire force of the steam exerted against the piston; in other words, the entire moving power.

The out end of the crank shaft is supported by a cast iron frame and box.

The fly-wheel is made in the form of a band wheel, so that it may be used for a driving pulley if desired. There is room on the crank shaft for an extra pulley if necessary. The arms of the fly-wheels of the two largest sizes are made of wrought iron.

A horizontal pump is used, the plunger being attached to the crosshead. This is the almost universal practice at the present time. It is provided with brass valves fitted to seats of the same metal.

The governor or regulator stands on an arch which rests on two fluted columns; these stand on the upper slide. The governor stand or shaft is made of wrought iron, turned and polished, and stands in a brass step or box. The upper part of the governor, which is usually made of cast iron, is made of brass, which is less liable to break and looks much better. The joints of the lever or beam which connects the governor with the valve, are also made of brass.

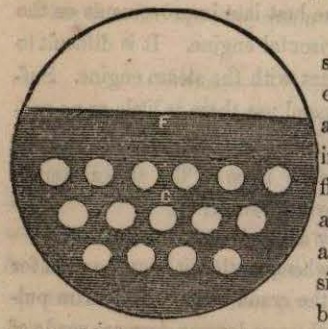
The steam-gate or throttle valve is very similar to the globe valve used by gas-fitters. It is, however, so modified as to bring the screw outside of the stuffing box, so as not to be exposed to the corroding action of the steam. The hand wheel is turned and polished.

The boxes of the connecting rod are provided with oil cups; these cups are fitted up for wicks, and are furnished with caps or covers to retain the oil. There is a cock in the cylinder head to clear the cylinder of condensed water, and one in one of the pump valve boxes for an air-cock. These trimmings are not mere traps, but are in keeping with the rest of the engine, being fitted up in a neat thorough and workmanlike manner. In addition to the parts before enumerated as polished, are the following, viz: the slidesa nd crossheads, the governor arms and a band around the governor balls, also most of the stuffing boxes. A part of the bolt heads are polished on all sides, the rest have the end or top turned and polished. Many of the other parts are polished; but the above will give an idea of the "finish," as it is termed, of the Engine.

The valves are set and the entire Engine is packed as far as possible before it leaves the shop. Many of the parts most liable to injury are taken off and boxed before shipping.

A table of the dimensions of the Engines is given in connection with that of the boilers and fixtures.

THE BOILERS.



The Boiler furnished with these Engines is in some respects similar to the common two-flue boiler, in others it resembles the Locomotive. It is a short Cylindrical Boiler with return flues; but instead of having from one to three or four large flues, from seventeen to thirty-five or more flues and tubes are used. The annexed cut represents a cross-section of one of these Boilers; the outside circle represents the shell or outside of the boiler, the small ones the flues; the dark portion represents the water. This makes a Boiler at once compact, efficient, economical, durable, and, as compared with many others, safe.

Compact, as it takes up but little room; the four horse power usually occupies (when put up ready for use,) only four by seven feet on the ground, and about five feet high; the twelve about five by ten, and about six feet high.

Efficient, as it exposes a large amount of fire surface of the best quality in a small compass, and a much larger amount of fire-surface is given to the horse power than most builders give; and being surrounded with a non-conducting substance but little heat is lost by radiationor conveyed away by the surrounding atmosphere.

Economical, exposing as it does a large amount of fire-surface, it withdraws a larger amount of heat from the smoke or heated air, and being surrounded by masonry but little heat is lost by external influence. The flue being divided into a large number of small tubes, the entire column of smoke or heated air is brought into close proximity to the water. These flues being entirely smooth inside, that is free from joints or rivets, the surface can easily be kept comparatively free from soot and ashes, which would otherwise collect in them and in a great measure prevent the fire from coming in contact with the metal, thereby, of course, prevent the free passage of the heat to the water.

Another source of economy is this: the bulk of the water being small in proportion to the amount of fire-surface contained, it requires much less fuel to fire up ready to start. This advantage is much more apparent when it is used for a Furnace, or some other purpose where it is required only an hour or two at a time, as the steam can be raised and an ordinary "charge" for a small furnace melted with less fuel than would be required to raise steam ready to start with a large plain cylinder or two flue boiler.

