The Locomotive

OF

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1920-1921.

INDEX TO VOL. XXXIII.—1920-1921

REFERENCE MARKED WITH A STAR (*) ARE TO ILLUSTRATED ARTICLES.


It's all
In the Firing!
Wasteful Fuel
Consumption!
High Steam Cost!
Correspondence Course
For FIREMEN

The Locomotive

DEVOTED TO POWER PLANT PROTECTION

PUBLISHED QUARTERLY

VOL. XXXIII. HARTFORD, CONN., OCTOBER, 1920. No. 4

BOILER EXPLOSION AT OWOSSO, MICHIGAN.

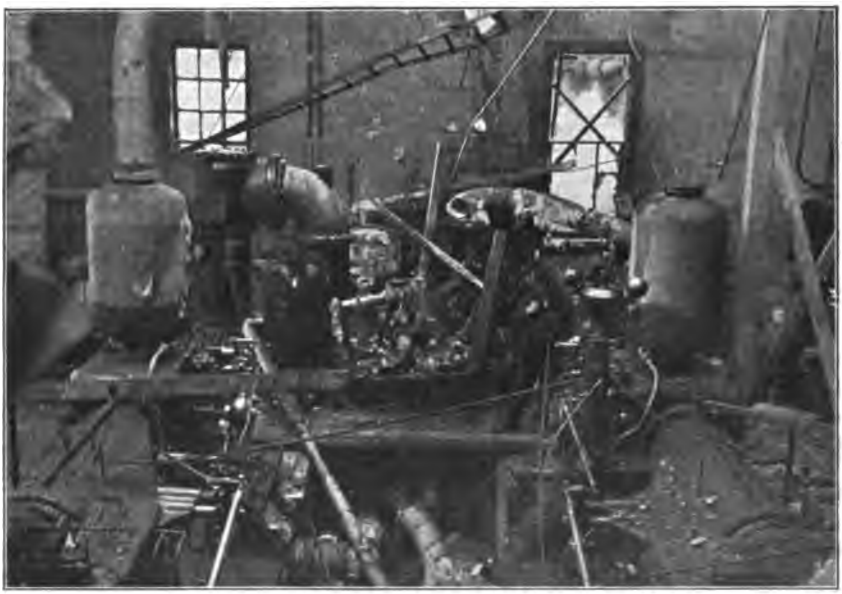
Flywheel Explosion at Scotia, Cal.

Damage to Engine House Built of 12" Concrete Walls.

THE illustrations on the front cover and next page of the present issue of the LOCOMOTIVE show some of the resulting damage when a 16 foot flywheel exploded on February 23rd at the sawmill of the Pacific Lumber Company, Scotia, Cal. The property damage was quite heavy but fortunately there were no fatalities as is so often the case with such disasters. Of the five men who were only slightly injured, four did not even stop working.

The wheel was of the flange joint type, made in four sections and really consisted of two wheels bolted together which formed a total rim face of 5 feet. The engine on which the exploded wheel was mounted was of the twin type with releasing type of valve gears, both cylinders receiving steam at approximately boiler pressure. One fly-ball governor regulated the cut-off for both cylinders with the usual arrangement of a rockershaft extending from one side of the engine to the other and this feature appears to have had a more or less prominent part in the cause of the engine running away.

The leading cause of the accident was a sudden release of all load from the engine by the breaking of the main driving belt which is thought to have been brought about by a piece of wood wedging between the belt and the face of the wheel. The broken main belt knocked off the governor-driving belt from its pulley so that the governor stopped revolving. If the trouble had terminated there the dire results shown in the illustrations should have been averted by the so-called safety cams on the valve gear which come into play when the governor drops to its lowest position and prevent the further admission of steam to the cylinders. However, as the big belt coiled up into the wheel pit, it broke the afore-mentioned governor rockershaft, which



General View of Cylinders and Valve-gear.

had the effect of preventing the safety cams on the north cylinder from functioning so that this cylinder continued to receive steam during a portion of each stroke and the speed of the engine increased rapidly.

We are advised that when the trouble began one of the operators ran to the throttle valve wheel and succeeded in closing the valve to within ⅛ inch after which he ran for safety just in time to escape with his life. This throttle valve was located overhead in the steam-line at the point where the steam-line forked into the two pipes that led to the cylinders, and moreover, on each cylinder stood a spacious steam separator so that the volume of steam between the throttle and the cylinders was very large and in all probability was sufficient to run the engine at a destructive speed, so that it is extremely doubtful whether his courage would have been crowned with success even if he had shut the valve tight.

The loss was estimated between twenty-five and thirty thousand dollars and was covered by insurance.

Horizontal Tubular Boiler Settings and Details of Installation.

H. E. DART, Superintendent of Engineering Department.

OUR Engineering Department is now engaged in making new drawings of setting plans for horizontal tubular boilers. In past years there has been a big demand for such setting plans and some of the tracings for the more common sizes of boilers are literally worn out. In making the new drawings, advantage is taken of the opportunity to show certain features in greater detail than was formerly the case and the scope of the plans has also been extended so as to include typical methods of piping and the proper manner for installing the usual fittings and attachments. Figures are also given to show the quantities of bricks required for setting the boilers in accordance with the plans. For each of the common sizes of boilers, it is the intention to make four drawings, two with overhanging fronts and two with flush fronts, one of each style showing boilers suspended independently of the setting walls and the other showing boilers supported by means of brackets resting on the walls. The complete set of plans is not yet finished but drawings are ready for many of the ordinary sizes of boilers and blueprints can be furnished from such drawings as are finished. Requests for such blueprints should be made preferably through the chief inspector of the department in which the boilers are located (see list of departments on back of THE LOCOMOTIVE) rather than directly to the Engineering Department, because our chief inspectors are familiar with the conditions which exist and are generally able to submit the data which we need to determine which drawing is best adapted to each particular case.

The most important features in connection with the new setting plans are described below. While many of the features mentioned will apply equally well to the design of settings for any other type of boiler, it should be remembered that this description is concerned primarily with hand-fired horizontal tubular boilers using coal for fuel, and is written from that viewpoint.

WALL CONSTRUCTION.

On our old setting plans the outside walls are shown as indicated by Type I, Figure A, but on the new plans we are showing all of the four types of construction described in Figure A, leaving it to the boiler owner to make his choice between these designs. Complete dimensions are given on the drawings for each type of construction.

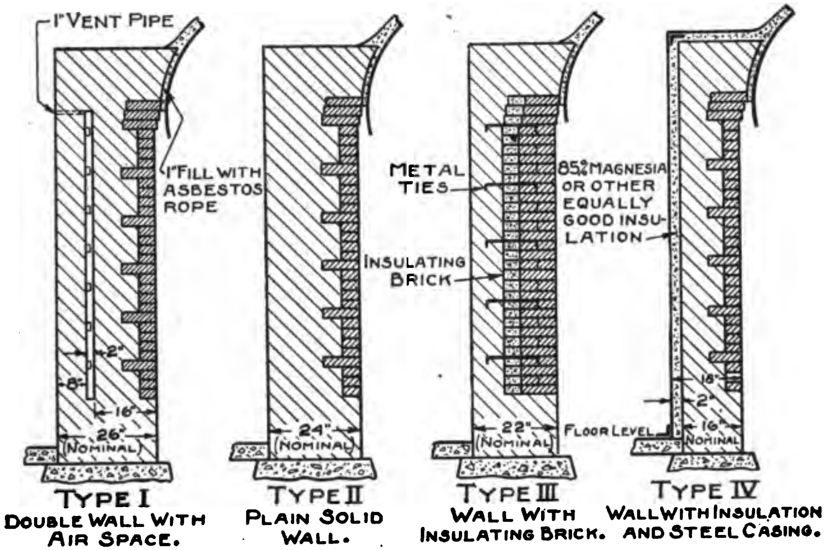


FIG. A. DIFFERENT TYPES OF CONSTRUCTION FOR SETTING WALLS.

