Aug. 13, 1940. L. A. BROOKE 2,211,491

FLEXIBLE PORT CLOSURE

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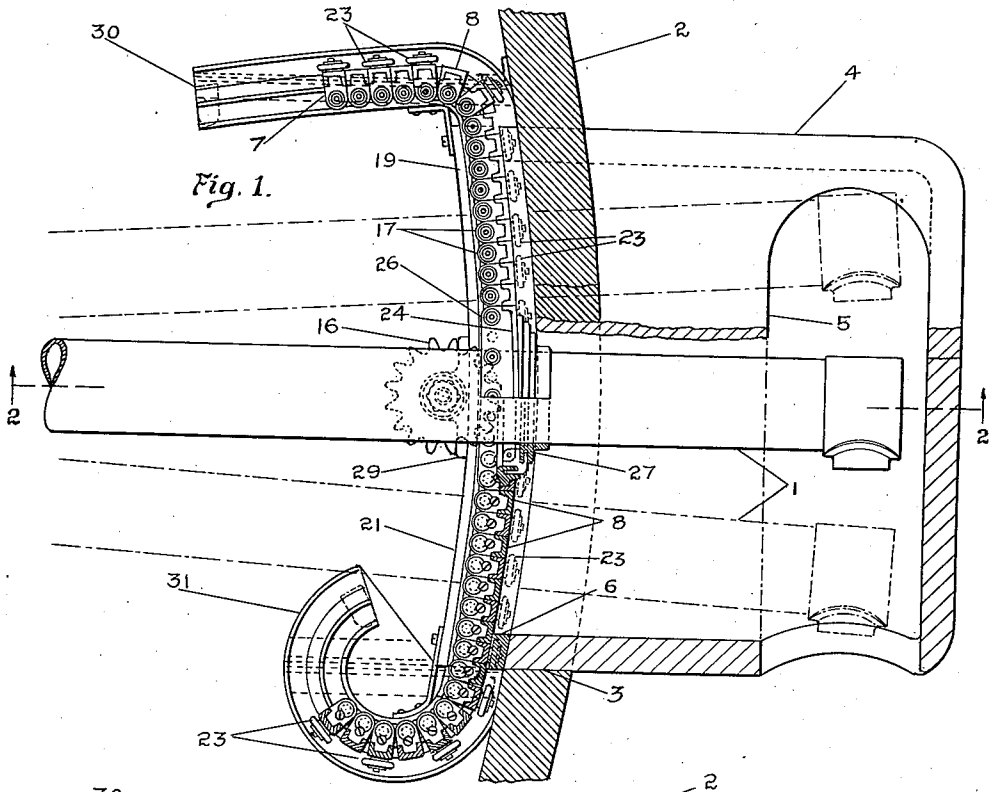



Fig. 1.

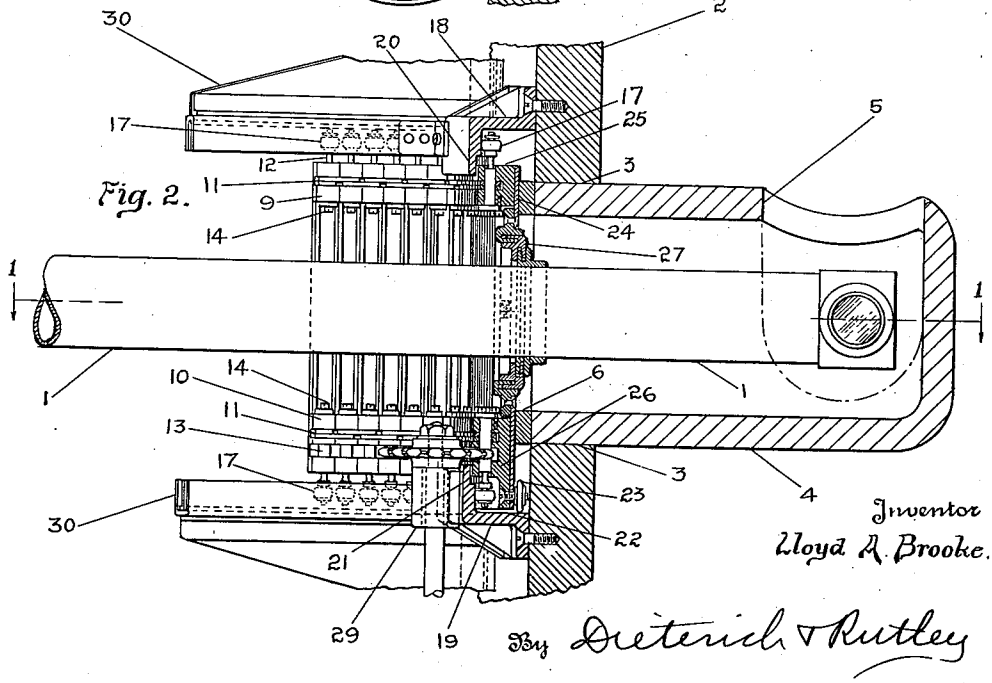



Fig. 2.

