RULES AND INSTRUCTIONS

FOR THE GUIDANCE OF

LIGHT KEEPERS

AND OF

Engineers in Charge of Fog Alarms

IN THE

DOMINION OF CANADA

Prince Edward Island Lighthouses

RULES AND INSTRUCTIONS

FOR THE

Guidance of Lightkeepers

AND OF

Engineers in Charge of Fog Alarms in the Dominion of Canada

TOGETHER WITH

Rules Governing Buoys and Beacons

FIFTH EDITION
1st July, 1912

All earlier editions and circulars to Lightkeepers are hereby cancelled.

By Authority of the Department of Marine and Fisheries.
OTTAWA, CANADA

OTTAWA
Government Printing Bureau
1912

23740—1

PART I.

RULES AND INSTRUCTIONS.

FOR THE

GUIDANCE OF LIGHTKEEPERS

IN THE

DOMINION OF CANADA.

1. RESPONSIBILITIES OF LIGHTKEEPERS.

1. The security of the lives and property employed in the navigation of the waters and in the fisheries of the Dominion of Canada depends greatly upon the efficiency and perfection of the lighthouses and the faithful and skilful performance of their duties by the lightkeepers. These rules and Instructions are, therefore, issued by the Department of Marine and Fisheries for the guidance of lightkeepers, and no excuse will be accepted for negligence or improper performance of their important and responsible duties.

2. The lights in the Bay of Fundy and on the southern and eastern coast of Nova Scotia, those required for the winter passage of either steamers or ice boats to Prince Edward Island, the light on the southwest point of St. Paul island, and all the lights in British Columbia, are to be exhibited all the year round.

3. Lights used solely as harbour lights need not be exhibited when the harbour is closed, although the general navigation may remain open, and fishing lights need only be maintained during the fishing season. Where navigation is closed by ice in winter, all other lights under the control of the Department of Marine and Fisheries are to be maintained in operation whenever there is any possibility that navigation in the vicinity is open. In any case where there is the slightest doubt whether the light is required it is to be kept in operation. If any keeper has doubt respecting his duty under this regulation he is to apply for special instructions through the proper channel.

4. The date when each light is put in operation in the spring and discontinued in the fall, and also the dates and durations of any intermediate discontinuances, are to be mentioned in the first subsequent quarterly report forwarded.

5. The lamps are to be lighted at sunset and kept burning at their full brilliancy until sunrise; but whenever the weather is foggy, or dark from any other cause, the lightkeepers will light the lamps earlier or keep them lighted later, as may be necessary for the security of navigation.

6. No circumstance whatever will excuse any keeper for failing to exhibit the lights in his charge at the prescribed time, or for neglecting to keep them burning with the greatest possible brilliancy.

7. The keeper is to be in attendance sufficiently early to have the lamps burning with their full effect by the time twilight ends. When the lamps are first lighted the wicks are to be low, and afterwards they are to be raised very gradually until the full power of the flame is attained.

8. After lighting up, the keeper is to remain in the lantern for thirty minutes, attending to the flame of the lamps, and before leaving he is to be particular in seeing that all the reflectors, lamps, chimneys, &c,, are vertically and truly in position, the lamps burning clearly at their full height, and the glass chimneys all clean and whole. A supply of spare chimneys must always be kept clean, ready to replace any that may get smoked or broken.

9. At the smaller lights employing coal oil lamps with wicks, the keeper is not expected to remain in attendance or visit during the night except when unusual conditions prevail, such as heavy gales or derangement of the apparatus. At all Light stations employing vapour lights, occulting, revolving, or flashing apparatus, the keeper is expected to visit the light at stated intervals throughout the night, the visits to be of such frequency as will insure an efficient light being maintained.

10. At stations having more than one lightkeeper, the one on duty shall call his relief a few minutes before the expiration of his watch, and return immediately and remain on duty until the arrival of his relief, when he shall turn over the lights to the relief and inform him of everything that may be necessary in

regard to the condition of the lights and ventilation, and the effect of the weather on the flames.

11. Whenever a flame shows signs of diminution or dullness, the wick must be trimmed, the chimney cleaned or changed, or the draft regulated, as the case may require; but every lamp must be kept burning at its full power from the time of lightning until it is put out.

12. The lantern glass is to be kept clear from drift, snow, sleet, or any other obstruction to the light on the outside, and also from any moisture that may accumulate on the inside.

13. As soon as the lights are put out, the wicks are to be trimmed, as it can then be much better done than when they are cold.

14. The blinds are then to be put upon the lantern windows, and the linen covers provided for the purpose put over the lenses or reflectors. In the case of a revolving light, the clockwork is to be wound up, and the weight supported so that there may be no strain upon the cord.

15. The lamps and apparatus are to be cleaned as hereinafter described. Reflectors, after being polished, are to be put in their places and the curtains hung over them. The floor and interior of the lantern are to be thoroughly cleaned, care being taken not to raise any dust. The glass of the lantern is to be polished both inside and outside with linen towels.

16. The oil reservoirs are to be filled; all implements and cloths used in cleaning removed from the lantern to their proper places in the lightroom, and generally all work necessary to prepare the lamps for lighting in the evening properly performed.

17. The keeper is especially enjoined to bear in mind that unless the full power and development of the flame of the lamps are obtained, the value of the remainder of the apparatus is in a large measure lost, and that to obtain the best results, attention to the principles which regulate the production of the flame, and unceasing watchfulness during the time of its exhibition, are necessary.

18. The principal features therefore to be observed are: That the substance to be consumed is not the wick but the oil,

and that a free current of air is necessary to perfect combustion; that the oil should be pure and free from sediment, so that the wick may supply it abundantly to the flame, obviating the charring of the wick (the invariable cause of low flame) and consequent constant trimming.

19. If during the night the wicks become charred they must be trimmed, special care being taken to have their tops exactly even and free from smoky points.

20. All parts of burners exposed to the action of the flame are to be kept bright and polished, other parts to be kept perfectly clean, especially the ventilating holes in the burners.

21. The lamp reservoirs or fountains are to be emptied and thoroughly cleaned with hot water and soap at least once in two months, and more often if needed.

22. Besides the usual daily cleaning, every reflector is to be thoroughly polished on the bench in the light-room, twice a week. They are first to be carefully dusted to remove all particles that might produce scratches, and particular care must be taken that the chamois skins used in rubbing them are perfectly free from dust or gritty particles.

23. The great art of keeping the reflectors in order consists in the daily, patient, and skilful application of manual labour in rubbing their surfaces, beginning at the centre and gradually working outwards with a circular motion of the hand.

24. No damp or wet substances should be applied to metallic reflectors. If their silvering becomes dim, a little of the rouge powder provided may be employed with the chamois skins, but *no other material must under any circumstances be used.*

25 Any scratches in the silvering must be due to dust or careless work, and the keeper will be held accountable for them.

26. If a reflector has become badly tarnished by being laid aside, or from any other cause, it should first be rubbed with rouge mixed with sweet oil, and afterward polished in the usual manner with dry rouge and clean chamois skins.