The design shown by Type I involves the construction of two separate brick walls, bonded solidly together for a distance of about sixteen inches at the top and at the bottom, but separated by an air space two inches wide for the remainder of the height. It is thought by many people that this air space acts as a heat insulator but such is not the case; experiments by the Bureau of Mines have shown that a wall of this type will transmit just as much heat under given conditions as a solid wall of the same total thickness. As regards air leakage into the furnace, however, the double wall with air space has a distinct advantage over the solid wall shown by Type II because the cracks will occur principally in the inner wall, leaving the outer wall intact. With a solid wall, the cracks will extend clear through the brickwork, thus greatly increasing the probability of air leaks and thereby decreasing the efficiency on account of excess air. Not long ago we had occasion to make an examination of a solid-wall setting which had been built in the same boiler room with two older settings of the air space type. Although the new setting had been in use only a few months the test with a candle flame showed more leaks than were found in the other settings which had been used several years. Of course such a test is not entirely conclusive, since there are other features which should be considered, but we believe it gives a fair indication as to what may be expected in the average case. In constructing setting walls with an air space it is advisable to insert a few ventpipes as indicated in the cut, these pipes being especially desirable if the bricks contain much moisture when they are laid. After the setting has thoroughly dried out, all ventpipes should be permanently sealed so as to prevent air leakage into the setting and heat radiation from the inner wall.

Type III in Figure A makes use of insulating bricks to reduce the amount of heat that is transmitted through the wall and thereby lost. These insulating bricks are made of different materials by different manufacturers and they are cut to the proper size to lay up evenly with ordinary bricks and fire bricks. They have little mechanical strength in themselves so that it is best to use metal ties, as shown in the cut, for bonding the inner firebrick section to the common brick on the outside. It is also advisable to use a uniform thickness of nine inches for the firebrick lining in place of the 4½ inch lining with headers as shown for the other types. This type of construction makes a very good setting, costing somewhat more than either Type I or Type II.

Type IV is similiar to Type I with a steel casing substituted for the outer wall and the air space filled with magnesia or other good insulating material. This makes a most excellent form of setting, the only drawback to its more general use being its greater cost as compared with other types. The insulating material reduces the heat radiation loss to a minimum and the steel casing prevents the even greater loss due to air leakage through the setting walls. Furthermore, a setting of this kind presents a very neat appearance and requires less space than any of the other types illustrated, there being a saving of eight inches in length and sixteen inches in width as compared with Type I. Number 8 U. S. gage steel plates should be used for the casing with angle irons placed about 3½ feet apart along the sides and back and with similar angles at the top, bottom, corners and elsewhere as needed for stiffness and stability.

For the division walls between boilers set in battery the style of construction shown in Figure B is satisfactory, regardless of what type of construction is used for the outside walls. The vertical slot shown in the center of the wall does not indicate an air space like that in Type I but is intended to show that the two walls should be built separately and not bonded together in the center. This is advisable to make allowance for expansion when there is a fire on only one side of the wall.

The sections in Figure A apply to the side walls at the rear of the bridge wall. For the furnace section in front of the bridge wall, we advise that the walls be battered from the grate level to the closing-in line near the middle of the boiler shell. Our drawings show a batter of six inches in this height, thus making the walls that much thicker at

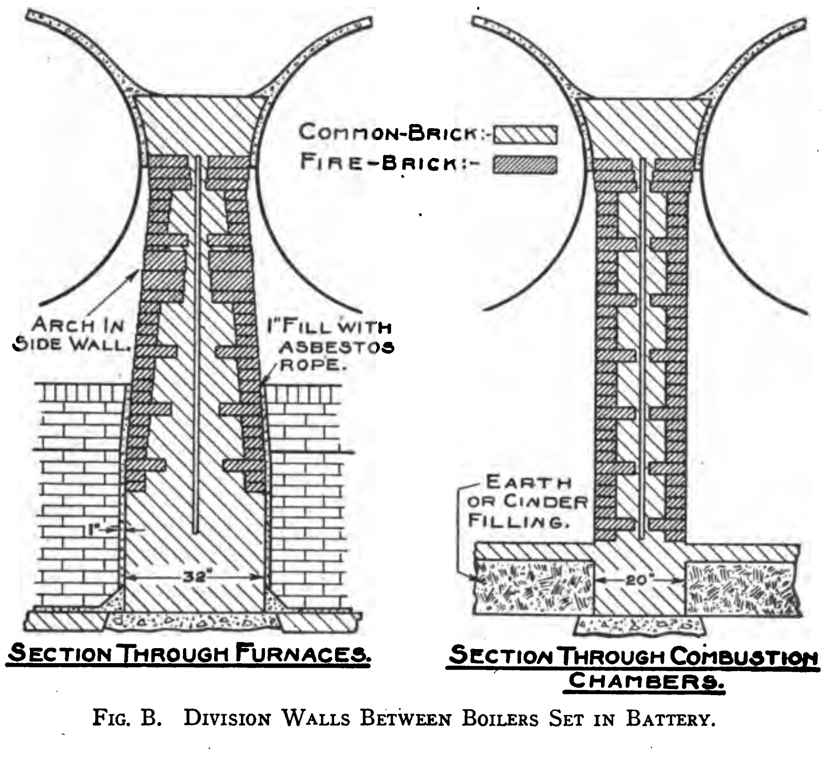


Fig. B. Division Walls Between Boilers Set in Battery.

the bottom. A reference to Figure B will make this point clear. The section at the left shows the battered wall while that at the right shows the straight form which can be used back of the bridge wall. This figure shows sections for the division wall between boilers but the same idea should be applied to the outside walls.

In constructing side walls and division walls it is a good idea to build an arch in the firebrick lining at a height of about three feet

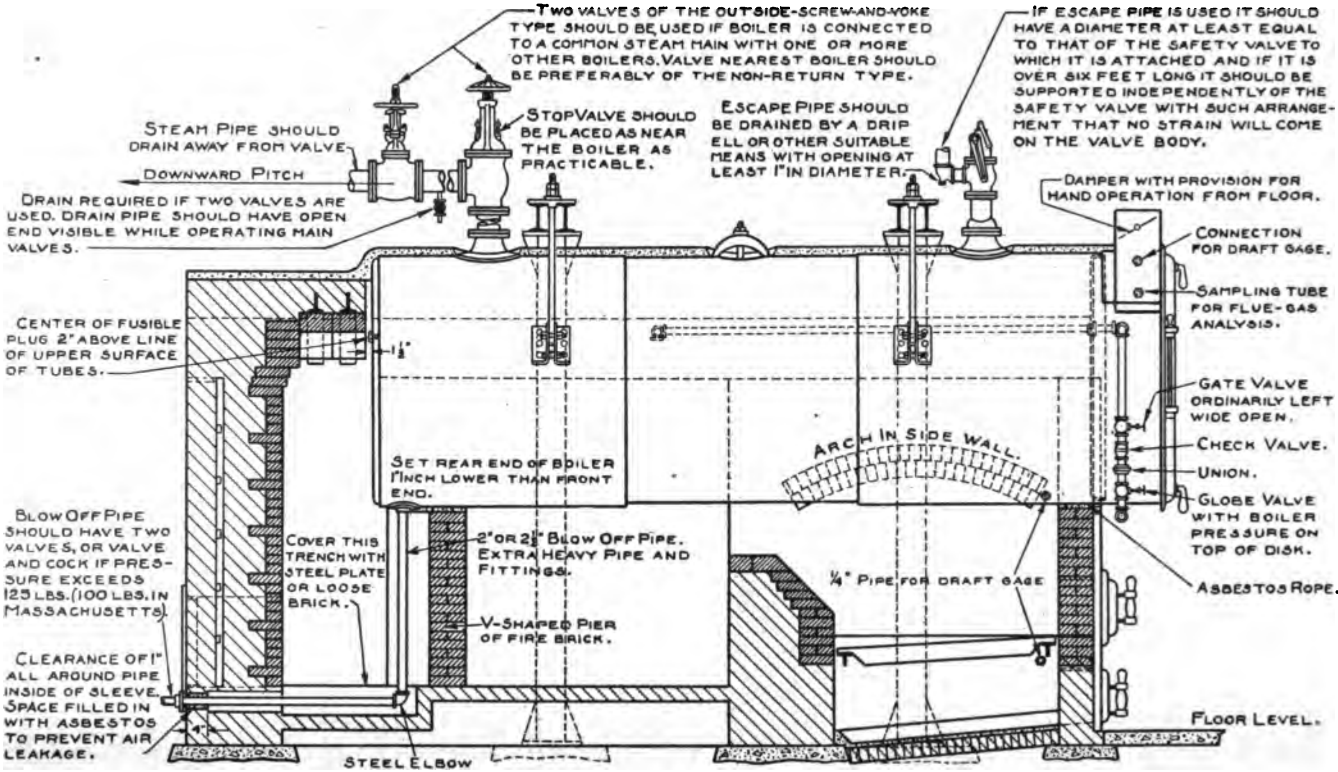


FIG. C. LONGITUDINAL SECTION THROUGH CENTER OF SETTING.

above the grates, as illustrated in Figure C. When it is necessary to replace firebrick this arch supports the brickwork above and prevents it from falling down.