Durable, being made entirely of wrought iron of the best quality, it is not liable to crack from the sudden changes of temperature to which a Boiler is inevitably exposed. There being no internal joints, if a leak ever occurs it must be on the outside, were it can easily be got at to repair. The out as well as inside being heated, it is comparatively free from the strain caused by one portion of the Boiler expanding more than another. The head-sheets and flues are not exposed to the most intense heat of the fire, therefore are far less liable to injury from that source than in many forms of boiler in general use.

Safe. Being made much stronger, in proportion to the pressure of steam, they are are intended to bear more than a large share of the boilers in use in this State, and immensely so as compared with those used west. The flues being much smaller in diameter, they have a proportionately less amount of pressure to bear; consequently the liability to collapse is proportionately less, and the danger in case a flue does give way is reduced in a still greater ratio; for should a flue of three inches diameter give way it would only leave an opening of about seven square inches; whereas, one of twelve inches diameter would leave one of over one hundred square inches. Another consideration which adds to the safety of this style of Boiler, as compared with Locomotive and similar Boilers, is the arrangement by which the flame or heated air is passed over a large amount of the surface of the Boiler before it enters the flues This materially obviates the danger in case the water is allowed to get too low. In one or two instances these Boilers have been run entirely dry and heat red-hot without any very sensible injury. A repetition of the experiment is not however recommended.

This kind of Boiler being very compact, and a perfect cylinder, can be handled with much more ease than any other style of Boiler in use; consequently they can be transported to a distance with much less expense than any other.

This arrangement is much better adapted to burning saw-dust, shavings, &c., than where the fire is placed inside of the Boiler. They are also well adapted to burning coal.

It is estimated that it requires about 1-16 of a cord of wood per day for each horse power; and it is believed that they will perform as much work with a given amount of fuel as any in use.

THE FIXTURES.

The Fixtures furnished correspond very nearly with those furnished by other builders, but some things are furnished that are seldom considered as belonging to an Engine and Boiler, particularly in some sections of the country. They are as follows, viz:

The Pipes to connect the Engine with the Boiler.—These consist of a steam-pipe to convey the steam from the boiler to the engine, and two feed or water pipes, one to convey the water from the pump to the heater, the other from the heater to the check-valve, thence communicating with the boiler. These pipes are made of wrought iron and the flanges are screwed on; this makes a neater and better connection than copper, and has been adopted by nearly all the principal builders throughout the country.

The Safety and Check Valves are furnished. The former needs no description; it is, however, so arranged that a pipe can be attached to convey off the the steam, a matter often omitted, particularly in small engines tin pipe is usually used. The Check Valve is often omitted, and in that case a cock is sometimes inserted in the connection between the pump and the boiler; but often both are dispensed with. With these Engines both are furnished. Their use is to prevent the water in the boiler from forcing back upon the pump, and allows the valves in the latter to be taken out and cleared (in case they become clogged,) without removing the water from the boiler, or even stopping the engine; for instance, if the valve in the lower valve-box of the pump becomes clogged, it can be taken up and the obstruction removed without disturbing anything else. If the upper one is clogged the check valve will supply its place, and will prevent the water flowing back in case it is desirable to take it up. The stop-cock enables the check valve to be taken up. It sometimes happens (not often, it is true,) that all the valves, or all but the lower one, in the pump become clogged. In that case the stop-cock is indispensable to avoid emptying the boiler. It may be thought that so many fixtures are superfluous, but it will be remembered that these Engines are designed to be used for purposes that would not warrant the employment of a regular Engineer; at all events not to devote his whole time to running the Engine, but on the contrary, they are usually managed by those who have had but few advantages in this respect, and who at the same time devote a large part of their time to other matters; consequently it is desirable that it should require as little attention as possible.

The water in a Boiler soon becomes very foul, particularly if the water used is not of the purest quality; this renders it necessary to frequently draw off the water to get rid of these impurities and the sediment that collects on the bottom of the boiler. This can be done most effectively when there is a pressure of steam causing the water to flow with such force as to carry away a large proportion of the sediment with it. To accomplish this a two-way, or perhaps more properly, a three-way cock is used to stop the water between the check valve and the boiler. One branch of this connects with the boiler, another with the check valve, the third is used for the purpose mentioned above. There is also a hand hole in the front head-sheet of the boiler, to scrape out the sediment that remains.