27. The backs or copper parts of the reflectors, as well as the stands or frames on which they are placed, are to be kept thor-

oughly clean. In replacing reflectors on their stands care must be taken that they are fixed as originally set, with their fronts leaning a little downward rather than upward.

28. The glass prisms and lenses of a dioptric apparatus are to be cleaned every day when in use, being first freed from dust by using the linen dusters slightly damped, and then rubbed with *perfectly clean* and dry soft chamois skins.

29. If the glass becomes greasy, it should first be washed with a linen cloth steeped in spirits of wine, then carefully dried with a soft linen cloth free from all dust or grit, and finally rubbed with a fine chamois skin.

30. All the polished metal work about the apparatus is to be kept clean and in good order, but while being cleaned, great care is to be taken that the glass prims and lenses receive no injury. The level of the lenses must be tested periodically. It is fatal to the efficiency of the light if the lens is out of plumb or the lamp out of focus. There is no occasion to use any polishing material on the metal framing of lenses, all that is required is to keep the metal free from deposits of foreign matter.

31. The machinery employed to operate revolving lights must be kept scrupulously clean. All journals and working parts must be regularly and carefully oiled once a week when in use, and those making quick motions more frequently.

32. The machinery must be regulated so as to have a uniform motion, and must have its revolutions frequently checked, and, if not performed in the prescribed time, corrected by changing the angle of the fans on the regulators.

33. The cords or chains must be frequently inspected, to see that there is no danger of their parting, and the weight must never be allowed to bear on them when the machinery is out of use.

34. For directions with respect to the care and operation of vapour lights, refer to catalogue describing the particular light in service.

35. To obtain the full power of the flame of the lamps, particular attention must be paid to the ventilation of the lantern This can be regulated by the trap door in the floor, the air

registers in the floor and the base pieces, and the revolving plate in the ventilator overhead.

36. The storm panes furnished for replacing broken glass in the lantern must always be kept ready for use, and, when required put in place without any unnecessary delay.

37. Besides the daily cleaning of the lantern, all parts are to be carefully examined, and any requisite repairs made at once. Particular care is to be taken to keep the joints tight, and to see that all the putty around the glass is secure.

38. Besides such cleaning of the plate glass of the lantern as the weather may necessitate, once a week it is to be cleaned with whiting and water mixed to the consistency of cream. The paste is to be laid on inside and out, and when dry the glass is to be polished until clean and clear.

39 No tools, cloths, nor oil vessels are under any circumances to be kept in the lantern.

40. Once a year at least the lantern and its appendages are to be scraped clean from all rust and blistered paint, and newly painted inside and out.

41. The lightroom, or room immediately below the lantern, is to be used by the keeper when in attendance upon the lights, and is to be fitted up with convenient shelves and drawers or cupboards, a bench, and, if a catoptric light, with a reflector-polishing stand. In this room must be stowed away all the tools and materials required in the service of the lantern.

42. A barrel full of water and two pails are to be kept in the lightroom for use in case of fire, and on no account to be removed for household or other purposes.

43. For extinguishing burning oil, in case of any accident to the illuminating apparatus, water is worse than useless; a few bags of sand that can be readily opened and used to absorb the oil, are to be kept in the lightroom for this purpose.

44. The keeper must take especial care at all times that neither matches nor anything that can be easily ignited are left anywhere about the premises, so as to endanger them by fire. Any

substance saturated with oil is particularly dangerous, as it is liable to spontaneous combustion.

45. The lighthouse building is to be kept in repair and periodically repainted by the keeper. The deck outside the lantern is to be frequently examined, and the joinings filled with thick paint wherever required, to prevent weather from getting in. Lime for white washing, paint, and oil will be furnished for the above purposes, which must be carefully kept and used economically.

46. When stores are being landed the keepers are to attend and give their assistance. The principal keeper at each station must upon these occasions satisfy himself of the quantity and condition of the stores received, which must be entered in the quarterly returns.

47. The keeper is held responsible for the safety and good order of all stores, utensils, tools, and apparatus, for everything being put to its proper use and kept in its proper place. Stores, including fuel, must be placed under cover immediately after being landed. He is also to observe the strictest economy and most careful management in the use of the stores.

48. All worn out or unserviceable articles are to be preserved by the keeper until the visit of the superintendent with the supply vessel, when they are to be handed over to him. Any deficiencies will be charged against the keeper. On no account is the keeper to throw away or otherwise dispose of anything belonging to the Department without special orders.

49. Should the supply of any of the stores appear to be getting short, so as thereby to endanger the regular appearance of the light, the lightkeeper must immediately, by mail or telegraph, as the exigencies of the case may require, send information to the agent of the Department of Marine for the Province in which the light is situated, or, if in Ontario or Manitoba, to the Commissioner of Lights at Ottawa.

50. Oil supplied in barrels will be delivered from the supply steamer into tanks, which are to be kept in the oil store, and only the small service cans are to be kept in the lightroom. The space between the two iron rims into which the cover of an oil tank fits is to be kept filled with refuse oil to exclude the air; drip pans are to be kept under the cocks, and the floor and bench are to be

kept clean and free from oil. Oil supplied in cans must be carefully handled, kept top up, and the cans and boxes kept in good order for return to store.

51. A light is never to be taken into the oil store, nor is oil under any circumstances to be heated by fire, as it then gives off gases that will explode on the slightest contact with fire.

52. As soon as an oil tank is emptied, it is to be cleaned out with hot water, and wiped dry, particular care being taken to handle it so as not to injure the solder, and to see that no water remains inside.

53. Keepers must perform any repairs which can be made without the assistance of skilled labour, and which may be necessary to the efficiency of their stations, and must paint the different parts when they require it, or when directed by the superintendent, for which no extra allowance will be paid them. They must protect the Government by having any authorized expenditure confined within the lowest possible limits, and will be held responsible for any neglect in this respect as well as for any disposition shown to impose unnecessary expense upon the Government either personally or in purchases made or labour employed.

54. In case any labour is done or repairs are made in the absence of the superintendent, necessitating the employment of strangers, the keeper is to keep a correct account of the men's time and of the material used, and render a full statement of the same to the Department.

55. Should any unexpected repairs be required to meet an emergency, the keeper shall report them at once to the agent of the Department for the Province in which the light is situated, or, if in Ontario or Manitoba, to the Commissioner of Lights at Ottawa, adding an estimate of the cost.

56. Keepers must do all painting required at their stations, as part of their regular duties, but where a tower is so high that a hanging scaffold has to be used, unskilled assistance will be allowed for moving the scaffold only, but special authority for obtaining such assistance must be had.

At stations where two or more keepers, or a keeper and engineer, are employed, they must do all the painting without outside assistance.

All painting and whitewashing required to preserve Government property from the weather and to keep it neat and bright, is to be done as the Superintendent may direct.

57. The whole interior of every lighthouse lantern, above the window sills, including false roof, ventilator, smoke conductors, &c., is to be painted white, and must be kept clean, free from soot and grease, and the white paint renewed as often as necessary. The paint may be kept clean and free from soot and grease by occasional scrubbing with clean soft hot water and soap, followed by clean water.