For construction like that shown in Types I, II, and IV, where the firebrick lining is only 4½ inches thick, headers should be used for every fifth course or even more frequently. In all firebrick work the joints between the bricks should be made just as thin as possible. For this reason a trowel should not be used but the bricks should be dipped in thin fire-clay and then rubbed down into place so as to make "brick-to-brick" joints.

ALLOWANCE FOR EXPANSION AND PREVENTION OF AIR LEAKS.

Ample provisions should be made throughout to allow the boiler and the setting to expand without cracking the brickwork or opening up places where air can leak into the setting. If the brickwork is built tight up to the boiler shell at the closing-in line, cracks are sure to develop when the boiler is heated up and there will also be an opportunity for air to leak in between the boiler and the brickwork. It is best, therefore, to leave the brickwork about an inch away from the boiler and fill this space with asbestos rope or some similar material, as illustrated in the different sections of Figure A. In a similar way, the brickwork and the ironwork of the boiler front should be kept about ¾ inch away from the boiler shell (and concentric therewith) and this space should be filled in with asbestos rope. To prevent cracking due to endwise expansion of the bridge wall, it should be built separately from the side walls, leaving a space of about one inch at each end. This space should be filled with asbestos rope to prevent the accumulation of ashes which would become solid and nullify the advantage to be gained by building the bridge wall independently of the side walls.

At the rear end of the boiler, a space of about 1½ inches should be left between the boiler head and the brickwork; this space can best be sealed against air leakage by extending the insulating covering down over it as shown in Figure C. There is a tendency for the covering to crack open at this point as the boiler expands and contracts but this difficulty can be largely overcome by the use of a piece of sheet iron, formed to fit over the rear end of the boiler shell and bent down over the head to extend out on top of the brickwork. With the piece of sheet iron in place under the covering the probability of cracking is lessened and, if a crack does develop, the sheet iron will tend to prevent air from leaking into the setting. We advise the use of insulating covering for the boiler top instead of the brick arches which are sometimes used. The covering is a better heat insulator and it can be removed and replaced more readily in case repairs or inspections of the boiler shell are required. The covering can best be applied in the form of blocks which can be held in position with mesh wire and then finished with plastic magnesia or other insulating cement to make a smooth finish and fill the joints between the blocks. A harder surface can be secured by using a little Portland cement in the final coat. The total thickness of the insulation should be at least two inches.

The loss due to excess air is generally greater than that from any other cause in hand-fired boilers of the type under consideration, and it is also the most difficult to prevent because it is such an intangible sort of thing that the firemen cannot be made to realize its importance. Much of this excess air leaks in through the setting walls and efforts to prevent such leakage by the methods outlined above will be well repaid. It is not sufficient merely to construct the setting as described, however; inspections and tests should be made at frequent intervals to be sure that the asbestos remains in place and that the joints are properly sealed at all points. We have made a number of investigations of this kind and we almost invariably discover air-leaks at some of the places mentioned above as well as around blow-off pipes, firing doors, clean-out doors, etc.

There are several different paints and coatings on the market which can be used to good advantage in the prevention of air leaks. Such compounds are usually composed of asphalt, asbestos and other materials, combined to produce a thick elastic coating which will stretch without cracking as the setting expands when it is heated up. The coating is usually applied to the entire surface of the setting, care being taken to work it into all cracks, joints and openings around door-frames, boiler fronts, or other similar places. A very satisfactory home-made substitute can be prepared to take the place of the commercial compounds.

PROTECTION OF BLOW-OFF PIPES.

The proper protection of the blow-off pipe is an important feature in connection with any setting for a horizontal tubular boiler. There are many ways of providing such protection and in making a choice between different methods one important principle to be kept in mind is that the pipe should be easily accessible for inspection. For this reason a simple pipe sleeve around the blow-off pipe is not satisfactory because such a sleeve cannot be removed without disconnecting the blow-off pipe. Split sleeves of cast iron are better but it is usually rather difficult to remove them after the connecting bolts have been exposed to the heat and flames. Several patented styles of blow-off covering are available and these give good results as a rule. In general, such blow-off coverings are made of some refractory material and applied in sections with an interlocking arrangement so that they are easily removable.

Except under extraordinary conditions, the method of installation shown in Figure C provides ample protection for blow-off pipes. The principal features of this method are a V-shaped pier of firebrick which prevents the flames from impinging upon the vertical portion of the pipe, and the location of the elbow in a covered trench where it will be well protected. Blow-off pipes are more liable to fail at the elbow than at any other point and the location of the elbow in this position is therefore highly desirable. The best arrangement is to build the bottom of the combustion chamber at a somewhat higher level than the boiler-room floor so that there will be space enough to install the blow-off valve or cock without cutting into the floor. It is advisable also to locate the cleaning door at one side of the center where there will be no interference with the blow-off valve when the door is opened. Plenty of space to permit freedom of movement, due to expansion or settlement, should be left around the pipe where it passes through the setting wall. For this purpose a pipe sleeve about four inches long should be built into the brickwork at the outer end but a larger opening can be left around the pipe through the remainder of the wall thickness, without any sleeve. The sleeve should have a diameter two inches greater than that of the blow-off pipe and it should be filled with asbestos to prevent air leakage. A set-screwed collar on the pipe makes a good finish against the brickwork together with provision for a gasket of sheet asbestos or other suitable material to more thoroughly seal the opening against air leakage. The V-wall should be left a little below the boiler shell to allow for expansion and settlement, and the space should be filled with asbestos to keep the flames from impinging upon the flange where the pipe is connected to the boiler. Blow-off valves should always be located so that there will be ample opportunity for a man to get away in case of a break in the blow-off piping while he is operating the valves.

ARCH-BARS.

The rear arch-bars shown on our setting plans and in Figure C are of the so-called " HARTFORD " type, designed by this Company several years ago. Bars of this type extend transversely of the setting, spanning its width and bearing upon the side walls. Except for large boilers, only two of these arch-bars are needed for a single setting but a different pattern is required for each size of boiler. In some sections of the country the "quadrant" type of arch-bar is more popular and it is just as acceptable; this style of arch-bar is made in the form of a quadrant or ninety-degree arc of a circle. The bars rest on the rear wall, arching over to the rear head, and some means must be provided to support the upper ends, so as to permit the boiler to expand without developing air leaks. Several of these bars are needed for a single setting, the exact number depending upon the diameter of the boiler, but the same pattern can be used for all sizes of boilers where the distance from the rear head to the rear wall of the setting is the same. Both types of arch-bar described above are so designed that the metal is protected by the firebrick and not exposed to the action of the flames and hot gases; this feature should be a requirement in the design of any arch-bar.

Arch-bars should be set so as to leave a full, free opening through all the tubes, with proper provisions for inspecting and removing the fusible plug but, at the same time, care should be taken that no part of the head above the lowest permissible water level is exposed to the heat. We recently heard of a case where a head was burned, due either to poorly designed arch-bars or to placing the arch-bars so high as to expose the upper part of the head to extreme heat.

GRATES.

We believe that there is a general tendency to use larger grates than necessary with hand-fired boilers of the horizontal tubular type and this belief is borne out by our experience in several cases where we have found that coal was being burned at a rate of ten to twelve pounds per square foot of grate area per hour whereas better results would be obtained with a rate of fifteen to twenty pounds of coal per square foot per hour. In some cases we have advised blanking off the rear part of the grates by covering them with fire brick and a gain in economy of coal consumption has been secured in such cases. Furthermore, it has been common practice to use the same size of grates for a given diameter of boiler regardless of the tube length though it is obvious that if a certain area is proper for a boiler eighteen feet long it would not be correct for a sixteen-foot boiler in which the heating surface would be about eleven per cent less. Assuming an evaporation of about nine pounds of water per pound of coal, the ratio of heating surface to grate area should be about 40 to 1 in order to develop the full rated capacity of a boiler when burning coal at the rate of fifteen pounds per square foot of grate per hour. In designing our new setting plans we have used this ratio to determine the grate area, within the limits imposed by commercial standards as regards length of grates. Provision for overloads and allowance for a lower rate of evaporation can be taken care of by burning the coal at as high a rate as twenty pounds per square foot of grate per hour, this rate being attainable with proper draft and good firing methods. On the other hand, many horizontal tubular boilers in small plants are never operated at their full capacity and in such cases the grate area could be even smaller. It is fully realized that a larger grate area may be desirable in certain special cases but it is believed that the ratio of 40 to 1 will give good results for the average case and, of course, this is all that a set of general plans can be expected to cover; special cases should be considered in the light of all the data available in each instance.

