CLAIMS

1. A shut-off device for pipe for use in a pipeline for operation in response to ingress of water, comprising:

at least two valves for installation in a pipe of said pipeline, each valve comprising a valve member supported for movement between an open position when the valve is open to permit passage through said pipe and a closed position when the valve is closed to shut off the passage through said pipe, wherein at least one of the valve members has a planar body and is arranged, in the open position, to extend transverse to the direction of the passage through said pipe and, in the closed position, to extend transverse to the direction of the passage through said pipe; and

a buoyant member associated with the valve members for causing movement of the valve members to their closed position automatically in the presence of ingress water in the vicinity of the buoyant member;

wherein the valve members are arranged in their closed positions to act in respective upstream and downstream directions of the passage through said pipe.

2. The shut-off device as claimed in claim 1, wherein at least one of the valve members is arranged, upon movement from the open position to the closed position, to move into the passage through said pipe.

3. The shut-off device as claimed in claim 2, wherein at least one of the valve members is arranged to stay clear of the passage through said pipe when it is in the open position.

4. The shut-off device as claimed in any one of claims 1 to 3, wherein at least one of the valve members is arranged to move initially along a linear path from the open position and subsequently along a non-linear path to reach the closed position.

5. The shut-off device as claimed in claim 1, wherein the planar body of said at least one of the valve members is arranged to extend at a constant angle perpendicular to the direction of the passage through said pipe.

6. The shut-off device as claimed in any one of claims 1 to 5, wherein each valve member normally stays in the open position and is adapted to return automatically to the open position upon removal of said ingress water.

7. The shut-off device as claimed in any one of claims 1 to 6, wherein at least one of the valve members is connected by means of a movable connector to the buoyant member and has its entire weight supported by the buoyant member.

8. The shut-off device as claimed in claim 7, including a base below which the buoyant member is located for, upon floating on said ingress water, moving upwards to urge the connector against the base to cause movement of the connector and in turn movement of said at least one valve member to the closed position.

9. The shut-off device as claimed in claim 8, wherein said at least one valve member is arranged

initially to move upwardly with the buoyant member from the open position and subsequently, upon the connector being urged against the base, to move outwardly relative to the buoyant member and to reach the closed position.

10. The shut-off device as claimed in claim 8 or claim 9, wherein the movable connector comprises at least one link pivotally connecting the valve member to the buoyant member for movement relative to the buoyant member.

11. The shut-off device as claimed in claim 10, wherein the movable connector includes two said links arranged to form a parallel linkage adapted to fix the angular position of the valve member in motion relative to the buoyant member.

12. The shut-off device as claimed in claim 10 or claim 11, wherein the link or at least one of the links has an actuating part arranged to be urged against the base to cause movement of the 1ink or links and in turn movement of the valve member relative to the buoyant member and to reach the closed position.

13. The shut-off device as claimed in claim 12, wherein the actuating part is provided by an integral part of the link or said at least one of the links.

14. The shut-off device as claimed in any one of claims 8 to 13, wherein the base has an abutment against which the connector is to be urged by the buoyant member floating on said ingress water, and includes a guide adapted to guide the movement of the buoyant member floating on said ingress water.

15. The shut-off device as claimed in claim 14, wherein the buoyant member is in sliding engagement with the guide for guiding thereby.

16. The shut-off device as claimed in claim 14 or claim 15, wherein the buoyant member has a buoyant body including a mount with which the guide is in sliding engagement for guiding the buoyant member.

17. The shut-off device as claimed in claim 16, wherein the guide comprises a plurality of vertical rails, and the mount has respective parts in sliding engagement with the rails.

18. The shut-off device as claimed in any one of claims 7 to 15, wherein the buoyant member has a buoyant body including a mount with which the connector is pivotally connected for movement relative to the buoyant member.

19. The shut-off device as claimed in any one of claims 1 to 18, wherein the valves include respective valve seats from which the corresponding valve members disengage in the open position and with which the valve members engage in the closed position.

20. The shut-off device as claimed in any one of claims 8 to 17, wherein the valves include respective valve seats from which the corresponding valve members disengage in the open position and with which the valve members engage in the closed position, the valve seats being connected with the base.

21. The shut-off device as claimed in claim 20, wherein the valve seats are connected at equiangular positions around the base.

22. The shut-off device as claimed in claim 20 or claim 21, wherein the valve seats are adapted to be connected with said pipe at respective upstream and downstream positions thereof, to provide immovable support for the base and in turn sliding support for the buoyant member.

23. The shut-off device as claimed in any one of claims 19 to 22, wherein the valve member and the valve seat of each valve have respective sealing parts for inter-engagement to close the valve, and at least one of the sealing parts is provided with a magnet or magnets for magnetic attraction with the other sealing part to hold the valve member in the closed position.

24. The shut-off device as claimed in any one of claims 1 to 23, including a housing in which said at least two valves and the buoyant member are installed, the housing having at least two openings for connection in said pipe to face upstream and downstream directions of the passage through said pipe.

25. The shut-off device as claimed in claim 24, wherein the openings include or are provided with respective valve seats of the valves for co-operation with the valve members to control (shut off) the passage through each opening.

26. The shut-off device as claimed in claim 24 or claim 25, wherein each opening includes or is provided with respective pipe jointing means for connection in said pipe.

27. The shut-off device as claimed in any one of claims 24 to 26, wherein the housing has a main chamber for acting as part of the passage through said pipe and includes a bottom chamber immediately underneath the main chamber, accommodating the buoyant member and at least part of the valve members and for collecting ingress water, and the buoyant member is arranged to float on collected ingress water initially to move the valve members out of the bottom chamber and finally to cause movement of the valve member to the closed position.

28. The shut-off device as claimed in claim 27, wherein the bottom chamber has a lower part which is openable for removal of ingress water collected in the bottom chamber.

29. The shut-off device as claimed in any one of claims 24 to 28, being a self-contained unit for connection and use in said pipe.