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FLEXIBLE PORT CLOSURE

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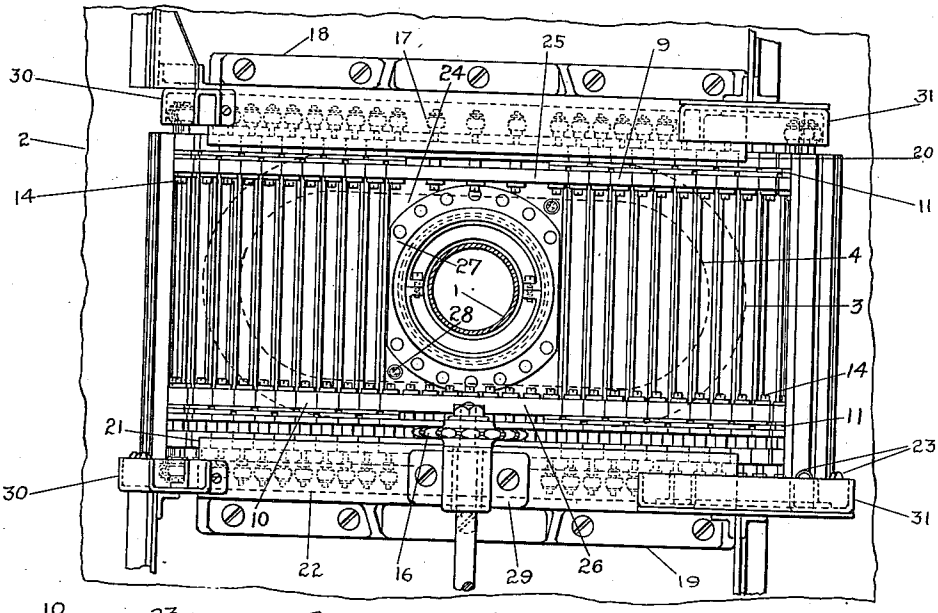



Fig. 3.

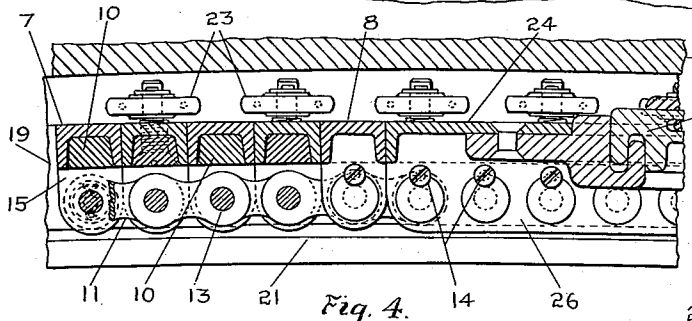



Fig. 4.

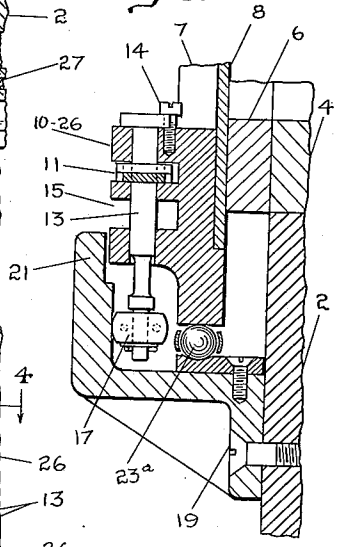



Fig. 6.

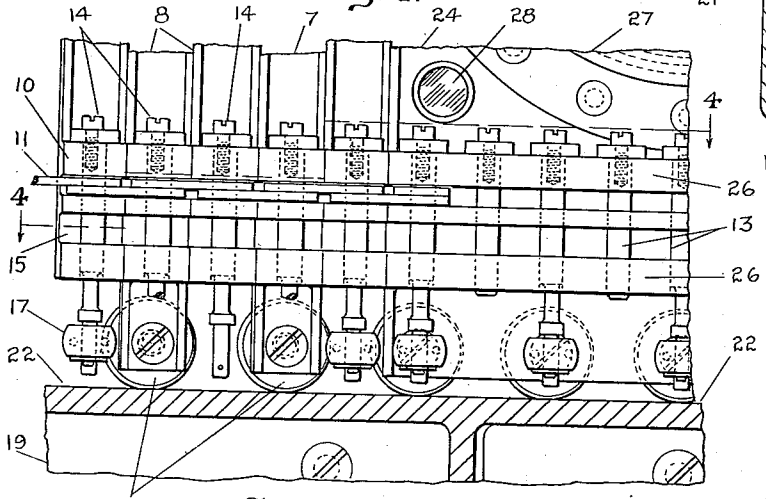



Fig. 5.

