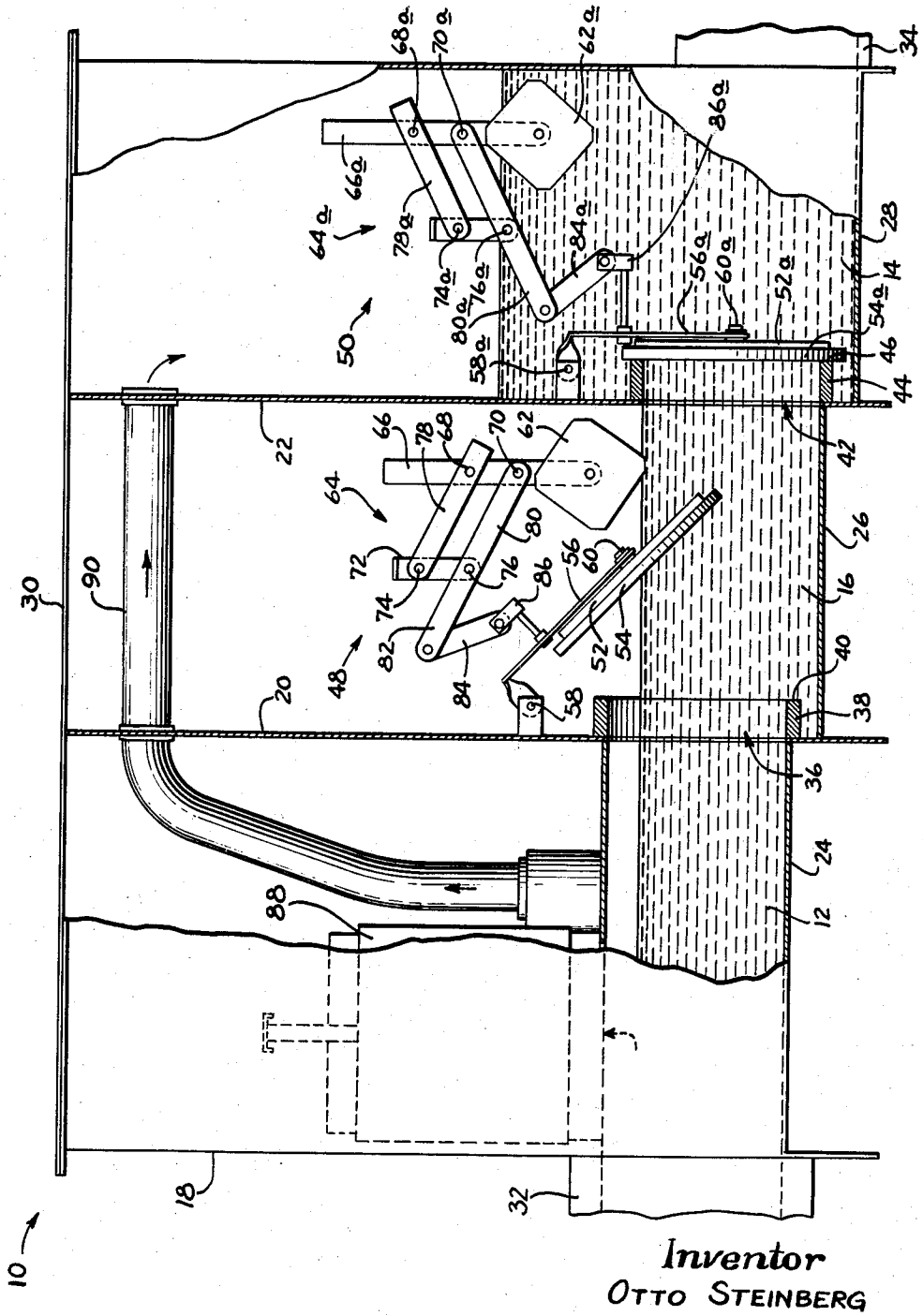
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BACKWATER CONTROL DEVICE FOR SEWERS

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Inventor

OTTO STEINBERG

By: Ooms, McDougall, Williams & Hersh

Attys.

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BACKWATER CONTROL DEVICE FOR SEWERS

Otto Steinberg, Plainview, Tex.

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This invention relates to devices for preventing water from backing up out of sewers into homes or other buildings.

One principal object of the invention is to provide a new and improved device that will positively prevent reverse flow of backwater above a predetermined level at the sewer outlet of a building.

A further object is to provide a new and improved backwater control device having means providing double safety against the rising of backwater.

