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FIRE PROTECTION HISTORY-PART 197: 1901 (STEAM/ROTARY PUMPS/JOHN FREEMAN)

By Richard Schulte

The fifth Annual Meeting of the National Fire Protection Association (NFPA) was held in Chicago in June 1901. Among the subjects discussed at this meeting was a standard for the construction of steam and rotary pumps used in fire protection systems. The following is a transcript of this discussion:

"***REPORT OF COMMITTEE ON STEAM AND ROTARY FIRE PUMPS.***

W. H. Stratton,	*Albert Blauvelt,*	*F. M. Griswold,*
Chairman,	*R. M. Hilliard,*	*W. S. Wensley,*
J. T. Naylor,	*A. W. Hardy,*	*W. C. Robinson.*

The President. We will now have the report of the Committee on Steam and Rotary Fire Pumps, W. H. Stratton, Chairman.

Mr. Stratton first read the following report of the Committee on Rotary Pumps:

Just what to do with this subject must be decided here upon the floor. The best designs and products now available are perhaps as good as your Committee could expect, but it is the unfortunate surroundings that make this kind of pump so questionable.

The location of these pumps is usually in a wheel pit in an out-of-the-way place, subject to many variations of conditions, alternating dry and wet, hot and cold where all parts rapidly accumulate rust. The operation involves the most dangerous conditions in mechanics. Starting a rusty device, all cast iron, perhaps in a temperature below freezing, after long disuse, putting it immediately under high velocity and excessive journal pressure invites a disaster. We rarely find them properly supplied with the right kind and quantity of lubricant, and we feel it only necessary to report that just as few of these pumps as possible should be used, that they should be located to the best advantage as suggested by the underwriters where they have the opportunity, and that they should be provided with all the safeguards known to be needed, namely:

First– Say a barrel of well chosen lubricant.

Second– A check valve to guard against the loss of water from other sources should the pump go to pieces.

Third– A pop or spring relief valve to avoid dangerous pressure.

Fourth– Securely set upon reliable foundations to prevent vibration or strain, preferably to be driven by separate wheel.

Fifth–If geared to the general power, all other machinery should be arranged to throw out by friction clutch at or near the pump.

Sixth–Friction gears, or if possible to find a reliable clutch, should be the means of attaching power to the pump; both the pump and the gearing to be so securely fastened that they cannot shift when the gears or clutch are thrown in.

This is the best your Committee can recommend upon this subject, but we would be very glad to have suggestions from others to be made a part of the record on this question.

Respectfully submitted,

W. H. Stratton, Chairman.

The President. You have heard the report of the Committee; have any members any suggestions to make as to rotary fire pumps? We would like to hear from some of the members who are familiar with that class of apparatus, and the New England field ought to be rather prolific in that line, it formerly was I know, I don't know how it is now.

Mr. Blauvelt. Mr. President, I don't feel any embarrassment in speaking, although I am a member of the Committee, for the Committee didn't get an opportunity to meet until the other day, and I wish to speak now in support of my Chairman. I think the views he has advanced on rotary pumps are quite correct, but if I recollect, he didn't emphasize very much the great amount of leakage at the stuffing boxes that these rotary pumps have. The stuffing boxes are all the time out of condition, and interfere with both the suction and the discharge of the pump. I fully agree with the Chairman of the Committee that as few of these pumps should be used as possible, and that little reliance is to be put upon them when you do have them.

The President. Any further remarks? If not, a motion to receive the report will be in order. It is moved that the report be received–and the Committee continued, Mr. Chairman?

Mr. Stratton. Well, it might be well to retain Committee, because possibly something may develop by which we can improve the present bad existing conditions.

It was voted to receive the report and continue the Committee.

Mr. Stratton then read the following as the Committee's report on Steam Fire Pumps:

Since the last convention additional evidence has been secured concerning the needs for the proper protection of insurance interests in the correction of existing standards and means of obtaining a strict adherence thereto, all of which will be treated in detail hereinafter.

At the last meeting your Committee reported that the specifications then in force concerning the construction of the Underwriters pump were found acceptable, and at that time we had no recommendations to make for correction. Our views are changed at this time, however, to the extent of making some suggestions in the specifications and urging a program under which the Laboratory officials shall be able to obtain strict adherence to the requirements as presented.

Before proceeding with our own conclusions it is proper that we should make acknowldgment [acknowledgment] *to Mr. John R. Freeman, who compiled the original requirements for the Underwriter pump. The chairman of this Committee has conferred with him and obtained permission to use any or all of the existing standard, and also believes that the corrections and requirements which we are about to submit will meet with his approval and adoption.*

The Freeman specifications have been in force since 1895, although the preliminary work and development covered a period of five years prior to that date, and as the specifications will be printed in full in connection with this report, the existing conditions and the objections to certain items and the proposition for their correction will all be embodied in the records of this year's convention.