The Guage-cocks are furnished, also the Grates, but require no special description.

The Boiler, or more properly the Furnace-front, is somewhat differently constructed from those in general use. Instead of a plate to form the entire front of the furnace, and through which the door-way is cut, a light inch wall forms the front of the furnace and the furnace door is provided with a frame made deep, or which extends back far enough to reach through the wall to prevent it from being injured in throwing in the fuel. This arrangement prevents much heat being lost in this direction.

An ash-pit door and frame is also furnished, which renders the arch, when properly put up, nearly air-tight, so that when it is desired to reduce the fire, closing the ash-pit door will check it instantly.

The Smoke-box or "Bonnet," is furnished. It does not differ materially from those generally used in this part of the country for flue boilers. There is a door for the purpose of cleaning out the flues. The front or head comes flush with the wall; the whole making a neat arrangement.

The stand-pipe is furnished. This is a pipe that fastens to the bottom of the boiler and extends through the side of the arch. Through this pipe the water is fed into the boiler, and through which it is also drawn or blown off.

The holes for bolting this pipe, as well as the safety valve to the boiler, are drilled and threaded and the bolts fitted so that the work only requires putting together—not *fitting*. This is seldom or never done by other builders, and in fact cannot with safety be done unless, as is the case with these Engines, full and complete directions for putting up are furnished with each. If so, and the directions are followed, everything comes in its proper place.

And "last, though not least," a Tubular Heater is furnished. This is an article rarely furnished with small Engines, or even any size. Its use is to heat the water used to supply the boiler before it is forced in. This saves a large amount of fuel and adds proportionately to the efficiency of the Boiler. It is evident that a Boiler of a given capacity will convert more water into steam, and do it with less fuel if the water is previously heated to nearly the boiling point, than if cold water is used. The water being heat by the exhaust steam, or the steam after it has been used in the Engine, is therefore so much saved. This Heater is made

almost precisely like the boiler; like that it consists of a cylinder or shell to contain the water, through which the tubes are set in the same manner as in the boiler, the difference being that the steam is used to impart the heat instead of the fire. Some builders furnish a cheaper style of Heater, but this style is probably the most expensive and best style in use; at least it is the most popular.

Proportions of Engines.

No. Horse-power rated,	4	8	12	
Length of Frame,	$5\frac{7}{12}$	$6\frac{10}{12}$	7	feet.
Depth of "	$6\frac{1}{2}$	8	$9\frac{1}{2}$	inches.
Diameter of Cylinder,	5	$7\frac{1}{4}$	9	"
Length of stroke,	10	12	12	"
No. Revolutions per minute	150	120	120	
Diameter of Fly-wheel,	4	5	6	feet.
Width of face of do.	5	7	8	inches.
Diameter Crank shaft in Journal,	$2\frac{1}{2}$	$3\frac{1}{4}$	$3\frac{5}{8}$	"
Length of "	3	4	5	"
Length of Connecting rod,	30	36	36	"
Diameter of Crank-pin, (cast-steel,)	$1\frac{1}{16}$	$1\frac{5}{16}$	$1\frac{9}{16}$	"
Length of bearing on do.	2	$2\frac{3}{8}$	$2\frac{3}{4}$	"
Diameter of Piston rod, (cast-steel,)	1	$1\frac{1}{4}$	$1\frac{1}{2}$	"
Width of Slides,	$1\frac{3}{4}$	$2\frac{1}{4}$	$2\frac{3}{4}$	"
Length of bearing of Cross-head,	$3\frac{1}{2}$	$4\frac{1}{2}$	$5\frac{1}{2}$	"

Boiler.*

Length of Boiler,	5	7	8	feet.
Diameter of do.	28	32	36	inches.
No. of Tubes,	17	26	35	
Diameter of Tubes,	$2\frac{3}{4}$	$2\frac{3}{4}$	$2\frac{3}{4}$	"
Surface of Boiler exposed to fire,	80	160	240	feet.
Length of Grating,	20	40	30	inches.
Width of do.	20	20	30	"

Heater.