Another object is to provide a new and improved backwater control device having means for discharging normal drainage into the sewer when the backwater has risen to such an extent that the backwater control feature of the device has gone into action.

Thus, it is an object of the present invention to prevent reverse flow of backwater while providing for disposal of normal drainage.

It is another object to provide such a new and improved backwater control device which is unusually simple in construction and low in cost.

Further objects and advantages of the present invention will appear from the following description, taken with the accompanying drawing, in which the single figure is a diagrammatic elevational sectional view showing a backwater control device which constitutes an illustrative embodiment of the invention.

The illustrated backwater control device **10** comprises an inlet or first chamber **12**, adapted to receive normal drainage from a building or the like, together with an outlet chamber **14** adapted to be connected to a sewer main. The backwater control device **10** also preferably includes an intermediate or second chamber **16** which is interposed between the first and third chambers **12** and **14**. In this instance, all three chambers **12**, **14** and **16** are formed by a single tank **18**, rather than a series of tanks, which might be provided. First and second partitions **20** and **22** divide the tank into the three chambers. Thus the first partition **20** is between the first and second chambers **12** and **16**, while the second partition **22** is between the second and third chambers **16** and **14**. The three chambers **12**, **16** and **14** have bottom walls **24**, **26** and **28** which are at successively lower levels to provide for normal drainage by gravity. A single, removable top wall or cover **30** closes the upper ends of all three compartments. In the usual installation, the cover **30** is approximately flush with the lowermost floor of the building, usually the basement floor.

An inlet pipe stub **32** leads into the first compartment **12** and is adapted to be connected to the drainage system of the building or the like, for receiving the drainage therefrom. In like manner, an outlet pipe stub **34** leads out of the outlet compartment **14** and is adapted to be connected to the sewer line.

Between the first and second compartments **12** and **16**, there is an opening **36** which extends through the partition **20**. A pipe stub or ring **38** is mounted in the second compartment **16** around the opening **36** to provide a valve seat **40** facing into the compartment **16**.

There is also an opening **42** extending through the partition **22** between the second and third compartments **16** and **14**. A pipe stub or ring **44** is mounted around the opening **42** to provide a valve seat **46** facing into the third compartment **14**.

The openings **36** and **42** are adapted to be closed by float valve mechanisms **48** and **50**, which are essentially the same in construction. Thus, only the intermediate float valve **48** need be described in detail. The components of the outlet float valve **50** will be given the same reference characters as applied to the corresponding components of the intermediate float valve **48**, with the addition of the suffix "*a*." In this way, the description of the intermediate float valve **48** may readily be read upon the outlet float valve **50**. It will be seen that the intermediate float valve **48** is equipped with a valve plate **52** faced with a sheet or plate **54** of synthetic rubber or other soft, resilient material. The rubber-faced plate **52** is adapted to move against the valve seat **40** so as to form a seal therewith and thereby close off the opening **36**.

The valve plate **52** is mounted for swinging movement toward and away from the valve seat **40**. In this instance, the plate **52** is carried by a flexible spring arm **56** which is swingably supported at its upper end by a pivot **58**, the lower end of the arm being connected to the center of the valve plate by a bolt **60** or the like.

To actuate the valve plate **52**, the valve mechanism **48** is equipped with a float **62**, connected to the valve plate **52** by means of a parallelogram linkage **64**. Thus, the float **62** is mounted on a vertically movable bar or member **66** which carries upper and lower vertically aligned pivots **68** and **70**. A fixed member **72** carries fixed upper and lower pivots **74** and **76** which also are vertically aligned. Upper and lower parallel links **78** and **80** extend between the movable member **66** and the fixed pivots **74** and **76**. More specifically, the upper link **78** is connected between the pivots **68** and **74**, while the lower link **80** is connected between the pivots **70** and **76**. One of the links, in this case the lower link **80**, has a lever arm **82** extending away from the float **62** and beyond the pivot **76**. A link **84** is pivotally connected between the arm **82** and a bracket **86** which is carried by the valve supporting arm **56**. Thus, upward movement of the float **62** tends to close the valve plate **52**, while downward movement of the float is effective to open the valve plate. The weight of the float **62** and the parallelogram linkage **64** is made sufficient to bias the valve plate **52** to its open position, in the absence of backwater.