With battered furnace walls, as described in the foregoing, the width of grates will be six inches less than the boiler diameter while with straight walls, as frequently used, the grates have a width equal to the diameter of the boiler. As explained above, the grate area is generally larger than it should be and the smaller dimension for width is therefore generally satisfactory. For the sake of simplicity and uniformity, stationary grates are shown on all of our setting plans but we recommend the use of shaking grates under ordinary conditions.

HEIGHT ABOVE GRATES.

Remarkable savings in fuel consumption have been claimed in many cases as a result of setting horizontal tubular boilers at extreme heights above the grates but, as a general rule, these claims do not seem to be fully substantiated because all of the credit for any increased efficiency is laid to the greater height of furnace whereas there are usually other factors which should also receive consideration. In a typical case of this kind, a new boiler is installed in a plant where there are one or more older boilers and perhaps the new boiler is set at a height of 5 feet above the grates while the corresponding height of the old boilers is only 28 inches. More or less careful tests are made and it is found that the new boiler is more economical in coal consumption than the old ones. It is then almost invariably assumed that the gain in economy is entirely due to setting the boiler at a greater height above the grates; although the old settings may be twelve or fifteen years old and full of cracks and openings which permit the entrance of a large percentage of excess air while the new setting is tight, this fact is completely disregarded. Furthermore, it seems to be generally assumed that the height chosen in any such case is the proper height to give the best results although there is usually no information available to prove that just as good results would not have been obtained with a height of 3½ feet, for instance, instead of 5 feet. In attributing a gain in economy to higher settings there are other factors also which may be ignored such as a change in the fuel used, an improvement in the proportions or design of the new boiler as compared with the older ones, better firing methods, improved draft conditions and method of draft control, a better type of grates, etc.

For any set of fixed conditions as regards size of boiler, character of fuel and other details, it is evident that there must be some limit in height of furnace beyond which there will be no gain in economy. It would probably not be possible to fix such a limit very definitely but much interesting information could be obtained from a series of carefully conducted tests carried out by some agency such as the Bureau of Mines which would have the necessary apparatus and technical skill, together with the means for insuring that all other conditions remain constant while the height of the furnace is varied.

The combustion volume, and therefore the height from grates to boiler shell, should be varied in accordance with the character of the fuel used, more volume being required for fuels containing a large proportion of volatile matter than for those which contain a relatively greater percentage of fixed carbon. On our setting plans we do not show any fixed dimension for the furnace height but we recommend certain dimensions as determined from our experience and best judgment. For a 72-inch boiler with tubes 18 feet long, for instance, the heights which we advise would be as follows:—

For anthracite coal and semi-bituminous coals containing less than 18 per cent. of volatile matter (Pocahontas, Georges Creek, etc.)—36 inches.

For bituminous coals containing from 18 per cent. to 35 per cent. of volatile matter (Pittsburgh)—40 inches.

For bituminous coals containing more than 35 per cent. of volatile matter (Illinois, etc.)—44 inches.

For other sizes of boilers the figures are varied so as to maintain approximately the same ratio of combustion volume to grate area. In this connection it might be mentioned that the ratio of combustion volume to grate area would be nearly 19 to 1 for a 72-inch boiler with 18-foot tubes, set as shown in Figure C and with a height of 44 inches from grates to boiler shell. Although the setting is designed only for hand-fired horizontal tubular boilers, this ratio is considerably in excess of that ordinarily used for stoker-fired water tube boilers which may be forced to 100 per cent. or more above their nominal rating.

It would therefore seem that these combustion volumes ought to be more than ample and that no gain in economy should be expected from an increase in the ratio.

METHOD OF SUPPORT.

When boilers are suspended in battery it is best to place the supporting columns entirely outside of the setting walls, using only four columns with beams of sufficient strength to support the boilers in a single span. With standard I-beams it is possible to support in this manner three boilers of any diameter not exceeding 78 inches or two boilers of larger diameter. If the installation involves more boilers it is best to set them in separate batteries of two or three boilers each, rather than to use columns in the division walls between boilers; if it is absolutely necessary to use such intermediate columns, an air space should be left all around each one with a suitable ventilating duct to admit air at the bottom. We know of several cases where columns have been burned off or otherwise damaged when built solidly into setting walls.

Our setting plans show the proper sizes of I-beams to use for suspending boilers, together with alternate designs for both round and square cast-iron columns, structural steel H-beams and built-up columns made of plates and angles. In general it will be found that these designs are heavier than those usually employed by boiler manufacturers, but we think that these sizes are needed in order for the columns to have a strength equal to that of all other parts of the installation where it is customary to use a factor of safety of 5. Boiler columns are loaded entirely at one side and the stresses are therefore greater than when the loading is symmetrical as assumed in the tables published in structural steel handbooks. Furthermore, proper consideration should always be given to the "ratio of slenderness," a heavier section being needed for a long column than for a shorter one carrying the same load. I-beams are frequently used for columns but they are not well adapted for the purpose as the distribution of metal in the I-beam section does not make a good column design. Our Engineering Department can furnish designs for reinforced concrete columns, if desired.

Boilers having a diameter of 78 inches or less can be supported by brackets which rest upon bearing plates built into the setting walls but the suspension method is better, particularly for the larger sizes. Four brackets (two on each side) are sufficient for boiler diameters of 54 inches or less but eight brackets should be used for boilers larger than this size; the brackets should be located in pairs with a single bearing plate for each pair. Brackets at the front end should rest directly upon the plates but rollers should be used under the brackets at the rear end to permit free expansion of the boiler. As a rule, not enough care is used in setting the bearing plates with the result that a good bearing is not obtained over the entire surface of both brackets. In an extreme case the bearing may be only along one edge of one bracket. The boiler should be supported by blocking or other suitable means while the setting is being built and its weight should not be allowed to come upon the walls until the mortar has thoroughly hardened so that there will be no settling.

INSTALLATION OF BOILER PIPING, VALVES, FITTINGS, ETC.

Figure C shows a typical longitudinal section through a suspended boiler with overhanging front. Several self explanatory notes will be found on this drawing relative to the proper installation of piping, valves and other details. In addition to the items mentioned the following details should receive attention in any well planned installation.

The steam gage should be graduated at least 50 per cent. in excess of the maximum allowable working pressure and it should be piped up with a siphon, union cock, drip cock, and connection with stop valve for test gage, brass pipe and fittings being used throughout.

A water glass and three gage cocks should be used. The lowest visible part of the water glass should be at least two inches above the center of the fusible plug and the gage cocks should be located within the range of the visible length of the glass. Brass pipe and fittings, 1¼ inch size, should be used for the water connection to the water column except for small boilers where the minimum size may be 1 inch. To facilitate cleaning, plugged crosses should be used in these water connections in lieu of tees or elbows.

A blow-down pipe should be provided for the water column with a gate-valve or cock. This pipe should have a diameter of at least ¾-inch and should be connected to the ash pit or some other safe and convenient point of waste. It should be secured to the boiler front near the bottom by a pipe-clip or other suitable means.

All valves and fittings should be of extra heavy pattern if the pressure exceeds 125 pounds per square inch. In Massachusetts a State law fixes this limit at 100 pounds.

A sampling pipe for flue gas analysis and three ¼ inch pipes for draft gage connections should be placed in position when the setting is being built even though it is not expected to use them. The expense is insignificant and they may prove useful.

The foregoing description is intended to cover the more important

(Continued on page 54)

The Low Pressure Boiler Hazard.

A CASUAL glance through the bound volumes of THE LOCOMOTIVE of the last dozen years reveals the fact that during that time illustrated accounts were published of not less than fourteen very serious low pressure boiler explosions, as distinguished from a large number of lesser accidents of this nature. One or more persons were killed in eight of these fourteen selected cases, and serious personal injury resulted in several of the remaining number.