58. In painting, durability is to be the first consideration.

The surface to be painted must be smooth and free from grease or dirt. If wood is new, all knots or other places showing gum must first be covered with a coat of shellac dissolved in alcohol, to prevent the gum from showing through. Then the first coat, with some raw oil in the paint, should be put on thin. This is called the priming coat. If iron is new, a thin coat or two of red lead should be put on as priming. After priming, all holes, cracks, nail-heads, &c., must be filled with putty.

A second coat of paint is never to be put on until the previous one is thoroughly dry and hard, which will never be the case whilst the least stickiness is felt on applying the hand to it.

Each coat should be of the same thickness throughout, with just sufficient paint to lie smoothly without running, otherwise the work, when done, will have an unfinished or slovenly appearance.

Paint put on too thin will crack in drying, if too thick it will blister off.

In using the brush the largest tool feasible is to be employed. Where the space is contracted or rough, the paint should be laid on in dabs, and in all angles and recesses it must be well worked in so that every portion of the surface may be well covered; in large spaces it should be laid on in long strokes, and wherever the surface permits it should be finished off in long smooth strokes parallel to the grain, joints, or length of the surface.

59. Before painting over old paint all dirt and grease must be removed, or the new paint will not adhere. Oil or other stains that cannot be removed by thorough washing, should be scrubbed vigourously with a stiff brush dipped in turpentine, and if this is ineffectual, a thin whitewash painted on, allowed to dry, and then removed with a stiff brush, will leave the parts in proper condition to receive the paint.

Hardwood lye may be used to clean very dirty or smoked paint, but must never be used to prepare for repainting.

All blistered and cracked paint, and most particularly all rust on iron, must be carefully removed and the parts smoothed before repainting. 2 lbs. potash dissolved in a pail of water with 1½ lbs. slaked lime added and stirred well into it, makes a wash that will remove paint from iron. It is to be applied liberally, and after a few minutes the paint may be scraped off. As fast as the old paint is removed the iron is to be rinsed with fresh water and dried. It must be repainted while fresh and bright.

60. Whitewash made on the following recipe, taken from the U.S. Instructions to Lightkeepers, 1902, has been found by experience to answer on wood, brick and stone, nearly as well as oil paint, and is to be used at all Canadian lightstations for outbuildings, fences, &c.:

'Slake half a bushel of unslaked lime with boiling water, keeping it covered during the process. Strain it and add a peck of salt, dissolved in warm water; 3 pounds of ground rice put in boiling water, and boiled to a thin paste, half a pound of powdered Spanish whiting, and a pound of clear glue, dissolved in warm water; mix these well together, and let the mixture stand for several days. Keep the wash thus prepared in a kettle or portable furnace, and when used put it on as hot as possible, with painter's or whitewash brushes.'

61. The large paint brushes provided, are used for painting over large surfaces, which require a uniform coat; the small brushes are to be used only for parts which the large ones, from their size, cannot reach; flat brushes are used for sashes, for varnishing, and for painting in lines or narrow spaces.

Brushes must never be left to dry with paint on them. If required again within a short time, they should be put into a pot with sufficient water to come within half an inch of the binding of the brush. (If the water comes higher, the binding will soon rot and the brush will be useless). When brushes are to be put away, or used for a new colour, they may be washed in boiled oil or turpentine, and finally with soap and hot water, until clean. The oil and turpentine used in washing will answer for mixing paint of the same colour as that washed from the brushes. When the bristles of a brush get loose, a few thin wedges of wood driven inside of the binding will fasten them again.

62. At stations where the apparatus is superimposed on a float revolving in a bath of mercury, the bath must be emptied

once a year, the mercury being drawn off into the original flasks. When emptied, the bath must be carefully cleaned as likewise the float. In reassembling, the greatest care must be exercised to the end that the bath may be raised to its proper position, and that sufficient mercury and no more is placed in the bath.

63. Care must be exercised at all times that any deficiency of mercury, whether occasioned by evaporation, leakage or splashing due to vibration of the tower, may be made good immediately. The keeper will note that the weight of the revolving part of the apparatus, in the case of mercury floats, is to be supported by the mercury and not by the ball bearings. The bearings are intended only as guides to keep the apparatus truly vertical.

64. Lightkeepers will give strict attention to the matter of keeping records and making reports as required, full directions for which will be found on the report forms which will be provided.

65. If any accident occurs that may require immediate attention, the keeper is to send to the nearest telegraph station, and communicate, in as few words as possible, the nature of the accident; at the same time he will write to the Department, making it acquainted with the particulars.

66. No expenditure must be incurred by a keeper without specific written authority from a responsible officer of the Department of Marine and Fisheries, and no expenditure authorized must be exceeded without further written authority. Except in a case of extreme urgency, no claim for reimbursement of unauthorized expenditure will be entertained.

67. Authority to spend money up to a given amount means only that the sum named must not be exceeded. Keepers must furnish bills showing all details to cover the amount actually spent, must endeavor to keep the expenditure below the estimate, and must protect the Department against unnecessary or useless expenditure or exorbitant charges. They will be held strictly responsible for the correctness of the accounts they submit, and for the economical expenditure of any money entrusted to them, Bulk sum contracts are only to be made under special authority and then must be based on written and signed specifications.

68. Accounts are to be submitted to Ottawa in duplicate, or if sent through any Agency of the Department, in triplicate. Those containing items for materials must give quantities and rates charged. Accounts for labour must give the time the labourers were actually engaged and rate per day. Keepers must certify each account as nearly in the following words as may be applicable: 'I certify that the above expenditure was authorized and was actually incurred on Government business, that the materials were provided { and / or } that the labour was actually performed, and that the prices charged are fair and just.' This certificate is to be signed and dated by the keeper, with the name of his station and post office given, and he will be held legally responsible for the correctness of his certificate.

69. In forwarding accounts to the proper officer, keepers will cover them by a letter, quoting the date and file number of the letter which authorized the expenditure, and reporting the state of the work. Where several accounts are submitted together, they must be accompanied by a statement showing the total expenditure covered by them. Accounts are to be forwarded receipted, if they have been paid. In cases where the receiver of the money cannot write he must make his mark in the presence of a witness other than the keeper who will sign under a statement that he has seen the mark made. The names and post office addresses of parties to whom cheques are to be made payable are to be written plainly on the accounts.

70. No lightkeeper will be allowed to perform his duties by substitute, without the written permission of the Department, and approval of the keeper's nominee. Such permission will be given only under exceptionally urgent circumstances and for limited periods.

71. In the event of illness or incapacity of keeper, he is to notify the Department, stating at the same time what arrangement is being made for the maintenance of the aid to navigation of which he may be in charge; this, in order that the Department may be informed of the conditions obtaining.

72. At stations where the entire time of the keeper is paid for by the Department, the keeper is not on any account to absent himself without leave in writing from the Department

except for such short periods as may reasonably be required for the purpose of drawing his salary, procuring provisions and attending church; but in every case he is to provide an efficient substitute during his absence.