Diameter of Heater,	6	11	17	inches.
Length of do.	12	12	12	"
No. of Tubes,	7	19	31	
Diameter of Tubes,	$1\frac{1}{4}$	$1\frac{1}{4}$	$1\frac{1}{4}$	inches.

* It is sometimes necessary to vary the proportions of the Boiler, as tubes of the above length and size cannot always be obtained, in that case the equivolent is given. Plain Cylinder or "Log Boilers" of the same diameters of the above, would require to be 17, 30, and 40 feet long respectively, to expose as much surface to the fire. That is, it would require a plain Cylinder Boiler 36 inches in diameter to be 40 feet long to expose as much surface to the action of the fire as twelve horse power Boiler described above.

Objections, &c.

The first objection raised by many is, that they would prefer to have it portable; that is, to have the Engine attached to the Boiler; and there are advantages in this form; but on the other hand there are many and serious objections to this mode of construction. The greatest of these, however, are against the Boiler.—One objection to having the Engine attached to the Boiler is that it cannot in that way be held sufficiently firm; on the contrary, an Engine of any considerable size is seldom if ever built that will not give some when working at full power, when built in that way.

The parts are also misplaced or thrown out of line by the expansion and contraction of the Boiler; for should everything be in its proper place when it is contracted, or cold, they cannot of course be when it is hot. And what is the use, let it be asked, of taking the pains of lining up an Engine when the expansion of the Boiler in firing up ready to start will throw it out of line? And besides, the additional heat is injurious to the working parts.

Some fancy an upright Engine. But this is liable to the same objection in one particular as the above; it is the difficulty of obtaining sufficient firmness.—It is true that it can be made to hold in this way, but it is essential to the well-being of machinery, particularly the Steam Engine, many parts of which are required to work steam-tight, that the frame should not give, otherwise it will cramp or bind in the working parts. But when the Engine is built on a substantial horizontal cast iron frame, and the whole bolted to a good foundation, any desirable degree of firmness may be obtained; and when so placed it will remain.

A common objection raised by those who are only familiar with the old fashion long stroke Engines is that the stroke is too short. But it will be found that where both are used that the short stroke Engines are the most popular, and that almost every new set of patterns made are made shorter than the preceding; the prejudice in favor of long stroke Engines being mainly kept alive by builders who having such patterns naturally desire to build from them. It is not to be denied, however, that there are advantages in using long stroke; the principal one is this: the longer the stroke is the less number of strokes it will make in a minute, and as a matter of course the wear on some of the parts will be less; on a large proportion of the parts, however, there is no difference. On the other hand it is equally true that there are advantages in making the stroke short. One is, that it makes the Engine more compact; it also saves gearing up. To get a motion quick enough for ordinary purposes, belting directly from the fly-wheel or a pulley on the crank shaft is sufficient.

Also, the shorter the stroke the lighter the work can be made, and still be of the same relative strength. It requires no argument to prove that a shaft or other piece of machinery that revolves twice to transmit a given amount of power only requires to be half as strong as one that only revolves once in the same time. This is a point where something is saved on these Engines; but it will be seen by referring to the Table of Dimensions, that they are made stronger than many

of much longer stroke, and it is believed that the superiority of the stock and workmanship will more than compensate for the increased motion.

Some entertain the idea that a short stroke Engine of a given diameter of cylinder is less powerful; yet there is little difference—none at all, according to the rules laid down by Engineers for estimating the power of an Engine. The reason is this: the longer the stroke the less number of revolutions it will bear to make in a minute; that is, an Engine of one foot stroke will bear to make twice as many revolutions as one of two feet stroke.

Customers frequently say that they do not care about any outside polish, and that they would rather have all but the working parts rough. There is but little, however, to be saved in this way, for after an Engine is well fitted up out of first rate stock, it costs but little to put in enough polish to give it a neat and workmanlike appearance.

Messrs. W. & Co., after having been for two or three years engaged in manufacturing rough work principally, have become convinced that it is best, both for themselves and their customers, to use an extra quality of stock and fit up the Engines in a neat as well as thorough manner, and also give an extra amount of Boiler, and by taking advantage of every available facility to afford their work as low as possible, and by so doing and adding an extremely small amount of profit, they still keep their prices below any other establishment in the country. They are willing to do business on a small profit, hoping in time to acquire a reputation and an extent of business that will compensate them for their present sacrifices.