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FLEXIBLE PORT CLOSURE

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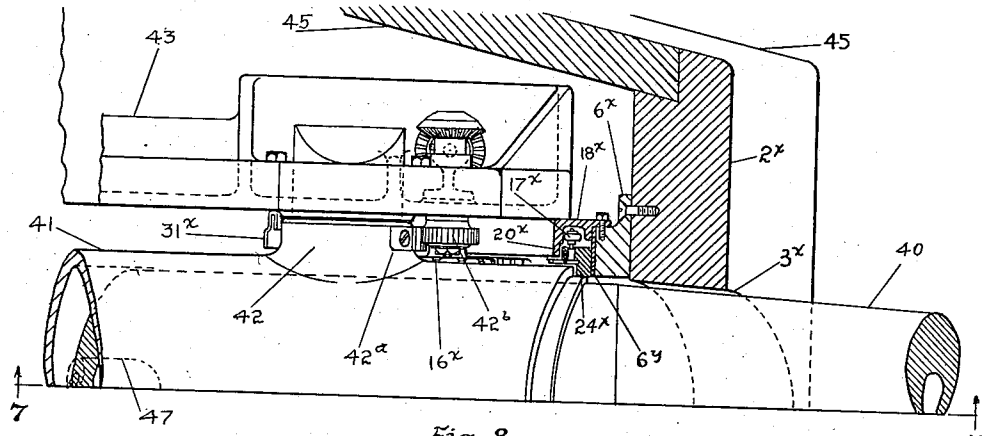



Fig. 8.

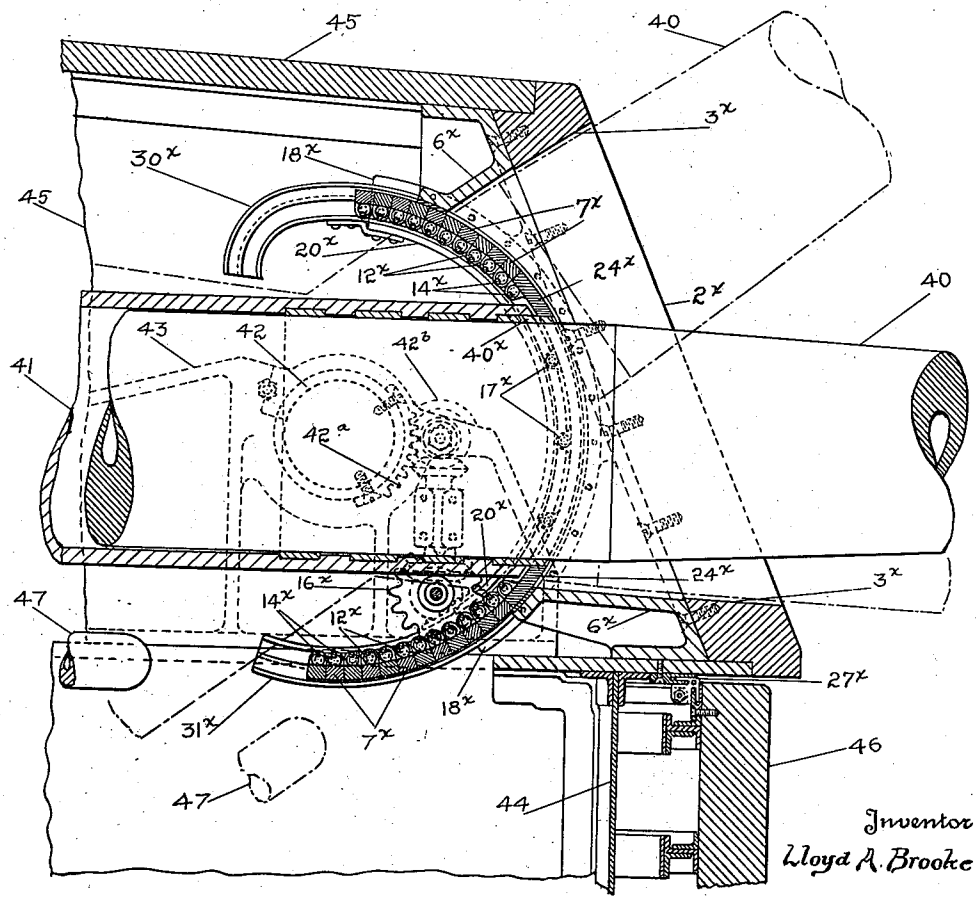



Fig. 7.