At the more unimportant stations where the entire time of the keeper is not paid for by the Department, the keeper may engage in any legitimate occupation which does not interfere with his duties as lightkeeper.

73. Lightkeepers occupying dwellings provided by the Department are prohibited from having boarders or lodgers therein.

74. Besides the regular routine duties, keepers must at all times be ready to perform any duties connected with the repairs of lighthouses or apparatus, maintenance of light, preservation of stores, repairing and keeping in order dwelling houses, landing places, roads, drains, fences, and everything belonging to the Department; in short a keeper is expected to take the same care of his station and do the same work about it, as a thrifty man would do with his own property. The Government considers the salary paid to be sufficient in every case to cover all the work required in and around the station under his charge. In the case of minor lights to which small salaries are attached the Government does not expect to obtain the whole of the keeper's time, but insists that he must do all work necessary, in addition to the mere attendance on the lights, to keep all Government property in proper order and to do all necessary painting. In all other cases, where the salary may be fairly taken to represent the value of a man's time, the Government expects to have the disposal of the whole of the time of the keeper; and at stations where an allowance is made contingent on the employment of assistants or fog alarm engineers, the Department will also expect to have the disposal of the whole time of such assistants or engineers.

75. Keepers must not only keep their lanterns, lighthouses, dwelling houses and outbuildings clean and tidy and in good repair, but must also keep the surroundings of their stations in a state to reflect credit on the Government, and be a model to the neighbourhood. Fences must be kept in proper repair, and those in the immediate vicinity of the buildings, neatly painted or whitewashed. All fire-wood and chips must be confined to proper yards, and no Government tools, vehicles or supplies, must be left exposed to the weather.

76. No buildings shall be erected, nor the colour of any structure changed; nor trees cut down nor any other changes made on lighthouse premises without authority.

In no case will a keeper be allowed to erect any private building on the lighthouse property without a special written permission being previously obtained, and where such permission is obtained, the officers of the Department must be satisfied that the building will be of a character that will not be discreditable to the station.

77. If a lightkeeper for any cause permanently leaves a station or dies, neither his heirs nor he will be made any allowance for improvements made at his station; nor can they exercise any right of property over any private building erected; and the Department need not allow the removal of any such building; nor will it recompense the builder unless the structure is required for government use.

78. If a boat is maintained at any station the keeper must keep it in good order, make all small repairs, and keep it properly painted. He will also be held responsible for any preventible damage done to it by storm or by exposure to the weather. It must be properly and promptly housed or covered and kept on suitable bearings; and may not be used for any private enterprise of the keeper.

79. Keepers must take charge of any buoys or beacons in their neighbourhood if so required; and if any keeper should know of any buoy being carried away or moved from its proper place, he must give immediate notice to the agent of the Department for the Province in which he is, or if in Ontario or Manitoba to the Commissioner of Lights at Ottawa; and when in his power he should have it replaced.

80. Keepers are enjoined to render every assistance in their power to vessels in distress, and are to report at once to the Deputy Minister of Marine and Fisheries any shipwreck or accident that may happen to vessels in the neighbourhood of their stations, giving as circumstantially as possible the facts, and the cause thereof, and whether the light or lighthouse was visible to the vessel at the time of the disaster.

81. Keepers must conduct themselves with civility to strangers, and shall without charge show the premises at such hours

as do not interfere with the proper discharge of the duties of their office, but no visitors shall be permitted to touch any part of the apparatus, or deface any part of the buildings; and not more than three visitors shall be allowed access to any light-room at any one time.

82. The breach of any of the foregoing Rules and Instructions will subject a keeper to dismissal, or to such other punishment as the nature of the offence may require.

83. Keepers are to observe that the foregoing Regulations are general, and are not intended to conflict with more special written instructions that may be given to the keeper of any particular lighthouse, or such orders as may from time to time be issued by the Department of Marine and Fisheries.

84. Every keeper will be provided with a copy of these Rules and Instructions, and a copy is to be kept in each tower. In case of an assistant not being able to read, it shall be the duty of the keeper to read the rules over to him monthly, or oftener if required by the assistant.

PART II.

RULES AND INSTRUCTIONS

FOR THE GUIDANCE OF

LIGHTKEEPERS IN CHARGE

OF

MECHANICALLY OPERATED FOG ALARMS

Lightkeeper responsible for operation and maintenance of fog alarms.

1. The following Rules and Instructions have been framed for the guidance of Lightkeepers, in charge of fog alarms, other than explosive fog signals.

Throughout the text the Officer-in-Charge of the fog alarm machinery is referred to as the 'engineer,' this will in most cases mean the lightkeeper, as his qualifications are, as a rule, supposed to be such as will allow him to be in full charge of the plant both as regards its operation and maintenance.

In cases where, for special reasons, a separate man is employed to take charge of the machinery, the responsibility of seeing that the regulations are carried out will still devolve on the lightkeeper and he must be familiar with them accordingly.

Regulations are to be adhered to.

2. The duties of those in charge of fog alarms are of a most important and responsible kind involving to a very great extent the safety of life and security of property, and the Rules and Instructions laid down in this regard are to be carefully noted and strictly adhered to.

Judgment to be used.

3. Should any condition arise which is not covered by these regulations, failure to act properly and as befits a man of ordinary skill and good judgment will not be excused on that account.

Competent man to be in charge at all times.

4. Under no circumstances is any fog alarm station to be left, even temporarily, without at least one able-bodied man, capable of operating both the alarm and the light, being in charge.

Watch to be kept.

5. At all times night and day during the season of commission for any fog alarm station a careful watch on the weather is to be maintained and on no account whatever is this regulation to be broken, even during prevailing clear weather.

Damage and waste to be guarded against.

6. At all times every reasonable effort is to be made to protect the property of the Department from damage and such supervision is to be kept over stores as will prevent loss from wasteful use, theft, &c.

Shortness of fuel.

7. Should the supply of fuel or water at any time appear to be getting short so as to endanger the efficient working of the alarm the matter is to be reported as soon as possible to the Superintendent of Lights, and the Lightkeeper will until instructions are received from the Department use his own discretion in making such arrangements as may be necessary under the circumstances, that the best possible service be obtained.

Record to be kept.

8. An exact record of the operation of the fog alarm plant is to be kept on the forms provided for that purpose which are to be filled in and returned as may be directed. The records kept will show exactly, the day and hour when thick weather sets in and when the weather cleared, the starting and stopping of the alarm, fuel used, also under the heading 'Remarks' will be set out the weather conditions or other circumstance which necessitated the operation of the alarm and any occurrence such as accidents to machinery, wrecks in the neighbourhood, &c., &c. Other forms supplied will make provision for recording in a detailed manner the operation and maintenance of the plant and all information in this respect is to be filled in as accurately as possible and forwarded as directed. Copies of all records are to be kept at the station and carefully preserved from year to year.

Thick weather.