It would seem proper to pause a moment before we enter into the discussion that we may appreciate the great importance of the subject and to recall that the fire pump is the main reliance and safeguard against fire involving immense money values. Therefore, it is necessary that we should carefully prepare specifications and plan to see that they are strictly adhered to, and further, when the pump is upon the premises include in our requirements the proper means for its safe location, correct pipe connections, provision for the proper auxiliary apparatus and to guard it against accident from falling buildings, freezing, and all other means of disqualification.

The following items are particularly submitted for special attention.

Mr. Stratton. Before submitting these requirements I will say that the printed specifications of Mr. Freeman of May, 1895, cover all the conditions, but the points which we refer to here we think are not covered in a defective manner. Now it is a question how much of all these details you wish to consider. The suggestion would be that we accept those as they stand printed that cover items that have not so far developed difficulties in use.

The President. Is it the intention of the Committee to recommend for adoption by the Association the Freeman specifications with certain amendments which are specified particularly in their report?

Mr. Stratton. Yes, sir.

The President. Would it be the intention of the Committee to read the entire Freeman specifications from beginning to end, or simply to take up those in which they wish to suggest amendments?

Mr. Stratton. That is what we thought would cover the situation at this time, unless it may develop that we haven't covered all the objectionable points, and that the experience of other members shows that other features need correction.

The President. You may then continue reading the report, calling attention to the particular points of the Freeman specifications which the Committee wish to amend.

First–While it is specified in the requirements (see Page 6) that "on the pump maker rests the responsibility for first-class workmanship, good material and proper strength," and with due allowance for the uncertainty concerning the results of iron castings and the possibility for hidden defects, despite the best efforts, your Committee feels that makers should be called upon to guarantee that after their best efforts are carried out they will still replace promptly and without cost any defective parts, more especially the iron castings. The inspectors of the department in charge of your chairman, have found a number of accidents resulting in breaking of various parts of fire pumps and have sent pieces to the office which show that the castings

were defective. It would appear that the makers' interest would prompt them to avoid spending the time and money involved in putting the pump together having a defective cast iron part, as the value of iron would be insignificant compared with the labor involved. This is a feature of administration that can be best adjusted by whatever authority has in charge putting into execution any standard that we may adopt, making necessary arrangements with the manufacturers, but we show samples here and quote cases indicating that much improvement on the part of the makers is needed in the main castings for the pump.

Mr. Stratton. I have a special letter here from Mr. Freeman in which he indicates the same feeling on the question of the iron parts.

Second–The next item for our special consideration deals with the water valves referred to on Pages 18, 19 and 20. The specifications are complete and the reasons are fully given and the illustration (Figure 3, Page 20) shows the best opinions of the designer at the time of the original work some six years ago. Time has developed the fact, however, and we have the parts here to show, that the water valves of the pump require considerable improvement to prevent their giving out, disqualifying the pump and the parts going into the fire protection system and perhaps stopping up the sprinkler mains.

The requirements in the specifications permit of two kinds of construction, one where the base of the valve is screwed into the valve deck, the other where it was forced in on a wedge joint. Now these valves [referring to samples] set in a cast iron deck, and the rising and falling of these valves under sharp, quick pulsations and high pressure have worked these screwed valves right out of the deck, and pulled these that were driven in. There is one which went into the main, and was taken out of the hydrant by an inspector in North Carolina. That shows conclusively that the smooth-driven joint will not hold; and we find cases where even this arrangement for screwing in the base is not proof against its working out.

The illustration shows the base of the valve as screwed into the valve deck. Such an arrangement we recommend as involving the safest conditions so far brought to our notice. The valve which we have here seems to show that it was probably loosened by vibration and washed away and found in a hydrant, not being screwed into the valve deck but fastened by a tapering wedge joint. We have, however, Mr. Freeman's statement that valves screwed in have worked out by vibration. Therefore, your Committee would suggest that this item should be revised so that the base should be screwed inro [into] *the valve deck and then fastened to prevent turning by vibration.*

Third – The next feature that has developed a weakness under the inspections that we have an example of before us, is the screw where the stud that holds the spring is fastened to the center of the valve base. It will be observed that this attachment was liberated and worked out probably by vibration, allowing the valve stud and spring to be washed into the fire mains, being found in a hydrant. It is most fortunate that these parts did not enter and fill a pipe leading to sprinklers. As this can be more readily adjusted than the fastening of the valve itself into the deck, it is suggested that it be screwed through the base and one of the many known mechanical means of preventing the turning of the stud resorted to, preferably such a plan as will permit the taking out of the stud while in the valve deck in order to replace the rubber valve which is often necessary.