It will be noted that the valve mechanism **50** in the outlet chamber **14** is on a lower level than the valve mechanism **48** in the intermediate chamber **16**. If any water backs up from the sewer into the chambers **14** and **16**, the rising backwater will reach the float **62***a* in the outlet chamber **14** before it reaches the float in the intermediate chamber **16**. Accordingly, the valve plate **52***a* in the outlet chamber **14** will be closed before the valve plate in the intermediate chamber **16**. Closure of the outlet valve plate **52***a* will ordinarily prevent any further reverse flow of backwater into the intermediate chamber **16**. Thus, under the usual backwater conditions, the outlet valve **52***a* will close, while the intermediate valve will remain open.

However, there is some chance that sticks, stones or other debris may become caught between the outlet valve member **52***a* and its seat **46**. In that case, the backwater will leak past the outlet valve **52***a* into the intermediate chamber **16**. Accordingly, the backwater will continue to rise in the chamber **16** and will cause closure of the intermediate valve **52**. Thus, the two valves **52** and **52***a* provide a double safety factor. If

either of the valves functions normally, the reverse flow of backwater into the inlet chamber will be arrested.

Provision is made for disposing of drainage when either or both of the float valves **52** and **52***a* are closed. In the illustrated construction, an automatic sump pump **88** is provided in the inlet chamber **12** and is arranged in the known manner to withdraw water from the inlet chamber whenever the water therein rises above a predetermined level. The water discharged by the pump **88** is fed into a discharge conduit **90** which carries the water into the outlet compartment **14**. It will be seen that the discharge end of the discharge conduit **90** is substantially above the level of the opening **42** through which drainage normally flows into the outlet compartment **14** when the valves **52** and **52***a* are open. Thus, the drainage water passes through the discharge conduit **90** only when the pump **88** is operating. The pump **88** easily develops enough pressure to prevent backwater from travelling into the inlet chamber **12** through the discharge conduit **90**. Moreover, the pump **88** is easily able to force the drainage water into the outlet chamber **14** against any backwater pressure that may exist therein.

In the operation of the backwater control device **10**, the valves **52** and **52***a* are normally biased to their open positions by the weight of the floats **62** and **62***a* and the linkages **64** and **64***a*. The drainage from the building or the like enters the inlet chamber **12** through the inlet connection **32** and normally flows through the connecting opening **36**, the intermediate chamber **16**, the connecting opening **42**, the outlet chamber **14**, and the outlet connection **34**, into the sewer.

Under flood conditions, water may back up from the sewer. However, the control device **10** prevents the backwater from rising to an objectionable level at the inlet connection **32**. The rising backwater in the outlet chamber **14** lifts the float **62***a* and closes the outlet valve **52***a* before the backwater reaches an objectionable level. Ordinarily, the valve **52***a* closes completely before the backwater rises to a sufficiently high level to close the intermediate valve **52**. However, if the outlet valve **52***a* should leak or should be held in a partly open position for any reason, the intermediate valve **52***a* will be closed by its float **62** before the backwater rises objectionably in the inlet chamber **12**. Thus, the two valves **52** and **52***a* provide a double safety factor.

When either or both of the valves **52** and **52***a* are closed, the drainage water can no longer flow into the sewer by gravity. Accordingly, it tends to accumulate in the inlet chamber **12**. However, the sump pump **88** is effective to withdraw drainage from the inlet chamber **12** and to discharge the drainage into the outlet chamber **14**, against any backwater pressure that may exsit therein. The pump **88** also prevents any backwater from passing into the inlet chamber **12** through the discharge conduit **90** of the pump.

It will be recognized that the backwater control device is effective in operation. It provides a high degree of safety against reverse flow of backwater. Moreover, the backwater control device is unusually simple in construction and low in cost. The entire device may readily be serviced by removing the cover **30**.

Various modifications, alternative constructions and equivalents may be employed without departing from the true spirit and scope of the invention as exemplified in the foregoing description and defined in the following claims.

I claim:

1. In a backwater control device for sewers, the combination comprising means defining first, second and third substantially closed chambers, inlet means leading into said first chamber for receiving drainage, first connecting means extending between said first and second chambers for carrying the drainage therebetween, second connecting means extending between said second and third chambers for carrying the drainage therebetween, outlet means leading from said third chamber and adapted to be connected to a sewer for carrying the drainage therebetween, and first and second float valves biased to open positions and movable to closed positions for closing said first and second connecting means respectively in response to the rising of backwater to predetermined levels in said second and third chambers, said second float valve being disposed at a substantially lower level than said first float valve and thereby being effective to close prior to closure of said first valve, said first float valve being effective to close in the event that backwater should continue to rise in said second chamber due to leakage past said second valve.