9. When the weather conditions are such, from fog, snow, smoke from forest fires, &c., as to cause the land to be indistinct by day or lights by night, the alarm must be in operation and continue so until the weather clears, and if there be any reason to

believe that thick weather prevails within the range covered by the fog alarm, it is to be in operation even though the weather be clear at the station.

Pressure to be maintained.

10. At all times when thick weather may reasonably be expected, the air pressure at stations where diaphones are established is to be kept above twenty pounds pressure and where boilers form part of the equipment such steam pressure is to be maintained as will permit of getting the alarm in operation promptly on the first appearance of thick weather, without straining the boiler.

11. At diaphone and steam whistle stations, the steam pressure to be carried during threatening weather should not be less than fifty pounds.

Banked fires.

12. During the season when thick weather is prevalent, even though the weather may not be threatening, at each steam driven station one boiler is to be kept banked.

STEAM PLANTS, MANAGEMENT AND CARE OF BOILERS.

Starting Plant.

13. Whenever it becomes necessary to start up a plant driven by steam, the boiler pressure is to be worked up as slowly as possible to avoid straining the boiler. While steam is rising, the Engineer on watch is to see that all lubricators on the machines are filled and in proper working order, and that all belts required are in place. He shall open all steam and feed connections on the boiler, start up all necessary auxiliary machinery and when compressors form part of the equipment he shall start them running slowly so that they may warm up.

Before starting, great care is to be taken to see that all drains are open and steam valves are to be opened slowly letting the various pipes, connections, &c., warm up and get rid of all condensed water.

Use of feed pump.

14. When plants are provided with feed pumps and feed heaters, this system *and not the injector* is to be used when the plant is in operation, the pump being set to run steady on the boiler, delivering water as it

is used. When the plant is not in operation the boiler will be fed by the injector.

Soda in boilers.

15. For every one hundred gallons of water fed into a boiler a quarter of a pound of carbonate of soda (washing soda) more or less according to the class of feed water is to be dissolved in water and passed in with the feed.

The soda is not to be put into the boiler all at once, nor is it to be thrown into the feed water reservoir, but is to be fed in gradually through the pump, by means of a connection on the suction lifting from a special vessel; the connection is to have a valve, which will control the supply of soda solution and as nearly as possible, especially on long runs, the solution feed should be continuous.

The soda will render the boilers less liable to scale and the engineers must use their own judgment as to the actual amount required, remembering that too strong a solution will cause the boiler to foam and will be injurious to the gauge glasses.

Cleaning fires.

16. When cleaning fires, the clinkers and hot ashes are to be drawn into an iron barrow and wheeled directly out of the building.

Ash pits to be kept clear.

17. Care is to be taken to avoid accumulation of ashes in the ash pit. In boilers of the Robb-Mumford type, ashes should be drawn frequently from ash pits into an iron box fitting close up to boiler.

Ashes must not be slaked close to the boilers.

Safety valves to be raised.

18. While getting up steam on a boiler, the safety valve is to be raised, *by hand*, to blow freely, to ascertain it is in working order, in addition once each day when operating the plant the steam is to be raised to the proper 'blowing off' pressure to test the safety valve under service conditions. In testing the safety valves under steam pressure great care and judgment is to be exercised, due consideration being given to the possible inaccuracy of the steam gauge.

Caution in testing safety valves.

Engineer to test safety valves.

19. *Only the engineer* is to test the safety valves under steam pressure, except in case of emergency.

Defective safety valve to be repaired at once.

Warning to be given.

20. If any derangement of the safety valve or steam gauge is observed, or if such is believed to exist, it must be made right as soon as possible. If this cannot be done by the engineer himself, it is to be reported to the Supt. of Lights at the earliest moment, meanwhile all responsible for standing a watch are to be warned.

Blow through gauge glasses.

Try cocks to be used.

21. Once each hour when the plant is in operation each gauge glass is to be tested by 'blowing through' *i.e.* shut off bottom connections and open drain till steam blows freely, then close top connection, open bottom and see that water blows freely. Where try cocks are fitted, the water level is to be tested by them at least every hour.

Water columns.

22. Where water columns are fitted they with their connections are to be 'blown through,' as described for the gauge glasses above, at least once during every watch when the plant is in operation. Blowing through the water columns will not relieve the engineer from testing the gauge glasses.

Blow off to be opened.

23. Once each day that the plant is in operation the blow off cock is to be opened and a sufficient quantity of water blown out to insure against an undue increase of density.

Care in opening blow offs.

24. When the boilers are under steam the blow-offs are only to be opened when the plant is in operation except as set out in next paragraph *and the engineer is on no account to leave the boiler room whilst they are open but must stand by the boiler until they are securely closed again.*

Boiler too full.

25. In case a boiler has been allowed to become too full and danger might result from starting the plant, a sufficient amount of water may be blown out before putting the machinery in motion, but great care must be exercised in doing so and a careful check kept on the water level.

Checking fires.

26. Should it be necessary to check fires, this is to be done by closing ash pit damper and partially

closing chimney damper, *not by opening fire door*, the latter practice being injurious to tube ends and furnace joints.

27. Tubes are to be cleaned at such intervals as shall be necessary, it being remembered that dirty tubes lower considerably the efficiency of the boiler. Cleaning tubes.

28. In case of low water every effort is to be made to save the boiler, without undue risk of life, if not heavy, the fire should be quickly drawn, beginning at the front, but in this judgment must be used as in certain cases the act of drawing fires will cause them to blaze up suddenly generating a great heat. In such circumstances, it would be better to smother the fire with ashes or some such material as was at hand. Low water.

If the fires are not drawn, leave the furnace door open, close the dampers and relieve the pressure, gradually, as much as possible, until the water level can be obtained, then judgment must be used as to putting on the feed, remembering that water touching an overheated plate will probably cause instant disaster.

In no case should an attempt be made to draw the fire if the furnace has begun to bulge out of shape. Warning to be given if water level too low.

If low water be discovered all persons *in or in the neighbourhood* of the boiler room must be warned of their danger.

Low water should not occur.

29. On shutting down the alarm at the end of a run the water is to be left at a safe height in the boiler and the fire banked. The main stop valve, auxiliary valve and feed valve on the boiler are to be closed and all drains on steam and water connections, gauges excepted, opened. Shutting down.

30. Except in case of emergency a boiler is not to be emptied under steam pressure, but is to be allowed to cool down gradually with water in it, then open the blow off and allow the water to pour out. On no account is the boiler to be cooled by dashing cold water on the hot plates. Emptying Boiler.

Alternate use of boilers.

31. Where boilers are installed in duplicate they are to be laid off alternately each month and, immediately a boiler is laid off, the tubes must be cleaned and swabbed out with an oily rag, the fire side of the furnace and both tube sheets are to be swept down and scraped.

The water level in all boilers whether laid off or otherwise is to be changed at frequent intervals.

Boilers to be opened out.

32. Boilers are to be opened out and thoroughly washed, with the hose, at frequent intervals as required by the service performed, but no boiler should be allowed to be more than one month under steam without being washed out.