As before stated, the greatest objections to the portable Engines are to the kind of Boiler necessarily used. Of these the most common form is what is usually called the Locomotive Boiler, or something similar. One of the principal objections to that style is the unnatural strain to which it is subjected, caused by the unequal expansion of the different parts. This is owing to the unequal distribution of the heat; the inside of the fire-box or furnace and the tubes being exposed to the direct action of the fire and smoke, or heated air, while the outside of the boiler or shell is cooled by radiation and the atmosphere. This causes a strain on the joints which tends to loosen the tubes. This is avoided by heating the out as well as inside.

Another difficulty in that kind of Boiler is the tendency to burn off the ends of the tubes where they are fastened in the heads; the front-head sheet being exposed to the most intense action of the fire it soon destroys the caulking or set of the tubes, burning it off. This tendency is still greater in that form called the upright Locomotive; one of the heads is placed directly over the fire and in a horizontal position, which allows the sediment to collect on it among them where it is very difficult to remove. This is also obviated by placing the fire under a horizontal Boiler and carrying it the entire length before it enters the tubes; then there is not sufficient heat retained to materially effect them.

There are also several objections of minor importance, yet deserving of passing notice; for instance, the tubes nearest to the surface of the water being subject to

the first and direct action of the fire are very liable to injury in case the water is allowed to get too low, but the bottom of the Boiler is always covered as long as any water remains.

Another is that the tubes are often placed too close together; this makes the heads liable to crack from one tube to another, and the space between them is liable to become filled up, there not being sufficient room for the encrustation to scale off. All that is required is to set the tubes farther apart.

There is another objection to almost every form of portable Boiler that is often overlooked entirely and but seldom appreciated. It is the great amount of heat radiated and carried away from the external surface of the Boiler. A person can easily convince himself that there is a great amount of heat lost in this way, by a very simple experiment. On stopping the Engine at night or at any other time, put out all the fire, and it will be found in the course of an hour or two that the steam will be nearly all gone, although at the time of stopping there might have been steam enough to have run the Engine some time. And with this fact it should be borne in mind that this heat comes from the steam and water inside of the Boiler; that the heat has first to be abstracted from the fire by the efficiency of the Boiler and then is drawn from the steam. In other words, it is equivolent to so much steam being used for some other purpose; consequently it requires more fire and more heating surface in the Boiler than it otherwise would. This is is prevented by laying the Boiler in well with masonry.

There is still another objection to the Portable Boiler; and that is, the fire-box or furnace is usually, and it might almost be said always, too small. In some so called four-horse power a cylindrical fire-box is used only fifteen or sixteen inches in diameter! and the ash-pit and grates must be taken from even that!!— This of course precludes the possibility of using fuel that is not well prepared, and also adds greatly to the trouble of "firing up."

Boilers have been made and enclosed in a sheet-iron "jacket," or casement, instead of the arch; that is, the fire is placed in a flue running directly through the Boiler, and is then passed around it enclosed with sheet-iron. It is needless to say that a great amount of heat is lost in this way by radiation, and the sheet-iron must necessarily soon burn out, as it is nearly as much exposed to the action of the fire as the Boiler itself, and is entirely unprotected by the water. It has been attempted, in order to prevent the radiation, to enclose the Boiler in a double jacket and fill the space between the two with Plaster of Paris or Lime, or some other non-conducting substance, but while this partially remedies one difficulty it proportionately increases the other.

The common two-flued Boiler takes up two or three times as much room, costs two or three times as much to put it up, and requires much more fuel. The surface of the flues being rough it soon coats up with soot and ashes, which cannot be easily removed. These in a great measure prevent the passage of the heat to the water, and should any of the joints spring a-leak it is very difficult to repair.

The plain Cylinder Boiler scarcely deserves a notice for shop use, except where room and fuel are of no consequence.

It is sometimes objected by those accustomed to the plain Cylinder and large flued Boilers, that these Boilers look small; and they are so, for a Boiler of any required power can be made more compact in this way than in any other. This same objection, if it can be so called, would apply to the Locomotive, which all are aware ranks among the most efficient.