2. In a backwater control device for sewers, the combination comprising means defining first and second substantially closed chambers, inlet means leading into said first chamber for receiving drainage, connecting means extending between said first and second chambers for carrying drainage therebetween, outlet means leading from said second chamber and adapted to be connected to a sewer for carrying drainage therebetween, said connecting means defining a valve seat facing into said second chamber, a valve plate movable against and away from said valve seat, a flexible spring arm having its upper end pivotally supported and its lower end connected to said valve plate for swingably supporting said valve plate, a parallelogram linkage including a first pair of fixed horizontal pivots disposed one above the other, a movable vertical member carrying a second pair of horizontal pivots disposed one above the other, upper and lower parallel links extending between the upper and lower pivots of said pairs and supporting said vertical member for vertical movement, said links being disposed above the level of said valve plate, one of said links having a lever arm rigidly connected thereto and swingable therewith about the corresponding pivot of said first pair, an additional link connected between the outer end of said lever arm and said spring arm and extending downwardly therebetween, and a float mounted on said vertical member and effective to close said valve plate in response to the rising of backwater in said second chamber to a predetermined level, the weight of said linkage and said float being effective to bias said valve plate away from said valve seat to open position, said additional link being connected to an intermediate point on said spring arm to flex said spring arm and thereby apply spring pressure to said valve plate.

3. In a backwater control device for sewers, the combination comprising a tank having a pair of partitions defining first, second and third compartments therein, means defining an inlet opening leading into said first compartment for receiving drainage, means defining a second opening extending through one of said partitions between said first and second compartments for carrying the drainage therebetween, means defining a third opening extending through the other of said partitions between said second and third compartments to carry the drainage therebetween, means defining an outlet opening leading from said third compartment and adapted to be connected to a sewer main to carry the drainage out of said third compartment, first valve seat means around said second opening and facing into said second compartment, a swingable valve plate movable against and away from said first valve seat means, an operating mechanism connected to said valve plate and yieldably biasing said valve plate away from said first valve seat means, said mechanism including a float located in said second compartment and effective to close said valve plate against said first valve seat means in response to the rising of backwater in said second compartment to a predetermined level, second valve seat means around said third opening and facing into said third compartment, a second valve plate swingable against and away from said second valve seat means, and a second actuating mechanism connected to

said second valve plate and yieldably biasing said second valve plate away from said second valve seat means, said second mechanism including a second float located in said third compartment and effective to close said second valve plate against said second valve seat means in response to the rising of backwater in said third compartment to a predetermined level, said second float being disposed at a substantially lower level than said first mentioned float and thereby being effective to close said second valve plate prior to closure of said first valve plate, said first float being operative to close said first valve plate in the event that backwater should leak past said second valve plate.

4. In a backwater control device for sewers, the combination comprising means defining first, second and third substantially closed chambers, inlet means leading into said first chamber for receiving drainage, first connecting means extending between said first and second chambers for carrying the drainage therebetween, second connecting means extending between said second and third chambers for carrying the drainage therebetween, outlet means leading from said third chamber and adapted to be connected to a sewer for carrying the drainage thereto, said first and second connecting means defining respective first and second valve seats facing into said second and third chambers, first and second valve plates movable against and away from said respective first and second valve seats, each of said valve plates being provided with a flexible spring arm having its upper end pivotally supported and its lower end connected to said valve plate for swingably supporting said valve plate, first and second floats disposed inside said second and third chambers for closing said valve plates in response to the rising of backwater therein, and first first and second parallelogram linkages connected between said respective first and second floats and said first and second valves plates, each of said linkages including a first pair of fixed horizontal pivots disposed one above the other, a movable vertical member rigidly secured to the corresponding float and carrying a second pair of horizontal pivots disposed one above the other, upper and lower parallel generally horizontal links extending between the upper and lower pivots of said pairs and supporting said vertical member and the corresponding float for vertical movement, said links being disposed above the level of the corresponding valve plate, one of said links having a lever arm rigidly connected thereto and swingable therewith about the corresponding pivot of said first pair, and an additional link connected between said lever arm and said spring arm of the corresponding valve plate and extending downwardly therebetween, said additional link being connected to an intermediate point on the corresponding spring arm to flex said spring arm and thereby apply spring pressure to said valve plate, the weight of each linkage and float being effective to bias the corresponding valve plate away from said valve seat to open position, said second float being disposed at a substantially lower level than said first float and thereby being effective to close said second valve plate prior to closure of said first valve plate, said first float being operative to close said first valve plate in the event that backwater should leak past said second valve plate.

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