33 When washing out, the covers of all openings are to be removed and as high a pressure as possible is to be maintained on the hose and any sediment which cannot be dislodged in this way is to be removed by scrapers.

34. At least twice during the year the boiler is to be scaled, the inside of the drum and all accessible parts of the furnace, tubes, and main shell being scraped clean and where they are not exposed to fire or hot gases, they are to be given two coats of zinc oxide mixed in kerosene oil.

Spraying with kerosene.

35. The portions of the boiler which cannot be got at by hand are to be sprayed with kerosene but after this process steam should not be raised on the boiler till all the kerosene has been removed 'by boiling,' that is, with the boiler nearly full of water introduce a strong solution of soda, put on a small fire and bring the water to boiling point and no more, keep the boiler hot for about half a day, draw the fire and blow out, repeating twice or as often as is necessary.

Engineer to inspect boilers.

36. Each time a boiler is opened out, the engineer is to make a personal inspection of the interior and any part of the exterior where leaking or corrosion is liable to occur, removing any portion of the asbestos covering necessary and should he find that any

parts show signs of deterioration, he must report the same immediately to the Superintendent of Lights.

37. To counteract as much as possible the effects of pitting, zinc blocks will be supplied which are to be suspended inside the boiler. They are to be distributed uniformly and are to be attached so that there will be a good metallic contact between the zinc and the boiler plates. Zinc blocks in boiler.

38. All leaks in boilers are to be immediately taken up by caulking and should this means be found insufficient, the matter must be reported at once to the Superintendent of Lights.

Leaking flange joints, pipe connections, &c., on boilers must be made good as soon as discovered.

39. Gauge glasses are to be kept clean inside and out and all mountings where finished are to be kept polished and the whole boiler and boiler-room is to be kept neat and tidy. Mountings to be kept clean.

40. No form of boiler compound i.e. mixture for getting rid of, or preventing scale, except as supplied by the Department, is to be used without written authority from the Department. Boiler compounds not to be used without authority.

41. No alterations are to be made to the design of boilers nor are any openings to be made in them without written authority from the Department, except in case of emegency. Alterations to boilers not allowed.

LAYING UP FOR THE WINTER.

42. At stations where the alarm is not in commission during the winter, the Engineer will, when laying up the plant, thoroughly clean the boilers and otherwise treat them as described already in paragraphs 33, 34 and 35, and in addition will dry them out thoroughly, by hand, if necessary. When the boilers have been cleaned, dried, painted with zinc, &c., as described already, two bags each containing about 25 pounds of quick-lime are to be placed in each boiler, one in the drum or dome and the other in

the lower shell; pans containing about a pail full of red hot charcoal are then to be placed in each boiler, either in the drum or lower shell as most convenient; all handhole and manhole covers are then to be put on, tightened up and the whole boiler made air-tight and so left until required on the opening of navigation.

OIL DRIVEN PLANTS.

Starting.

43. Whenever it becomes necessary to start up an oil driven plant the Engineer will first see that all lubricators are filled and working properly, that the water in engine cooling tank *is above the top circulation opening* and that the cocks between this tank and engine are open, drains being closed. He will also see that all necessary belts are in place and that the valves or cocks on main air connections and compressor circulation connections are open.

Stopping.

44. When, on the weather clearing, the alarm has ceased sounding, the air pressure is to be raised to 30 lbs. Engines are to be stopped by closing off the fuel, the ignition switch being kept closed till they have ceased turning.

GENERAL DIRECTIONS ALL PLANTS WHEN ALARM IS IN OPERATION.

Engineer to check signal.

45. The engineer and all others who stand a watch in the engine room must know the signal advertised to be given by the alarm, and during the operation of the plant the time of the signal is to be checked, at least once each watch, any necessary adjustments being made promptly.

Engineer to remain in engine room.

46. The engineer on watch must remain in the fog alarm building continuously being relieved for meals, &c., by a man competent to handle the machinery.

Vigilance on watch.

47. At intervals of not more than half an hour the Engineer will go over the running machinery, feeling all bearings possible and observing the working of all lubricators. At diaphone stations he shall fre-

quently note the flow of water from the compressor jackets and the air pressure, the latter as a criterion of the proper working of the diaphone and compressor.

Where oil engines are established frequent observations are to be taken of the quantity of water in the cooling tanks and at steam driven plants, a very careful watch is to be kept on the gauge glass.

48. On stopping the plant it will be the duty of the Engineer to examine carefully all the machinery, boilers, &c. which have been in operation, to make sure that all joints, etc., are tight and should anything be found to have worked loose, or become deranged, it is to be put right immediately. Examination on stopping.

49. As soon as possible after stopping the plant, all machinery is to be properly cleaned and the fog alarm building made clean and tidy.

50. On stopping the alarm in frosty weather, all drains are to be opened and the Engineer is to make sure that all circulation jackets, pump chambers, &c., are clear of water. Frosty weather.

MAINTENANCE OF MACHINERY GENERAL.

51. Where compressors form a portion of the equipment, it will be the duty of the Engineer to see that all bearings are kept properly adjusted and that all glands and connections are kept tight. Compressors.

52. At least once a year the cylinders of compressors are to be opened out, the valves and piston rings being removed for cleaning and inspection. Where steam driven compressors are installed, the steam cylinder and steam chest must be opened as well as the air cylinder.

53. Pump cylinders and valve boxes are to be opened out frequently for inspection and cleaning. Pumps.

54. Where oil engines are installed their cylinders are to be opened and the piston drawn for inspection and cleaning at least every three months or oftener Oil engines to be opened out.

according to service. When the engine is open the Engineer will carefully inspect the piston rings, valves, piston pin, crank pin, and the bearings in connecting rod and assure himself of their good order, making such adjustments as may be necessary.

55. The Engineer shall frequently test the main bearings of engines for slackness and side play, if necessary making such adjustments as he can.

Cleaning ignitors.

56. Oil engine ignitors are to be removed from engines and cleaned after 100 hours of operation or oftener if necessary. Ignition batteries should be tested frequently with a volt meter.

Diaphone.

57. Where a diaphone forms part of the equipment of the fog alarm, it, with the operating valves, is to be opened out and inspected at regular intervals. The inside of the diaphone and the piston are to be cleaned frequently, using for this purpose a linen or cotton cloth soaked in kerosene. The rubber diaphragms in the operating valves should be examined frequently and if found to be cracked they should be renewed.

Electric machinery to be kept clean.

58. Dynamos must be kept clean, free from dust and all foreign matter such as fluff, waste, &c. Commutators must be kept smooth, clean and free from excessive accumulations of oil. The brushes should have a good bearing fit on the commutators and if they become rough or uneven they must be refitted, using for this purpose fine sand paper but when such material has been employed on commutators or brushes, great care must be taken to remove all traces of grit and to see that the bearings are clear of all foreign matter.

Sparking at commutators.

59. Sparking at commutators is always a sign of more or less trouble with a dynamo and should unless very slight, be corrected at once. The principle causes for this trouble are:—dirty or rough commutators or brushes, brushes not at proper angle, or machine overloaded.

Brushes not properly set.