Fourth–The next feature is the rubber valve itself, and we have samples to show the effect of pressure holding a poor composition so tightly upon the valve base that the imprint of the web and frame is shown bedded deep into the face of the valve, which, of course, will ruin the tightness of the valve. This means that the quality of rubber shall be definitely stated and that means to positively obtain adherence to the same shall be brought into effect by those who will have charge of the acceptance.

Fifth–The next item is the plate upon the top of the rubber valve which prevents the spring bearing upon the rubber and also by the annular bead or ring holds the spring in proper adjustment and prevents it from getting out of position. The lack of this plate permits the spring to work to one side, then buckle and tangle the spirals, throwing out of adjustment the relations of the valve to the duty required, for it makes a great difference in the operation of the pump; in one way cutting down the capacity and in another making the pump slam unless these springs are in correct position and adjustment.

We have two samples here of new valves. The one apparently in full conformity with the standard lacking the plate just described, although it will be noticed that the number of webs is four instead of six, which means the giving out of the rubber valve discs more rapidly. The other sample has the proper number of webs and the plate upon which the spring rests, but is made to be fitted into the valve deck on a smooth taper. No doubt there are many pumps to-day disqualified wholly or in part, and we may expect to find after the loss of a property that such valves have been forced into the mains and obstructed the flow of water to the fire apparatus, hence it would seem that this item should be promptly corrected and enforced.

Sixth–On Page 31, Article 49, reference is made to the priming pipes, and in this connection we exhibit one of the special check valves showing the result of its operation under high pressure, which indicates that they have not been made heavy enough and that the lift of the valve has been too great.

This is the check valve which was specially designed to form a part of the priming equipment, and you will notice the condition of the valve. It is pounded all out of shape. That is only one of a number we have taken out.

Mr. Blauvelt. These valves sometimes pound so they fall right through the seat, go right through.

A revision of the requirements should involve making this valve of proper strength and adjusting the lift from the seat to a minimum. This we understand the makers have under consideration, but if they are brought within the guarantee it will prevent putting out parts that will be necessary to replace at their expense.

I understand from Mr. Freeman by a telephone message received just before I left home that the makers have all agreed substantially upon the conditions necessary to make these valves reliable.

Seventh–On Page 31, the outlet from the discharge of the pump is illustrated showing the air chamber directly on top and the hose valves connected on the side of the elbow. The intention of the designer in this arrangement was to make the pump available as an individual apparatus so that everything could be shut off by one gate valve and hose streams attached directly upon the pump and its full capacity obtained in that way. Unfortunately, however, the usual location of fire pumps makes the valves thus attached inaccessible or dangerous to use. It is usually necessary to make a short bend in all or part of the hose streams leading from the pump. Such a strain immediately at the pump, where the full shock of the valve pulsations are delivered, is liable to burst or blow the hose off the coupling. This has happened many times. Your Committee therefore recommends that the valves shall not be attached as shown in the sketch on Page 31, but that a spool casting having flanges in three directions shall take the place of the present arrangement, so that all the outlets of the pump may be extended in the direction available and through the wall of the pump house where the possibilities of blowing off the hose will be reduced, short bends in hose avoided and the washing of the attendant out of the pump house averted.

Another objection to the old method has developed in actual experience. It has been found that the pump is often permitted to take the place of a hydrant, and this requires that the equipment of fire hose shall be kept in the pump house. We have an illustration of recent date where the highest type of fire hose was disqualified by heat acting upon the rubber within three or four months. By our Committee's suggestion the hose will be removed from the effect of the heat in the pump house, not only made more valuable, but its life prolonged, resulting in a saving to the mill owner and better protection to the insurance companies.

Eighth–On Page 3, on the full cut of the pump, a sight feed lubricator is shown connected into the steam yoke. No doubt such an arrangement will, for the quantity of oil it holds and the few drops per minute which it will feed into the steam cylinders, be a reasonable means of lubricating the pump for a short service provided the pump is in excellent condition, but unfortunately experience shows that fire pumps are greatly neglected and that they are in places alternately damp and dry, hot and cold. The steam cylinders rust in damp and cold weather and a hardened deposit accumulates from the oil that remains in them. Your Committee would suggest a sight feed lubricator of appropriate capacity and in addition, and as a main reliance, a hand oil pump of at least a pint capacity, so that when the pump is called into full capacity after long disuse it may be given a large quantity of oil to start it and overcome all of the disqualifications that may exist. Furthermore, a high grade steam engine lubricant should be kept in a metal can of say five gallons capacity in the pump house, always at hand to recharge the hand oil pump and maintain a big fire pump in easy working condition for a long period in a bad fire.