There is not available a census or even a reasonably reliable estimate of the number of either power — or low pressure heating boilers in the United States, but as a broad guess we may assume that there are more low pressure heating boilers than power boilers, and when the number of power boiler accidents of a serious nature occurring annually is considered, it is really not remarkable that one should be able to pick out this number of conspicuous low pressure boiler explosions, notwithstanding the fact that the list from which they are gathered cannot even be considered in any sense complete.

It is popularly not appreciated as well as it might be that with the low pressure house heating boiler all the essential elements, that eventually may enter into a real boiler catastrophe, are present, and in this the kind of material of which the low pressure boiler may be constructed does not seem to be a significant factor.

There are, to be sure, several features connected with such boilers that could be mentioned to controvert this statement, such as for example the much higher factor of safety of the structure of a low pressure boiler as compared with the usual factor of safety of power boilers. Also the fact that the low pressure boiler does not get so much of the forcing that the modern power boiler may be subject to. The explosion of a low pressure boiler, however, can usually be traced, not to lack of strength of its structure, but to ignorance and carelessness with the fitting up and the attendance. Over-pressures will occur in them in cases in spite of the most complete advice of the boiler manufacturer as to how they must be connected up and regarding the best way to operate them. During the heating season just passed, reports and news items reached us of a number of serious low pressure boiler accidents. One case in point is the explosion of the boiler shown in the accompanying illustration, which, from the information obtainable, seems to have been due to faulty fitting up and possibly also carelessness in handling. The boiler was used with a hot water system of heating in a garage. It was not provided with a pressure — or altitude gage and the installation was also possessed

Exploded Heating Boiler.

of the all too common fault of not having a relief valve attached directly to the boiler. Our inspectors have occasion to belabor this latter detail very frequently in inspection reports, and to our sorrow we find in not a few instances that an unduly large amount of argument is required to convince owners that a relief valve attached directly to a hot water boiler is a paramount necessity for safety, irrespective of the fact that such boilers may have free communication with an open expansion tank.

In the case of the boiler shown in the illustration, there appears to have been good reason for believing that the absence of such a relief valve was responsible for the accident. When, as is supposed, during the very cold night preceding the accident, the connections to the expansion tank froze up, it became possible for an enormous pressure to build up in the boiler when it was fired up in the morning. One man, who stood directly in front of it at the time, was killed, and another man was seriously injured.

It may not be out of place to remind owners of heating boilers that a periodical inspection of such apparatus by experts, whose whole time is devoted to such work, is of immense importance.

Summary of Inspectors' Work for 1919.

Number of visits of inspection made	203,671
Total number of boilers examined	371,285
Number inspected internally	160,847
Number inspected by hydrostatic pressure	9,043
Number of boilers found to be uninsurable	1,042
Number of shop boilers inspected	10,548
Number of fly wheels inspected	26,980
Number of premises where pipe lines were inspected	8,046

Summary of Defects Discovered.

Nature of Defects.	Whole Number.	Dangerous.
Cases of sediment or loose scale	31,599	1,783
Cases of adhering scale	47,284	1,907
Cases of grooving	2,393	271
Cases of internal corrosion	21,201	817
Cases of external corrosion	11,260	955
Cases of defective bracing	1,173	230
Cases of defective staybolting	2,428	493
Settings defective	9,423	836
Fractured plates and heads	3,473	487
Burned plates	4,836	518
Laminated plates	338	27
Cases of defective riveting	1,443	324
Cases of leakage around tubes	13,318	1,226
Cases of defective tubes or flues	19,700	6,353
Cases of leakage at seams	5,738	413
Water gauges defective	4,158	789
Blow-offs defective	5,325	1,488
Cases of low water	421	149
Safety-valves overloaded	1,134	289
Safety-valves defective	2,077	374
Pressure gauges defective	7,332	628
Boilers without pressure gauges	634	82
Miscellaneous defects	5,588	664
Total	202,276	20,603

Grand Total of the Inspectors' Work from the Time the Company Began Business, to January 1, 1920.

Visits of inspection made	4,733,353
Whole number of inspections (both internal and external)	9,389,203
Complete internal inspections	3,695,635
Boilers tested by hydrostatic pressure	367,113
Total number of boilers condemned	27,839
Total number of defects discovered	5,284,821
Total number of dangerous defects discovered	580,620

The Locomotive

DEVOTED TO POWER PLANT PROTECTION.

PUBLISHED QUARTERLY

HARTFORD, APRIL, 1920.

SINGLE COPIES *can be obtained free by calling at any of the company's agencies.*
Subscription price 50 cents per year when mailed from this office.
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Reprinting matter from this paper is permitted if credited to
THE LOCOMOTIVE OF THE HARTFORD STEAM BOILER I. & I. CO.

THE truth of the old adage, that one is never too old to learn, we occasionally have brought home to us through our efforts of teaching firemen by mail the basic facts of combustion, so that they may recognize the difference between wasteful and economical furnace conditions. Among the recent graduates of our Correspondence Course on combustion and boiler handling was a man well past the days of prime youth. When he applied for enrollment he wrote: "I am 65 years young but willing to learn."

He did very well indeed. As regularly as clockwork came in his well-nigh perfect answers to the review questions and in just about four months he had mastered all the lessons. At the end of his studies we were pleased to extend to him a certificate which was marked "with honor grade."

Personal.

Mr. James G. Reid was appointed Chief Inspector of the Baltimore Department of this Company to fill the vacancy caused by the death of Mr. R. E. Munro.

Mr. Reid first became associated with The Hartford Steam Boiler Inspection and Insurance Company in 1909 as inspector at the Chicago Department, in which he served as an active and directing inspector. In 1917 he assumed charge of the inspection work of the local office at Detroit, and with such success that his promotion to the position of Chief Inspector was a natural step. We heartily commend him to the favorable consideration of our assured.

After forty years and one month of continuous service, Mr. A. W. Getchell, an inspector at the Cleveland Office retired on January 31st, 1920 from active duties and has taken up his residence at Santa Anna, Cal. Mr. Getchell has not severed his connection with the Company though he carries no responsibilities.

He came to Cleveland with his parents in 1853 at the age of three years. From the very beginning of his business career he was linked up with steam boilers and machinery and at the age of 26 he was Chief Engineer on the passenger steamer "Concord" plying between Chicago and Ogdensburg. In 1880 he became connected with The Hartford Steam Boiler Inspection and Insurance Company and has served it faithfully ever since. On the day of his leaving the surroundings of so many years of useful activity, one of those delightful informal meetings, at which good will and esteem come plainly to the fore, was held at the Cleveland office and Mr. Getchell was presented by his office associates with a gold chain, diamond-set charm, gold knife and stickpin. We wish him many happy years to enjoy his well earned retirement.

OBITUARY.

Robert E. Munro.

Mr. R. E. Munro, Chief Inspector of the Baltimore Department, died on March 29th, 1920, after a prolonged illness. He was born June 14th, 1862, and educated in Liverpool, England, being graduated from the Liverpool Institute. After serving his apprenticeship with Rollinson's Engineering Works, Liverpool, his early career was as engineer for various steamship lines, his last engagement being with the Red Star Line, on board the "Pennland," one of the largest ocean liners of her time. In 1888 Mr. Munro settled in this country and accepted the position of Chief Engineer for a large oilcloth manufacturing establishment, at Astoria, L. I., New York, remaining there until September 1891, when he became an inspector in the Baltimore office. He soon attracted the attention of the officers of the Company and in 1893 was appointed Chief Inspector of that Department, which position he held at the time of his death.

During the many years of Mr. Munro's connection with the Hartford Steam Boiler Inspection and Insurance Company, he was very highly regarded by its clients in his department and his aid and advice on engineering matters were frequently sought.

In addition to his professional attainments Mr. Munro was the happy possessor of a genial and sympathetic disposition. He made many friends and was much beloved by his associates in his office and a large circle of personal friends. Besides his widow, Mr Munro leaves three sons, two daughters and five grandchildren. To the members of his family we express our condolence in their great loss.