60. Dirt or roughness can be corrected as described above. If this be not the cause and the machine is not overloaded, the sparking may be caused by the brushes not being at the proper angle. This can be corrected, when provision is made, by shifting the brushes a little ahead or back.

Dynamo overloaded.

61. If the dynamo be overloaded, excessive sparking at the commutator will result and further there is danger of 'burning out' the armature and general overheating. To avoid this, it is to be noted that no lights or devices other than those provided for in the original installation are to be connected to the machine without written authority from the Department, and in asking for such authority the Engineer must give full particulars of the dynamo, number and candle power of lamps already installed and whether any other device is electrically driven.

No extra lights to be added.

Examine electric connections.

62. Once each watch the various electric connections on the dynamo and on the switch board are to be examined and if any are found loose they are to be immediately tightened. All loose ends of wire and anything else which might cause a short circuit are to be avoided.

Bright work on machines.

63. Lubricators, rims of fly wheels and all finished work about compressors and pumps are to be kept polished. All paint work about the machines is to be kept clean, the paint being renewed as often as necessary. Any leaks found in pipe lines are to be made tight at once.

Air tanks.

64. The air tanks at diaphone stations are to have the blow offs opened at frequent intervals and the Engineer must see that they are as far as possible kept clear of water. Once each year the air tanks are to be opened out and thoroughly scraped and painted inside and out.

Clear weather.

65. In clear weather it shall be the duty of the Engineer to move, by hand, all the machinery at the station each day. Compressors and engines are to be turned over several times and care is to be taken that the position of stopping is changed from day to day.

During prevailing clear weather all the machinery at each station is to be put in operation, under power, once each week, the alarm being sounded for half an hour. *This does not apply to a boiler which is 'laid off.'*

LAYING UP FOR THE WINTER.

66. At stations where the alarm is not in operation during the winter, the engineer will when laying up the plant open out all engines and compressors, &c. and thoroughly clean them, making sure that all parts of them are clear of water. All bright work is to be polished and if liable to rust it is to be oiled.

Steam driven compressors to be opened out.

67. At steam driven diaphone plants the steam cylinders of compressors are to be opened out and thoroughly cleaned, the piston rings being removed from the pistons, cleaned and oiled before being put in place. The same is to be done with the air end. The steam chest is to be opened out and the steam valves with the faces they work against cleaned and oiled. The compressors will then be closed up.

Draw packing

68. The packing is to be drawn from all glands and piston rods and valve stems cleaned and well oiled. Waste soaked in cylinder lubricating oil is then to be placed in the glands, the cross-head guides are to be cleaned and thoroughly oiled.

Air cylinder valves.

69. The air cylinder valves both suction and discharge are to be removed from the machines, cleaned, oiled and carefully stored away.

Governor.

70. The packing is to be drawn from the governor and all moving parts of it are to be well oiled, all external bright work is to be properly cleaned and well oiled and precautions taken to prevent dust, &c., from working into the bearings.

Oil engines to be opened out.

71. At stations where oil engines are established, the engine is to be opened out and cleaned as already described. The piston is to be removed from the cylinder and it with its rings well oiled and stored

away. The cylinder will be thoroughly cleaned, all carbon, &c., being scraped out from the counter-bore, the valves and ignitors removed and these parts thoroughly cleaned and oiled are to be stored away, when the engine will be closed up.

Belt driven compressors.

72. The compressors at oil driven stations will be treated as already described for steam driven stations as far as applies to these machines.

Diaphone.

73. Where a diaphone is installed, the Engineer will before leaving the station, remove the piston from the diaphone, the valves and diaphragms from the operating valves, clean up all these parts and store them away carefully. The inside of diaphone and operating valves will be thoroughly cleaned and the cast iron portions of the inside of the operating valves oiled, two thicknesses of stout canvas are to be securely fastened across the end of the resonator and the diaphone and operating valves closed up.

Time devices.

74. At all diaphone stations, the time devices are to be cleaned and oiled and secured against dust, the counter-shafting driving them is to be cleaned and oiled.

75. At stations where special engines are installed for driving timing machinery these are to be treated in a similar manner to the steam driven compressors.

Pumps.

76. All pumps are to be opened out and carefully cleaned and dried and all iron parts where not painted are to be well oiled, bright work being first polished.

Drains to be opened.

77. At all stations the Engineer is to make sure when the plant is laid up that all drains are open and that no water is left in any portions of the machinery or pipes. Should there by any doubt that any portion does not properly drain, through the ordinary drains, the necessary joints are to be broken for this purpose.

Engine room, etc., to be made secure.

78. Where a station is unwatched during the winter the Engineer will make sure before leaving that all doors, windows, &c., are properly secured and that everything is done to protect Government property

during the winter season. He shall also leave the engine room and all other parts of the fog alarm building in a clean and tidy condition.

Plant to be examined during winter.

79. At stations where the staff remains during the winter, the plant and power house should be examined at least once a week so that any source of trouble may be corrected at once.

Laying up boilers.

80. See paragraph 42.

GENERAL.

Submarine bells.

81. At stations where Submarine bells are established, the engines, dynamos, compressors, &c., operating them are to be operated and cared for as described already for such machines and it shall be the duty of the Engineer to maintain all electric connections, electric lines, &c., used with them, as far as is in his power, reporting to the Superintendent of Lights at the first opportunity, any derangement which is beyond his power to correct.

Winches, etc.

82. Where stations are provided with winches, separate engines for driving time devices, &c., these machines with all their appurtenances are to be operated and cared for in the same manner as the regular fog alarm plant in so far as applies to their case.

Water pipes.

83. All water pipes above ground and outside the fog alarm building are to be scraped and painted at least once a year or otherwise treated as the Department shall direct. In frosty weather they are to be kept drained except when actually required and should it be found that any of these pipes will not drain properly, it will be the duty of the Engineer to fit the necessary drains at the earliest possible moment, applying to the Superintendent of Lights for all necessary material.

Ordering material.

84. When ordering parts for machinery, pipe, fittings, &c., the Engineer must give full particulars of what is required and in the case of parts for machines, as well as describing the part, he will give the horse

power or size of the machine with its shop number. When requisitioning for discs for globe valves, not only must the size of the valve be specified but also the make. The same applies to parts for lubricators, &c., where the maker's name, number or distinguishing mark of lubricator and size of connection, are to be given. The reason why any part is required must also be stated fully with the date when the last supply was made.

Assistance to be given to Inspectors.

85. On the occasion of the visit of an Inspector or any other duly appointed officer of the Department, it shall be the duty of the Engineer to render such officer all the assistance he may require and further, he shall carry out such repairs or work as he may then be instructed to do.

PART III.

INSTRUCTIONS TO GUIDE LIGHTKEEPERS

IN THE OPERATION OF

COTTON POWDER ELECTRIC EXPLOSIVE FOG SIGNALS

1. At stations where fog guns or explosive signals are established, the firing is to begin immediately after fog, snow or other thick weather that would obscure the land by day or the light by night, has set in, and the firing is to be kept up at the stipulated intervals until the weather is again clear.