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FLEXIBLE PORT CLOSURE

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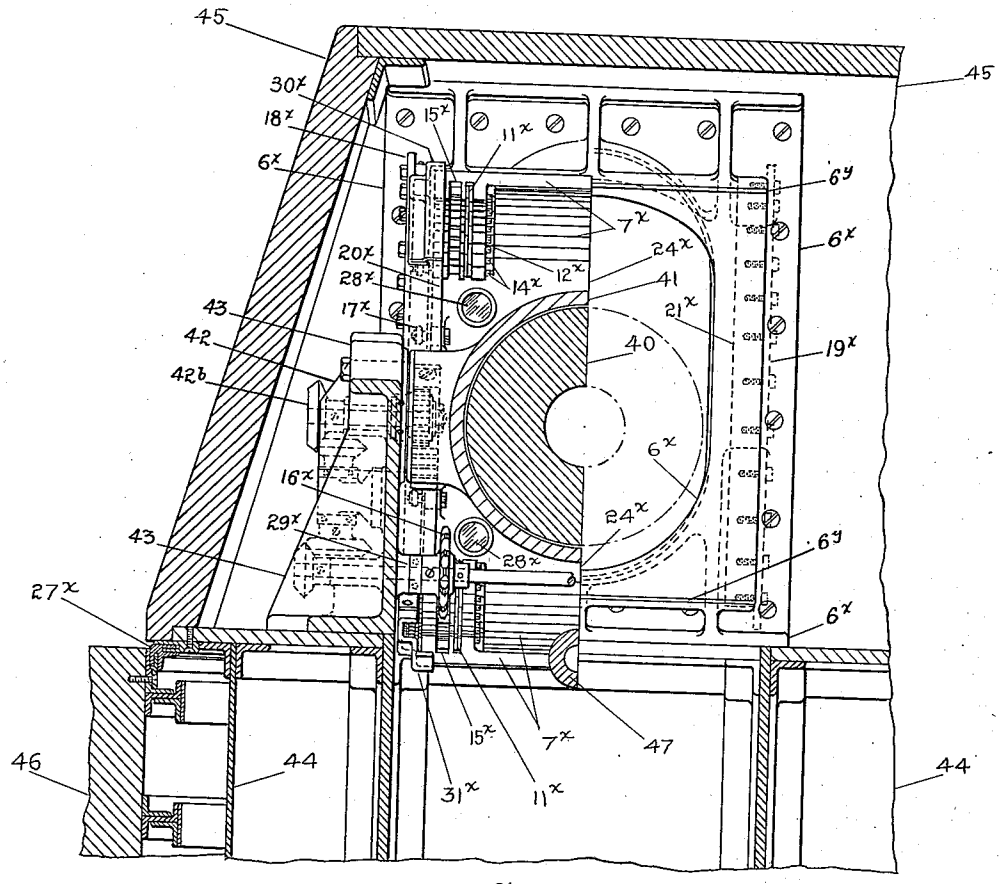



Fig. 9.

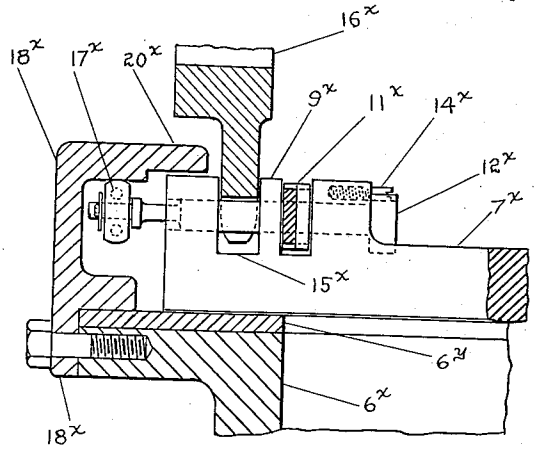



Fig. 10.

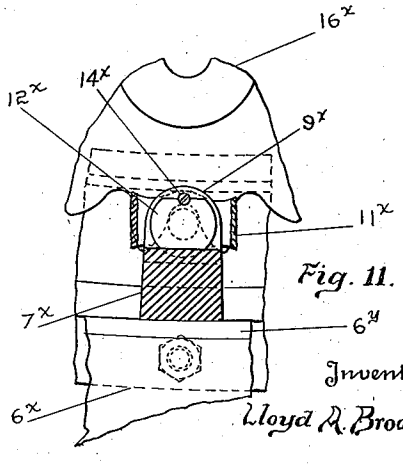



Fig. 11.

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FLEXIBLE PORT CLOSURE

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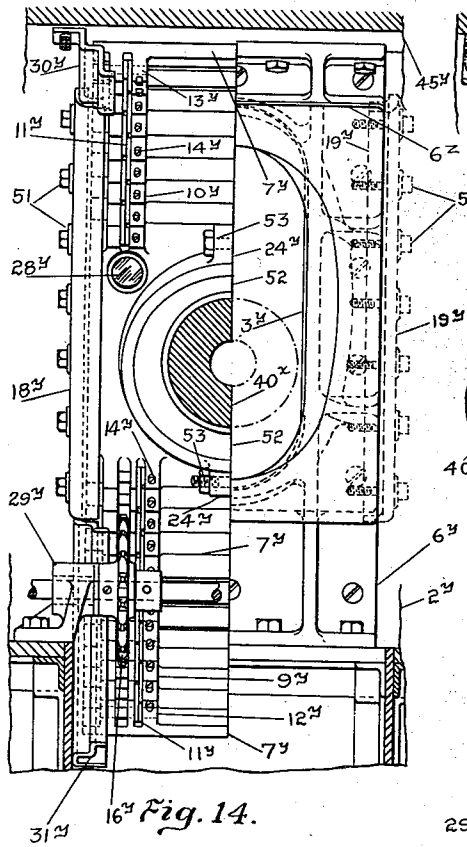


Fig. 14.