The reason why a Boiler can be made more compact in this way than any other is this: as large a proportion of the external surface or shell is exposed to the fire as in the plain Cylinder Boiler, and the inside, up to low-water mark, is filled with tubes, so that no surface or space is lost; whereas, in the Locomotive none of the outside is available, and in the plain Cylinder none of the inside is used.

Take a common Locomotive Boiler and remove the part containing the fire-box, and take the "waist," (the cylindrical part containing the tubes,) and put it in an arch, and it would make more steam than it would before, because there would be more of the shell available as heating surface than was before contained in the fire-box.

In some Boilers the heads, and sometimes other parts, are made of cast-iron, but it is very liable to crack. In these Boilers the heads as well as the shell are made of the best (wrought) charcoal iron, with the imported Patent Lap-welded tubes.

Prices, Terms, Agencies, &c.

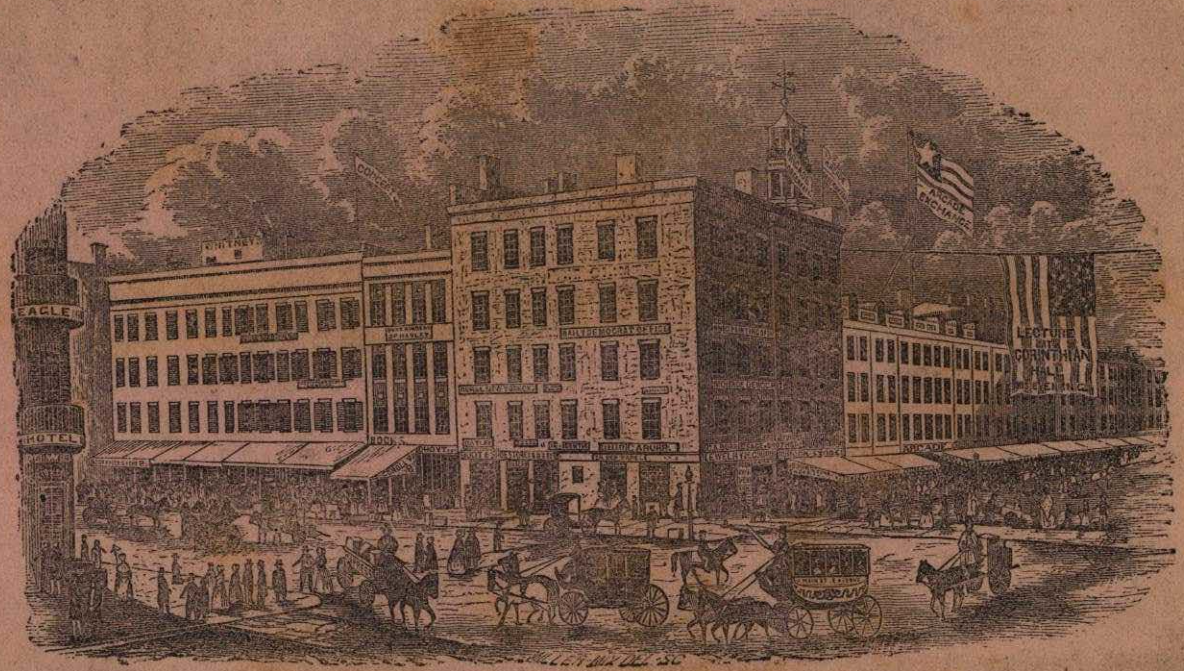
The Manufacturers have concluded, for the present, to discontinue all Agencies. This enables the prices to be put considerably lower than they otherwise could be.

Price of Four Horse-power Engine alone,	~~$190~~ 145
Price of " " " Boiler and Fixtures,	~~200~~ 185
Whole complete	~~$390~~ 330
Price of Eight Horse-power Engine alone,	$220
Price of " " " Boiler and Fixtures,	310
Whole complete,	$530
Price of Twelve Horse-power Engine alone,	$300
Price of " " " Boiler and Fixtures,	440
Whole complete,	$740

The above are Cash prices. A reasonable amount of Credit will be given on special agreement; but it will be necessary, usually, to charge a little extra.

Arrangements will be made on the opening of navigation to deliver the Engines at all the principal ports on the Lakes.

A few of the small size left, of former styles, some as low as $250.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