As stated in the opening of this report, the original efforts tending toward the correction of a standard were commenced in 1890 and the specifications now in force were issued in May, 1895. During the five years prior to the issue of 1895 the designer was in constant intercourse with makers and for various reasons it is needless to say they became thoroughly familiar with the conditions involved in the specifications, which for a time stimulated the excellence of their products. At this time, however, we do not feel that it is safe to recommend the purchase of an Underwriter pump without a special contract involving the complete specifications with an agreement on the part of the maker to comply thereto with appropriate and serious penalty attached, and until such an arrangement can be put into effect, such as the Laboratory now uses with other apparatus, we must rely upon the manufacturers of these pumps, although the present condition of their products does not warrant us in so doing.

We have a record of 18 reports giving specifically the defects and actual cases reported by inspectors and we know of the existence of other lists of a similar character.

If the Association is now prepared to give the necessary time and attention for a complete analysis of the standard and act upon it item by item together with the suggestions which your Committee have to make, we believe it would be possible to formulate a standard that so far as printed requirements can, would fully cover the needs of the situation. We suggest that you continue the Committee with power to adjust, with the aid of the Laboratory officials, any differences with the pump manufacturers. This course we believe would bring the matter to a satisfactory conclusion within the coming year, all of which is submitted for your consideration.

The President. You have heard the report of the Committee on Steam Fire Pumps and its recommendations; what is your pleasure, gentlemen?

Mr. Wensley. I move that the report be received and the recommendations adopted.

Mr. Blauvelt. I would like to speak a few words in support of what has already been said by the Chairman of the Committee. This practice of forcing in these valves on a straight taper I think is a very bad one. A case came under our observation out West exactly similar to the one Mr. Stratton has called attention to. The valve fell right out of the pump, and went down into the main and into the particular hydrant which was doing the most service in controlling the fire. The fire gained additional headway on account of their having to go to another hydrant. Fortunately, there was more than one fire pump in operation, for the first fire pump was entirely crippled, and there is no doubt that the extra damage done was $10,000 or $15,000.

I think this is a good time to urge on all members who have anything to do with fire pumps, and who are in the field, to look at the pumps as soon as they can, before they are paid for, and to find whatever fault they have to find with them then. That is the way I do now, and I have stopped the sale of some of these pumps until the pump manufacturers sent a man out and corrected the defects.

The Freeman specifications, while, as Mr. Stratton has said, they are not fully clear and obligatory to the effect that these several parts shall be securely fastened, recommend it; they don't make it precisely mandatory, yet the pump manufacturers do know perfectly well that these valves should be fastened in in the very best possible manner. They don't do it, however; and without waiting for the Laboratory to get out any contract or to take any further action, it is in the power of every working inspector in the field to pull up the pump manufacturers, and if a few of us do it they will soon feel the effect on their sales and then they will fix these things properly. I have men at work making these pumps good at the present time, and others of you can do the same thing.

The President. Any further remarks? If not I will put the motion to receive the report and continue the Committee. Adopted.

Mr. Robinson. Before we leave this subject, Mr. President, I would like to ask Mr. Stratton if the point we had up this morning with regard to the use of a certain design of throttle valve, which I believe was referred to his Committee, can be taken up at this time.

Mr. Stratton. We recommend here that our requirements should include specifications for all the auxiliary connections, valves, and other arrangements, and in those we would use the regular steam trottle [throttle] *of the globe valve pattern. These valves are not opened to their full extent as a rule, and it is known that the flow of steam around the edge of the gate valve cuts the edge off, and puts the valve out of condition in short order, whereas, the steam coming up and inpinging* [impinging] *upon the centre of the disc of a globe valve takes off the wear; and that is why the steam users have adopted a globe throttle in preference to a gate. That is what we would recommend.*

Mr. Fiske. I think Mr. Robinson is probably referring to the matter of the by-pass automatic regulator which was referred to the Committee. That is where the controversy in regard to the outside screw and yoke came up, and that was referred to the Pump Committee for them to take up this coming year, as I understand.

Mr. Stratton. Yes. In that case we would for the steam use a regular steam throttle valve, or suggest the use of it; instead of the outside screw and gate we would use the outside screw and yoke globe steam valve.

Mr. Fiske. Also the question was to come up with regard to valves on the by-pass itself and the arrangement of the regulator and the connecting pipe. Those matters, as I understand, have all been referred to the Pump Committee.

Mr. Stratton. Yes.

The President. Before we take up the report on steel roll shutters, I understand that the Committee on Uniformity of Requirements is ready to report under 61 and 62 of Class F."

Of particular note in the discussion above is the Pump Committee's recommendation pertaining to the installation of rotary pumps in fire protection systems. It also appears that at this point in time, 1901, pumps utilized for fire protection purposes were not tested and listed by "the Laboratories".

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Source: "*Proceedings of the Fifth Annual* [NFPA] *Meeting*", Chicago, Illinois, 1901.