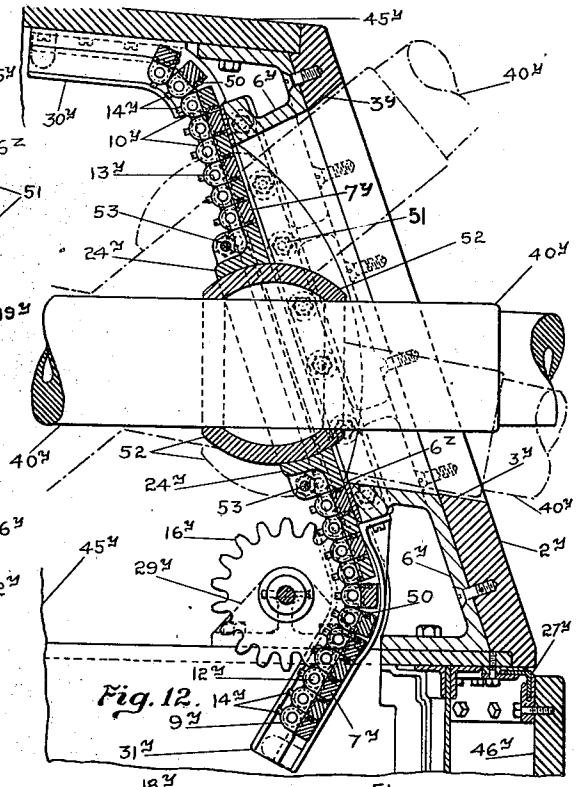


Fig. 12.

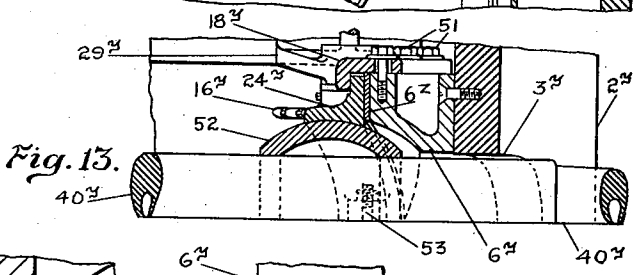


Fig. 13.

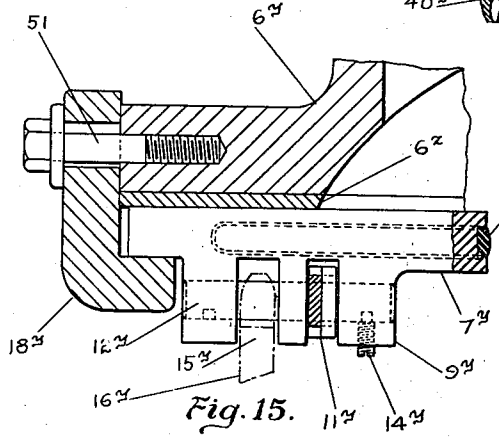


Fig. 15.

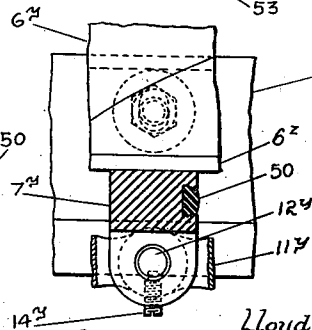


Fig. 16.

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Patented Aug. 13, 1940 2,211,491

# UNITED STATES PATENT OFFICE

2,211,491

## FLEXIBLE PORT CLOSURE

Lloyd A. Brooke, Washington, D. C.

Application April 27, 1939, Serial No. 270,456

17 Claims. (Cl. 89—36)

My invention relates to a method of effectively sealing the port openings in the housings for guns, machine guns, range finders, tank guns, airplane mountings, telescope port openings, and the like, so as to protect the personnel from machine gun fire and bursting shell fragments, and to keep out water, dust, smoke, gas and the like by an apparatus that may be manufactured of armor plate, preferably, varied in size, strength, weight and construction of design to meet any condition that may be required, that may be operated by a means that will not put any load on the equipment to which it is attached, and that will be simple to manufacture and may be readily installed or repaired.