Mr. John McGinley, an inspector of this Company in the Philadelphia Department since 1903, died on February 19th, 1920, at his home at Chester, Pa., after a long illness. He had been practically an invalid for about two years before his death. Mr. McGinley was born in Ireland in 1866 and for a long time followed the trade of boilermaking. His occupation at the time of entering the Company's employ was that of foreman boilermaker. He leaves a widow and three small children to whom we extend our deep sympathy in their bereavement.

The title page and index for Vol. XXXII of THE LOCOMOTIVE is now available for distribution to those of our readers who wish to bind their copies of the years 1918 and 1919. Upon application to the Home Office of the Company these title pages and indices will be furnished.

Horizontal Tubular Boiler Settings.

(Continued from page 48)

features connected with the construction of brick settings for horizontal tubular boilers and the installation of such boilers in accordance with good practice but without any unnecessary frills. As stated before, many of our new setting plans are now completed and available for distribution to our friends upon request. Any inquiries regarding special features in connection with this general subject will receive the best attention of our Engineering Department at any time.

Boiler Explosions.

June, 1919.

(199) — A drum of a water tube boiler ruptured due to bulging out of the top of drum shell on June 1st, at the plant of the Nebraska Cement Company, Superior, Neb.

(200) — A boiler exploded on June 3rd in the Hopkins Creamery, Hopkins, Mich., killing two men and seriously injuring two others. A number of others were buried in the debris but escaped with slight injuries. The building was wrecked.

(201) — A tube exploded in a boiler on June 3rd at the plant of R. & H. Simon Silk Mill, Easton, Pa. Four men were injured, one fatally.

(202) — Two tubes burst in a water tube boiler on June 4th at the plant of the Delta Light and Traction Company, Greenville, Miss.

(203) — A crown sheet collapsed in a locomotive boiler belonging to the Kirby Lumber Co., Houston, Tex., on June 4th.

(204) — A boiler blew up on June 4th in the Belcher Saw Mill, 28 miles S. E. of Tuscaloosa, Ala., killing one man and injuring two others.

(205) — A blow-off failed on June 5th at the Home Ice Factory, San Antonio, Tex.

(206) — A boiler accident took place on June 5th on board the steamer "Kingston," Toronto, Ont., Canada. Two were injured.

(207) — A tee connection failed on a boiler mud drum on June 10th at the plant of the Davies Box and Lumber Company, Blairsden, Plumas County, Cal.

(208) — The head blew out of a drum of a water tube boiler on June 12th at Cane's pencil factory, New Market, Ont., Canada, injuring 11 persons and doing great damage to buildings and machinery.

(209) — On June 13th, while 18 miles north of Fort Worth, Tex., the boiler of a train locomotive of the Fort Worth and Denver City Railway exploded killing the engineer and fireman.

(210) — A boiler blew up on June 13th in the Deep River, Ia., electric light plant, injuring one man.

(211) — A rupture of a boiler shell took place on June 13th at the plant of the City Ice Company, Jeffersonville, Ind.

(212) — On June 13th a tube pulled out of the tube sheet in a water tube boiler of the North Star Egg Case Company, Quincy, Ill.

(213) — A tank containing carbonic acid gas exploded on June 14th in the drug store of Dr. Jessup, Diagonal, Ia., killing one and severely injuring two other persons. The interior of the store was wrecked.

(214) — The mud drum of a water tube boiler exploded on June 15th at the plant of the Pittsburg Plate Glass Co., at Kokomo, Ind.

(215) — The shell of a boiler ruptured on June 16th at the plant of Max Hahn Packing Company, Dallas, Tex.

(216) — On June 17th the shell of a boiler ruptured at the plant of the Port Blakely Mill Co., Pork Blakely, Wash.

(217) — A boiler used in drilling a well at Burkburnet, Tex., exploded on June 17th, killing one and fatally injuring two other persons.

(218) — A boiler ruptured on June 18th at the plant of the Texas Pressed Brick Company, Ferris, Tex.

(219) — A boiler accident occurred on June 19th on board the whale back steamer "Atikokan" while at the wharf, Montreal, P. Q., Canada. Three men were scalded to death.

(220) — On June 19th a boiler exploded at the saw mill belonging to John Reeves, one mile east of Brooklyn, Ill. Two men were injured, one of whom died the following day.

(221) — A boiler exploded on June 20th at the plant of the Hudson Valley Ice Co., Albany, N. Y. It shot up through the engine room roof and when returning demolished the building.

(222) — A small cast iron boiler used for heating water exploded on June 20th, in the basement of the Elk Hotel, Denver, Colo. Two persons were seriously injured.

(223) — A crown sheet collapsed in a logging-locomotive boiler belonging to Larkin Green Logging Co., Blind Slough, Ore., on June 21st.

(224) — A boiler exploded on June 21st on board the naval tender "Melville" while in tow of the Collier Orion off Colon. Six men were killed.

(225) — A 5" stop valve exploded on June 21st at the plant of the Lyon Lumber Co., Garyville, La.

(226) — A large air tank exploded on June 23rd at the Redmon Motor Car Co. garage, Paris, Ky.

(227) — Five tubes pulled out of the tube sheet of a water tube boiler on June 24th at the plant of the By-Products Coke Corporation, South Chicago, Ill.

(228) — Two sections cracked in a C. I. heating boiler on June 24th at Clark University, Worcester, Mass.

(229) — The boiler of a locomotive pulling a troop train near Omaha, Neb., exploded on June 25th. One man was seriously injured.

(230) — On June 26th a tube in a water tube boiler ruptured at the plant of Stevens and Thompson and Walloomsac Paper Company, Walloomsac, N. Y. Two men received burns, one of them died shortly after.

(231) — Two corrugated furnace flues collapsed on June 27th in a marine type boiler at the boiler house of the West Philadelphia Stock Yards, due to low water which was caused by the choking up of lower water column connection.

(232) — On June 30th a blow-off pipe failed on a boiler belonging to Woodward Creamery Company, Woodward, Okla.

(233) — Waterhammer action in a steam pipe caused the fracture of a 4" tee on June 30th at the plant of McCleary, Wallin and Crouse, Amsterdam, N. Y. This was caused by feed water entering the steam pipe through a leaky diaphragm of a feed water regulating device.

(234) — A boiler exploded on June 30th at the oil fields of the P. Welch Oil Company, Maricopa, Cal.

JULY, 1919.

(235) — The boiler of a passenger train locomotive exploded on the N. Y. Central railroad at Dunkirk, N. Y., when a rear-end collision took place on July 1st. The engineer and fireman were fatally scalded.

(236) — A tube ruptured in a water tube boiler on July 4th at the plant of Armour and Company, Chicago, Ill. Two men were seriously scalded.

(237) — A boiler exploded on July 5th at the saw mill of G. W. Henry, three miles S. E. of Whitwell, Tenn. One man was killed and another seriously injured.

(238) — A boiler exploded on board the yacht "Flyer" on July 10th at Southampton, N. Y. Two men were killed and one seriously injured. The deck and upper portion of the ship were wrecked.

(239) — A steam heater exploded on July 11th at Treber's warehouse, Deadwood, S. D., resulting in serious injuries to two boys and considerable property damage.

(240) — A mud drum pulled off the nipples by which it was attached to the boiler at the plant of the Pittsburgh Plate Glass Company, Pittsburgh, Pa., on July 14th.

(241) — On July 14th, the top of a drum of a water tube boiler bulged and ruptured at the Farrell Works of the Carnegie Steel Company, Sharon, Pa.

(242) — The boiler of a locomotive pulling a heavy West Shore freight train blew up while traveling at 30 miles an hour near Kingston, N. Y., on July 15th, killing three men.

(243) — A tube burst in a water boiler on July 15th at the plant of the Lorain Steel Company, Johnstown, Pa., fatally scalding one man.

(244) — A crown sheet came down on July 16th in a track locomotive belonging to the Birdsboro Stone Co.

(245) — A header in a water tube boiler cracked on July 17th at the plant of the Industrial Works, Bay City, Mich.

(246) — On July 19th, the boiler of a threshing machine blew up at Maysville, Ky. Two men were seriously scalded.

(247) — A rupture of a boiler shell took place on July 19th at the plant of the General Ice Co., Amityville, L. I., N. Y.

(248) — On July 21st, the boiler of the locomotive pulling Union Pacific train No. 5008 blew up near Castle Rock, Utah, instantly killing three men.

(249) — A boiler exploded on July 22nd at the Banner Laundry, St. Paul, Minn., killing one and injuring ten others.