This signal is made by the explosion of cartridges connected by the wires of an electric detonator to an electric cable attached to a jib, and fired by a dynamo battery.

2. The cartridges are packed in wooden cases, containing 200 cartridges each, with zinc linings. Wooden rectifiers, for rectifying the hole in the centre of the cartridge, are supplied. The detonators are supplied in cardboard cases, packed in wooden boxes.

3. The cases containing the cartridges are to be carefully stored in the magazine, which is always to be kept locked. No naked light is at any time to be taken into the magazine. Whenever light is required, a lantern is to be used.

4. The electric denonators are to be kept in the magazine in the place appointed, and on no account are they to be removed, except when required for firing. When any are required for use, they are to be brought from the magazine in the case provided for the purpose, and they must be handled with care, and on no account brought near any fire. On no account must any attempt be made to detach a detonator from its electric fuse. The consequence of trying to do so might be very disastrous, as there is sufficient power in a single detonator to inflict serious wounds.

5. In handling and storing the charges and detonators it must be borne in mind:—

a. That they are explosive.

b. That if carefully handled and not brought into contact with fire, there is no danger.

c. That all the articles should be well protected from damp.

d. That smoking is strictly prohibited in the magazine in which the cartridges and detonators are stored, and in the room where they are handled.

6. The preparation of the signals for firing is not to be carried on in the magazine.

7. Take a cartridge and put the rectifier into it up to the shoulder, so as to be certain that the hole in the middle is of the proper size.

Test the detonator with the galvanometer and insert into the cartridge, pressing it in carefully as far as it will go and securing it there by the piece of copper wire attached to the cartridge.

If the detonator fails to deflect the galvanometer it is not good, and must be destroyed by drowning it in water.

8. When two cartridges have been so prepared, attach them to the electric cables by means of the clips provided for that purpose, and then place the jib in its firing position, if it is a movable one.

Connect the electric cable to the battery, press down the button on top of the box and turn or shove down the handle, when the fuse will fire and explode the charge.

When the time comes to fire the second cartridge, or if the first cartridge has missed fire, change the cable connection, and fire in a similar manner.

If dry cells are used all that is necessary to fire the charge is to touch the inner ends of the electric cable to the opposite poles of the battery. These ends must be so disposed that accidental contact with the cells cannot occur.

9. Immediately after the signal has been fired, *disconnect the electric cable from the battery* before commencing to prepare another cartridge for the next discharge. (This precaution is on no account to be omitted, and in the event of a charge failing

to explode, disconnect the cable, take down the cartridge and destroy it at the earliest opportunity by drowning it.)

10. All the apparatus, but especially the clips at the end of the electric cables, must be kept clean and free from oil and corrosion. The ends of the wires of the electric fuses should also be cleaned before using, as a slight corrosion may interfere with the passage of the electric current. When not in use the clips should be protected to prevent their being broken off.

11. The lightkeepers are to be thoroughly conversant with the manipulation of this signal, and in the event of any new keeper being appointed, these instructions are to be pointed out to him, with a caution that they must be strictly adhered to.

PART IV.

INSTRUCTIONS TO GUIDE LIGHTKEEPERS

IN THE OPERATION OF

HAND FOG HORNS AND BELLS, LIKEWISE MECHANICAL BELLS

1. At stations where mechanical fog bells are established, the lightkeeper will put the bell in operation immediately thick weather is observed within the range covered by the signal.

2. At stations where hand fog horns and bells are established, the lightkeeper will operate the signal in response to signals received from vessels during thick weather; that is, when a vessel is heard blowing, the lightkeeper is to reply with the hand horn or bell as the case may be.

PART V.

RULES GOVERNING

BUOYS AND BEACONS

ADOPTED UNIFORMLY

THROUGHOUT THE DOMINION OF CANADA.

1. It is expedient in the interests of navigation in the Dominion of Canada, that a uniform system of buoys and beacons should be adopted for the harbours and channels;—the following rules, based upon the system adopted by the Washington Marine Conference of 1889, are therefore to be observed uniformly throughout the Dominion, and no deviations will under any circumstances be permitted.

2. The term Starboard Hand shall denote that side which would be on the right hand of the mariner going with the main stream of flood, or in entering a river, harbour, or estuary from seaward, or, in tideless rivers, in going against the stream, or, in lakes, in going from the outlet towards the head of the lake. The term Port Hand shall denote the left hand of the mariner under the same circumstances.

3. Buoys showing the pointed top of a cone above water shall be called Conical and shall always be starboard hand buoys, as above defined. Buoys showing a flat top above the water shall be called Can; those showing a domed top above water shall be called Spherical; and those showing only a mast above water shall be called Spar buoys.

4. Buoys having a tall central structure on a broad base shall be called Pillar buoys, and like other special buoys, such as Lighted buoys, Bell buoys, Gas buoys, Whistling buoys, &c., shall be placed to mark special positions, which will be fully

described when the buoys are placed. With the exception of Conical buoys, which when used shall always be starboard hand buoys, Conical topmarks, which shall always be starboard hand, or Cylindrical topmarks, which shall always be port hand topmarks, as herein mentioned, the shapes of buoys or beacons shall have no special significance at present in Canada.

5. Starboard hand buoys shall be painted red, and, if numbered, shall be marked with even numbers. Port hand buoys shall be painted black, with odd numbers, if any. Buoys defining middle grounds shall be painted with red and black horizontal bands, and may be passed on either hand.

6. The use of mid-channel or fairway buoys is to be discouraged, as even intricate and narrow channels can be properly defined by using Starboard and Port buoys. If used as is occasionally convenient, particularly in the case of special signal buoys, they are to be painted in white and black vertical stripes and may be passed on either hand.

7. Numbers, letters or names may be painted on the buoys, but they must never be so large as to interfere with their distinctive colouring. Wherever numbers or letters are used they shall be in consecutive order, commencing from seaward.

8. Where top marks are used on buoys, they shall in no way conflict with the above regulations. Top marks resembling a cone to be used on the Starboard side, and those resembling a cylinder on the Port side of the channel. Any other distinguishing marks of buoys will be used to mark particular spots, a detailed description of which will be given when the mark is first established.

9. All buoys, and the topsides of vessels, used for the marking of wrecks, shall be painted a green colour, with a suitable white inscription, and shall be moored when possible near the side of the wreck next to mid-channel. Where it is practicable, by day one ball shall be exposed on the side of the vessel next the wreck, and two placed vertically on the other side. Three fixed white lights, similarly arranged, but not the ordinary riding light, should be shown from sunset to sunrise.

10. The above system of colouring and marking buoys is to be applied also to beacons, spindles, and other day marks, so far as it may be practicable to carry it out.

11. Starboard hand or red spar buoys are to be pointed as to the top; port hand or black buoys are to be sawed square across.

By order,

A. JOHNSTON.
Deputy Minister of Marine and Fisheries.

J. G. MACPHAIL,
Commissioner of Lights.

Department of Marine and Fisheries,

Ottawa, Canada, 1st July, 1912.