The means by which this is accomplished, being manufactured preferably entirely of metal, consists generally of:

A series of members, bars, in either the vertical or horizontal planes that fit together at the sides with each other, while the faces of the bars fit to a metal flange secured to the housing. The bar members are kept in contact with said flange by rollers on a spring-like shaft or a spring bearing, while the weight of the bars, in the vertical plane arrangements, is supported by rollers or ball bearings. The bar members are attached to each other by means of chain links, making them flexible, and are so constructed that they may be actuated by a sprocket or gear driven by a motor controlled by a variable speed gear, or driven by a gear train from the movement of the equipment, or in any other approved manner. This gives a flexible closure for port openings that will effectively seal the openings, that can be conveniently housed at the ends in comparatively little space, that can be readily installed and repaired, and that will add but little weight to the housing and no load on the operating mechanism of the equipment. In the case of range finders the closure, being located near the ends of the equipment, acts as a steadying member.

Other objects will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends, the invention still further resides, in purpose, in the novel details of construction, combination and arrangement of parts, and in its possible variation in size, shape, weight, material used, and construction to meet any required conditions, all of which will be first fully described in the following detailed description and then be particularly pointed out in the appended claims, reference being had to the accompanying drawings, in which:

Fig. 1 is a partial plan view of a typical closure for small or medium-sized rotating and oscillating equipment, the portion above the center line being shown with the upper guide rail removed, while the portion below the center line shows a section taken at the line 1—1 in Fig. 2.

Fig. 2 is a sectional side elevation of Fig. 1 with the section taken at the line 2—2 in Fig. 1.

Fig. 3 is a rear elevation of Fig. 1.

Fig. 4 is a plan view of a portion of the flexible closure, on an enlarged scale to show more detail, with the section taken on approximately the line 4—4 of Fig. 5.

Fig. 5 is a rear elevation of Fig. 4.

Fig. 6 is a lower portion of the closure in cross section, showing it supported by ball bearings.

Fig. 7 is a partial side elevation of a typical closure for medium and large oscillating equipment, with the section taken on the center line 7—7 of Fig. 8 of a gun turret mount.

Fig. 8 is a plan view of Fig. 7.

Fig. 9 is a rear elevation of Fig. 7, with the other side showing the port opening with the equipment removed.

Fig. 10 is a side view of one end of the closure bars, in detail and on an enlarged scale.

Fig. 11 is an end view of Fig. 10.

Fig. 12 is a partial side elevation of a typical simple closure with pivotal and sliding bearing for small oscillating equipment, with the section taken on the center line, of a small gun turret mount.

Fig. 13 is a plan view of Fig. 12, with a partial section at the center line.

Fig. 14 is a rear elevation of Fig. 12, with most of the equipment removed.

Fig. 15 is a side view of one end of the closure bar in detail and on an enlarged scale.

Fig. 16 is an end view of Fig. 15.

A practical embodiment of the invention in three forms is disclosed in the drawings, in which similar numerals indicate corresponding parts throughout the several views, as follows:

Referring to drawings Figs. 1 to 6, inclusive, one end of the equipment 1 (range finder) is shown projecting out of the housing or turret 2, through the port opening 3, which may or may not be fitted, as the equipment requires, with the hood 4. The hood 4 is fitted with the open port 5 to give the necessary visibility for the eye of the equipment 1 in rotation, as well as oscillation. The inner edge of the port opening 3 is fitted with a flange 6, preferably of a rust-

resisting, non-corrosive metal, secured to the housing 2 by any suitable means. The inner face of the flange 6, finished in an arc radial with the center of the pivotal point of the equipment, is the sealing and bearing surface for the face 8 of the bars 7 which fit it and are held against it in a manner hereinafter described. The bars 7 may be manufactured of any suitable material, preferably metal, in any width or thickness, and in any manner that conditions may require.

As shown, these bars 7 are constructed of channel irons with end pieces or blocks 9 and 10 secured to the bars in any approved manner. The sides of bars 7 are true and must fit with each other in order to make a seal, and they may be so finished that when they are together on the sealing surface of the flange 6 they will take up any lost motion in the connecting chain links 11 with which the bars 7 are fitted and attached to each other at or near the end of each bar. The links of the chain 11, of sufficient strength to carry the required series of bars 7 to make the closure, are joined by the pins 12 and 13 in the ends 9 and 10 in a recess for that purpose. The pins 12 and 13 are fitted with heads and secured by the lock screws 14, or in any other approved manner. These pins may be made continuous, if desired, going from top to bottom of the bar 7. The lower end 10 is further provided with a recess 15 through which the pin 13 passes (although either end, or both ends, may be so provided), acting to engage the driving sprocket or gear 16 for the purpose of actuating the closure. The pins 12 and 13 continue on out of the ends 9 and 10, where a reduced diameter and length is fitted on the end with the ball-bearing rollers 17. The reduced diameter and its length are such that there will be given a spring effect, putting the rollers 17 under a sufficient tension on the guide rails 18 and 19 to keep the outer face 8 of the bars 7 properly in contact with the sealing surface of the flange 6. Any other suitable means may be employed properly to maintain his contact.