(250) — A header in a water tube boiler fractured on July 22nd at the plant of the Westinghouse Airbrake Company, Wilmerding, Penna.

(251) — On July 25th, the boiler of a threshing outfit exploded on the E. and C. Bell farm, 15 miles S. E. of Charleston, Ill., seriously injuring two men.

(252) — A boiler exploded on July 26th at the cheese factory of Thos. Anglin, Kingston, Ont., Canada, killing one and seriously injuring four.

(253) — A rupture of a boiler shell took place at the plant of the Ashland Ice and Cold Storage Company, Ashland, Neb., on July 27th.

(254) — A boiler explosion took place on July 28th at the plant of the Model Laundry, East St. Louis, Mo.

(255) — A boiler blew up on July 29th at the plant of the Heldenfels Shipbuilding Co., and landed about a quarter of a mile away. Four men were instantly killed and the property damage was estimated at over $10,000.

(256) — A gas tank exploded as it was being removed from a wagon on July 30th in front of 92 Boerum Street, Brooklyn, N. Y. One man was instantly killled.

(257) — A tube ruptured in a water tube boiler on July 30th at the plant of the Michigan Alkali Company, Wyandotte, Mich.

August, 1919.

(258) — A tube ruptured in a water tube boiler on August 1st at the plant of the Public Service Corp. of N. J., Perth Amboy, N. J.

(259) — A blow-off pipe failed on August 1st at the plant of the Wm. S. Merrill Company, Cincinnati, Ohio, One man was injured.

(260) — A tube ruptured in a water tube boiler on August 1st at the plant of Mitchell Brothers Company, Cadillac, Mich. Two men were fatally burned and one other seriously burned.

(261) — A tube ruptured in a water tube boiler on August 2d at the power house of B. F. Goodrich Company, Akron, Ohio. Four men were slightly burned.

(262) — A header of a water tube boiler cracked on August 2d at the power house of the Pascagoula Ry. & Power Company, Pascagoula, Miss.

(263) — A tube in a water tube boiler ruptured on August 3d, fatally scalding one and seriously scalding another man at the plant of the Carthage Board & Paper Company, Carthage, Ind.

(264) — On August 4th a boiler exploded at the Standard Oil Works, Richmond, Cal. Three men were seriously scalded.

(265) — A tube ruptured in a water tube boiler at the Tuberculosis Sanitarium near Cresson, Penna. on August 4th.

(266) — On August 4th a boiler belonging to a threshing outfit exploded on the farm of Mr. Owen Meyers, Paris, Ill., killing one and injuring three others severely.

(267) — On August 6th an ammonia tank exploded at the plant of the Houston Ice Cream Company, Houston, Texas. Eight men were injured.

(268) — Waterhammer in a main steam line caused the disruption of a blank flange on August 7 at the plant of the Camden Forge Company, Camden, N. J.

(269) — On August 8th a boiler exploded on the dredgeboat "John Callup" of the Missouri Portland Cement Company near Nonconnah Creek. One man was killed and four others injured.

(270) — Four sections in a cast iron boiler failed on August 9th at the Apartment House, 124 West 72d Street, New York City, N. Y.

(271) — A tube in a water tube boiler burst on August 10th at the plant of the Prudential Oil Company, Baltimore, Md.

(272) — On August 11th a tube burst in a water tube boiler on board the wooden steamer "Fort Wright," while off the coast of lower California.

(273) — An explosion occurred on August 11th with a boiler used for threshing near Weatherford, Okla., painfully injuring one man.

(274) — A boiler exploded on August 11th at the camp of the Sutter Basin Company near Knights landing, Cal. One man was severely injured and the resulting fire did many thousands of dollars' worth of damage.

(275) — On August 13th the boiler of a threshing machine at the farm of John P. Wallace, Agency, Mo., exploded. One man was fatally injured.

(276) — On August 14th a boiler exploded in the lumber mill of Coulbourne Brothers near Eure Station, N. C., killing four and seriously injuring six others. The mill was totally demolished.

(277) — On August 16th a boiler used on a tire vulcanizing machine exploded at the plant of the Bellevue Tire Company, Fremont, Ohio.

(278) — On August 17th a boiler which furnished steam for a mine pump exploded on the farm of Norman Mayberry, five miles N. E. of Greenfield, Ill., killing three children and injuring fourteen.

(279) — The head of a kier blew off on August 21st at the Chester Lace Mills, Chester, Penna., causing a damage of $5,000.

(280) — A tube ruptured in a water tube boiler on August 24th at the plant of the Dubuque Electric Company, Dubuque, Iowa.

(281) — On August 25th a boiler exploded in the Toledo Canning Company's factory, Toledo, Ohio. Two men were severely scalded.

(282) — A blow-off pipe failed on August 26th at the plant of the Moody Bible Institute, Chicago, Ill.

(283) — On August 26th a boiler exploded in the sawmill of LeRoy Marbelle near Marlo, Wash. Two men were killed and two others were injured.

(284) — On August 27th a boiler used with a gas rigging outfit exploded on the farm of Fred McMannus three miles east of Carthage, Indiana. Two men were injured.

(285) — On August 28th a battery of three boilers exploded at the sawmill of W. J. Swann, at Stonewall, N. C. Three men were killed and several others more or less severely injured. The mill was demolished.

(286) — On August 29th a boiler belonging to the Shelby Oil Company near Fairmont, W. Va., exploded killing one man.

(287) — On August 29th the plant of the Green River Electric Light, Water & Ice Company, at Calhoun, Ky., was destroyed by a boiler explosion. The only man that was in the plant at the time was severely injured.

(288) — A tube in a water tube boiler burst on August 30th at the plant of the Aetna Portland Cement Corp'n, Fenton, Mich. One man was severely scalded.

September, 1919.

(289) —A tube of a superheater failed on September 1st at the plant of the Texas Power & Light Company, McKinney, Tex.

(290) —A tube in a water heater boiler ruptured on September 1st at the plant of the Hooker Electric Chemical Company, Niagara Falls, N. Y.

(291) — Three sections cracked in a cast iron boiler on September 1st at the apartment house, 50 West 67th St., New York City, N. Y.

(292) — On September 2d a hot water tank exploded at the home of Paul H Cromelin,, Hackensack, N. J.

(293) — Five headers cracked in a water tube boiler on September 2d, at the plant of the Consolidated Safety Pin Company, Bloomfield, N. J.

(294) — A tube sheet collapsed in a boiler on September 2d, at the plant of the Beacon Tire Company, Beacon, Dutchess County, N. Y.

(295) — An elbow on a blowoff pipe failed on September 3d at the plant of the Bailey Wall Paper Company, Cleveland, Ohio.

(296) — On September 4th a boiler exploded at the plant of the Polar Wave Ice Plant, St. Louis, Mo. Two men were severely injured, and the property damage was estimated at $5,000.

(297) — A tube of a water grate under a boiler failed on September 6th

at the plant of the Central Cotton Oil Company, Jackson, Miss. One man was seriously scalded.

(298) — A logging locomotive boiler of the Kirby Lumber Company exploded on September 6th, at Silsbee, Tex., killing one man and injuring two others.

(299) — On September 9th a rupture of a boiler shell took place at the plant of the Rockwood Brewing Company, Rockwood, Pa.

(300) — On September 10th a boiler exploded at the sawmill plant of John Fleming, Fairhope, Ala., killing three men.

(301) — A tube pulled out of a tube sheet of a water tube boiler on September 10th at the plant of the American Strawboard Company.

(302) — A 10" steam pipe failed under 150 lbs. pressure on September 10 at the plant of the Winchester Repeating Arms Company, New Haven, Conn. The pipe opened up over a length of about 10 feet and the resulting damage was over 3,000 dollars.

(303) — A blowoff pipe failed on September 10th at the plant of the Autauga Oil & Fertilizer Co., Prattville, Ala.

(304) — On September 12th a boiler of a threshing outfit blew up at Holder's farm near Neosho, Mo., killing one and injuring one other man so seriously that he died the next day.

(305) — A boiler exploded on September 12th at the Shaw-Batcher shipyard, South San Francisco, Cal. One man was killed.

(306) — A tube of a water tube boiler burst on September 13th at the plant of the Martinsville Gas and Electric Company, Martinsville, Ind. One man was injured.

(307) — On September 13th a tube in a water tube boiler burst at the Corpus Christi Ice and Electric plant, Corpus Christi, Texas. Two men were scalded, one of whom fatally.

(308) — On September 15th a boiler exploded at the Curtis mine, twelve miles from Steamboat Springs, Colo., fatally injuring one and slightly injuring two other men. The damage was estimated at 4,000 dollars.

(309) — The crown sheets came down, on September 15th, in three locomotive type boilers used for well drilling at the oil lease of the Cohan Estate near Whittier, Cal.

(310) — On September 17th the boiler of a freight locomotive exploded on the L. and N. Railroad, at Hygeia, Tenn., killing one instantly and fatally scalding one other man.

(311) — A heating boiler exploded on September 16th in the basement of the home of R. G. Soule, Syracuse, N. Y. The damage was estimated at 2,000 dollars.

(312) — Six headers in a water tube boiler failed on September 17th at the plant of the Pittsburgh Plate Glass Company, Ford City, Pa.

(313) — On September 17th a boiler blew up at an oil well at Murphysboro, Ill.

(314) — A steam line failed on September 17th at the plant of the Wand H. Walker Company, Pittsburgh, Pa., scalding two men.

(315) — The boiler of a locomotive exploded after falling from a 45 feet high trestle, on September 18th, at St. Louis, Mo. Two men were killed.

(316) — A tube in a water tube boiler ruptured on September 18th at the plant of the Winona Copper Co., Winona, Mich. One man was scalded.

(317) — A number of tubes pulled loose from the tube sheet of a water tube boiler on September 19th at the plant of the National Forge and Tool Company, Irvine, Pa.

(318.) — Two sections failed in a C. I. sectional boiler on September 22d at the apartment building of the Layman Land Company, Des Moines, Iowa.

(319) — A cap blew off from a sectional (power) boiler on September 22d at the plant of the Bradlee and Company, Philadelphia, Pa. One man was injured.

(320) — A tube pulled out of a drum of water tube boiler on September 22d at the plant of the Arizona Copper Company, Clifton, Ariz.

(321) — The shell of a boiler ruptured on September 23d at the plant of the Nazareth Brick Company, Inc., Nazareth, Pa.

(322) — On September 24th a boiler exploded at an oil well near Irvine's Mills, Bradford, Pa., fatally scalding one man.

(323) — A heating boiler exploded on September 24th at the Jewish Synagogue, Cheyenne, Wyo., fatally scalding the janitor and wrecking the building.

(324) — A header failed in a water tube boiler on September 24th at the plant of W. M. Bransford, Salt Lake City, Utah.

(325) — On September 25th a boiler exploded in a sawmill belonging to Stanford Lecates at Ross Point near Laurel, Del., resulting in the death of 4 persons and serious injury to 4 others. The mill was completely demolished.

(326) — A section in a cast iron boiler ruptured on September 25th at the building of the Wildwood Apartment Company, Jackson, Mich.

(327) — The boiler of a locomotive belonging to the Northwestern Railway Co. blew up on September 26th at the roundhouse at Norfolk, Neb., killing one man and slightly injuring three.

(328) — An acetylene tank exploded on September 26th at the Vickers Shipbuilding plant, Montreal, Que., killing one man and injuring sixteen.

(329) — A blowoff pipe failed on September 26th at the plant of the J. H. Smith Grape Juice Company, Lawton, Mich.

(330) — A boiler exploded on September 26th, at the National Tank Manufacturing Company, Los Angeles, Cal. One man was seriously injured by a flying fragment of the boiler.

(331) One section cracked in a cast iron sectional boiler on September 26th at the Windsor Avenue Congregational Church, Hartford, Conn.

(332) — A tube in a water tube boiler burst on September 26th at the plant of The Central Illinois Public Service Company, Mounds, Ill.

(333) — A blowoff pipe failed on September 26th at the plant of Spies Milling Company, Preston, Mich.

(334) — A furnace collapsed in a boiler on September 27th on board the dredge "Omega" at Calexico, Cal.

(335) — A tube in a water tube boiler burst on September 27th at the plant of the Hammermill Paper Company, Erie, Pa.

(336) — A hot water tank burst in the kitchen of the home of M. A. Frazar, Brookline, Mass., on September 28th, tearing a large hole in the side of the house. The damage was estimated at 2,000 dollars.

The Hartford Steam Boiler Inspection and Insurance Company

ABSTRACT OF STATEMENT, JANUARY 1, 1921

Capital Stock, . . . $2,000,000.00

ASSETS.		
Cash in offices and banks		$366,891.88
Real Estate		90,000.00
Mortgage and collateral loans		1,543,250.00
Bonds and stocks		6,188,435.00
Premiums in course of collection		728,199.44
Interest accrued		116,654.78
Total assets		9,033,431.10
LIABILITIES.		
Reserve for unearned premiums		$4,512,194.11
Reserve for losses		205,160.80
Reserve for taxes and other contingencies		388,958.85
Capital stock	$2,000,000.00	
Surplus over all liabilities	1,927,117.34	
Surplus to Policy-holders		**$3,927,117.34**
Total liabilities		$9,033,431.10

CHARLES S. BLAKE, President.

FRANCIS B. ALLEN, Vice-President, W. R. C. CORSON, Secretary.

L. F. MIDDLEBROOK, Assistant Secretary.

E. SIDNEY BERRY, Assistant Secretary.

S. F. JETER, Chief Engineer.

H. E. DART, Supt. Engineering Dept.

F. M. FITCH, Auditor.

J. J. GRAHAM, Supt. of Agencies.

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Incorporated 1866. Charter Perpetual.

INSURES AGAINST LOSS FROM DAMAGE TO PROPERTY AND PERSONS, DUE TO BOILER OR FLYWHEEL EXPLOSIONS AND ENGINE BREAKAGE

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BALTIMORE, Md., . . . 13-14-15 Abell Bldg. . .	LAWFORD & MCKIM, General Agents. JAMES G. REID, Chief Inspector.
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BRIDGEPORT, CT., . . . 404-405 City Savings Bank Bldg.	W. G. LINEBURGH & SON, General Agents. E. MASON PARRY, Chief Inspector.
CHICAGO, Ill., ... 209 West Jackson B'v'l'd .	J. F. CRISWELL, Manager. P. M. MURRAY, Ass't Manager. J. P. MORRISON, Chief Inspector. J. T. COLEMAN, Ass't Chief Inspector. C. W. ZIMMER, Ass't Chief Inspector.
CINCINNATI, Ohio, . . . First National Bank Bldg.	W. E. GLEASON, Manager. WALTER GERNER, Chief Inspector.
CLEVELAND, Ohio, . . . Leader Bldg.	H. A. BAUMHART, Manager. L. T. GREGG, Chief Inspector.
DENVER, Colo., ... 918-920 Gas & Electric Bldg.	J. H. CHESTNUTT, Manager and Chief Inspector.
HARTFORD, Conn., . . . 56 Prospect St.	F. H. KENYON, General Agent. E. MASON PARRY, Chief Inspector.
NEW ORLEANS, La., . . . 308 Canal Bank Bldg. . .	R. T. BURWELL, Mgr. and Chief Inspector. E. UNSWORTH, Ass't Chief Inspector.
NEW YORK, N. Y., . . . 100 William St.	C. C. GARDINER, Manager. JOSEPH H. MCNEILL, Chief Inspector. A. E. BONNETT, Ass't Chief Inspector.
PHILADELPHIA, Pa., . . 142 South Fourth St. . .	A. S. WICKHAM, Manager. WM. J. FARRAN, Consulting Engineer. S. B. ADAMS, Chief Inspector.
PITTSBURGH, Pa., . . . 1807-8-9-10 Arrott Bldg. .	GEO. S. REYNOLDS, Manager. J. A. SNYDER, Chief Inspector.
PORTLAND, Ore., . . . 306 Yeon Bldg.	MCCARGAR, BATES & LIVELY, General Agents. C. B. PADDOCK, Chief Inspector.
SAN FRANCISCO, Cal., . . 339-341 Sansome St. . .	H. R. MANN & Co., General Agents. J. B. WARNER, Chief Inspector.
ST. LOUIS, Mo., ... 319 North Fourth St.	C. D. ASHCROFT, Manager. EUGENE WEBB, Chief Inspector.
TORONTO, Canada, . . . Continental Life Bldg. .	H. N. ROBERTS, President, The Boiler Inspection and Insurance Company of Canada.