The guide rails 18 and 19, in this case secured to the housing by any approved means, are fitted with flanges 20 and 21 against which the bars 7 will come to rest when any shock, or the like, drives one or more of them to the rear, thus taking the strain off the roller spring before any damage is done to the roller or bearing and preventing it from returning the bar or bars to their former position. The lower rail 19 has a horizontal surface 22 on which the ball-bearing roller 23, fitted to the lower end of each or every other of the bars 7, contacts to carry the weight and make the moving of the closure easy and smooth. The rollers may be fitted to the upper ends of the bars and operated on a track, or the weight and movement may be carried on a series of ball or roller bearings $23^a$, as shown by Fig. 6.

In close proximity to the equipment 1 and around it is the plate or slab 24, formed to fit the sides of the bars 7 next to it (see Fig. 4) and fitted with pieces 25 and 26 which are constructed to meet the required conditions and to conform with the bars 7. Where the equipment 1 passes through the plate 24 the seal against rotation is made by the labyrinth closing device 27, as shown. In closures where an observation window or sight hole is required, it may be placed in the plate 24 as shown at 28. The plate 24 may be in two sections and joined by the flange on the labyrinth device 27, or in any other approved manner. In oscillating equipment where the labyrinth closing device 27 is not necessary but where it is required to open the port closure at times for ventilation, the plate 24 with the pieces 25 and 26 may be divided on the vertical center line and secured by latches so that it can be opened and closed readily.

The driving sprocket 16 may be placed at any convenient point above or below the equipment, or both, with its bearing 29 designed and secured in any approved manner. The sprocket should preferably be driven by a motor whose speed and direction are controlled by a variable speed gear the tilting box of which is actuated by and synchronized to the movement of the equipment, or it may be possible under some conditions to drive the sprocket 16 by a gear train actuated by the movement of the equipment, or in equipment where there is a steadying and operating means well removed from the center of the equipment 1 and near the inner wall of the housing 2, the plate 24 or the stationary ring of the labyrinth closing device 27 may be attached to, or integral with, this steadying and operating means, thus doing away with any means other than this to actuate the port closure mechanism.

The ends of the port closure not in contact with the sealing surface of the flange 6 may be stowed or housed in housings such as shown by 30 or 31, secured and supported in any approved manner where conditions permit, or they may be housed in a housing following the curvature of the port closure.

Referring to Figs. 7 to 11, inclusive, showing an oscillating equipment (turret gun mount) the gun proper 40 is mounted, carried, in the usual slide 41 supported by trunnions 42 in the deck lugs 43 which in turn are supported and secured to the girders in the turret pan 44. The turret or housing 45, fitted with port $3^x$ in the front plate $2^x$, is supported in the usual manner on a roller path below the turret pan 44 and surrounded by the usual barbette 46 at the top of which, and sealing it with the turret, is the labyrinth closure device $27^x$. The end of the counter-recoil plunger head 47 is shown below the slide. Backing the front plate $2^x$ is, preferably, a steel casting $6^x$ forming the closure bearing surface, which is fitted or lined with a non-corrosive metal plate $6^y$ (Fig. 10) secured in any approved manner, upon which the closure bars $7^x$ make the seal. The bars $7^x$ may be manufactured of any metal, in any width or thickness, and in this case are shown in one piece including the ends $9^x$ which are identical, but the recess for the driving sprocket may be omitted in the bars $7^x$ above the plate $24^x$ if desired. The same conditions are met regarding the fitting of the bars $7^x$ with each other and with the sealing surface $6^y$. They are also fitted, near the ends, with the chains $11^x$. The links of the chain must meet the required conditions, and are joined by the pins $12^x$, which in this case are identical in both ends, in a recess for that purpose. The pins $12^x$ are fitted with heads and secured by lock screws $14^x$ engaging the heads of the pins $12^x$ as shown, or they may be secured in any approved manner, as well as being constructed of one piece going from side to side of the port closure.

The ends of the bars $7^x$ are further provided with the recesses $15^x$ through which the pins $12^x$ pass, acting to engage the driving sprockets or gears $16^x$ for the actuating of the port closure. Each pin $12^x$ continues on out of the ends of the

bars $7^x$ where it has a length and a reduction in diameter, for the same purpose as in the foregoing case, and on the end of which pin is fitted the ball-bearing roller $17^x$. The same effect is met as heretofore in keeping the roller $17^x$, under slight tension, against the guide rails $18^x$ and $19^x$ sufficient to keep the outer face of the bars $7^x$ in proper contact with the sealing surface $6^y$ of the flange $6^x$. Any other approved means may be employed, regarding the spring effect at the roller, to properly accomplish this contact and sealing effect.

The guide rails $18^x$ and $19^x$ ($19^x$ being the opposite rail) are secured to the steel casting, forming part of the closure and the sealing surface flange $6^x$, in any approved manner, but always in such manner that they may be readily assembled or removed. The rails $18^x$ and $19^x$ are each fitted with a flange $20^x$, $21^x$ being the opposite flange, against which the bars $7^x$ will come to rest when any shock, or the like, drives the bars to the rear, taking the strain off of any spring mechanism, or the like, on the rollers $17^x$ and leaving them free immediately to renew the seal between the bars and the sealing surface.

In close proximity to the equipment, gun 40, and around it, but bearing on the forward bronze bearing ring $40^x$ in the slide 41, is the plate or slab $24^x$ constructed so that the bars $7^x$ may be attached to it and having three or more intermediate rollers $17^x$ to hold it against the sealing surface $6^y$. Where an observation or sight hole is necessary, it may be placed at either position shown by $28^x$. The plate $24^x$ may be in two or more sections and joined in any approved manner. It may be possible in some cases to actuate the port closure by this plate through the motion of the mount by the elevating gear of the mount.

The driving sprocket $16^x$ may be placed at any convenient point, but for obvious reasons it should be near the bottom of the port closure and on both sides of it, with one shaft and with the bearings $29^x$ placed or secured in any approved manner. The sprocket $16^x$ should, preferably, be driven by a motor as in the foregoing case, or it may be driven by the gear train $42^b$ as shown with a toothed arc or rack $42^a$, attached to the trunnions 42 of the slide 41 and the gear ratio and hookup such that it will properly pick up the closure. Or the gear train or gears may be driven or actuated in any approved manner to accomplish the proper results.

The ends of the closure not in contact with the sealing surface $6^y$ may be stowed or housed in housings such as shown by $30^x$ or by $31^x$ secured and supported in any approved manner.

Referring to Figs. 12, 13, 14, 15 and 16, oscillating equipment (turret mount for small guns), the gun proper or gun barrel $40^y$ is mounted or carried, and operated and actuated in any approved manner. The turrent or housing $45^y$, fitted with the port opening $3^y$ in the front plate $2^y$, is supported and rotated in any approved manner and is surrounded by the usual barbette $46^y$ or the like, at the top of which, and sealing it with the turrent $45^y$, is a simple form of labyrinth closure device $27^y$. Backing the front plate $2^y$ is, preferably, a steel casting $6^y$ forming the closure and the bearing surface for the flexible portion, which in this case is a flat or plane surface and which is fitted or lined with a non-corrosive metal plate $6^z$ secured to it in any approved manner, upon which the closure bars $7^y$ make the seal. In this case, especially, there should preferably be provided suitable lubricating grooves in the face of the sealing surface $6^z$, as well as a proper means of lubrication, but as the lubrication system is no part of the present invention it has not been illustrated.

The bars $7^y$ may be manufactured of any metal, preferably, in the desired or required width and thickness, and in this case are shown in one piece, including the ends $9^y$ and $10^y$. The ends $9^y$ of the lower bars $7^y$ include the recess for the driving sprockets, while the ends $10^y$ of the upper bars $7^y$ have the recess for the driving sprockets omitted. The same conditions are met regarding the fitting of the bars $7^y$ with each other and with the sealing surface $6^z$ and, in addition, the bars are provided on one side of each with a recess in which a rubber, felt, or the like, packing 50 may be placed, when necessary in some extreme cases.

The ends $9^y$ and $10^y$ are also provided with the chains $11^y$ at each end of the bars $7^y$. The links of the chain are joined by the pins $12^y$ and $13^y$, thus joining the bars to each other, in recesses for that purpose. The pins $12^y$ and $13^y$, identical at each end, are secured by the set screws $14^y$ in the bar ends $9^y$ and $10^y$, or they may be secured in any approved manner, as well as being constructed of one piece going from side to side of the closure bars.

The ends $9^y$ of the lower bars $7^y$, provided with the recesses $15^y$ through which the pins $12^y$ pass, act to engage the driving sprockets or gears $16^y$ to actuate the flexible port closure. The driving sprockets $16^y$ may be placed at any convenient point, but for obvious reasons should be near the bottom of the flexible port closure and on both sides of it with one shaft and with the bearings $29^y$ placed and secured in any approved manner. The sprockets $16^y$ should be driven by a motor whose speed and direction are controlled by a variable speed gear, the tilting box of which is actuated and synchronized by and to the movement of the equipment.

The guide rails $18^y$ and $19^y$ ($19^y$ being the opposite rail) are secured to the steel casting $6^y$ by means of the bolts and washers 51 which pass through the guide rails in slotted holes, allowing the rail to be set against the bars $7^y$ as desired, and also to allow the rails to give back (the rails being held in place by the tension set up in the bolt 51) when any shock drives the bars back, thus doing no damage to the bars or rails, which rails may be reset at any time. The displacing of the rails will not destroy the action of the equipment, but will destroy the seal against only smoke, gas, and the like. The inner face of the rails contacting the bars $7^y$ should be fitted with a suitable lubricating groove (not shown).

In close proximity and fitted around the equipment $40^y$ is the spherical section 52 which slides on the gun in recoil and when the bearing on the plate $24^y$ surrounding and bearing on it moves up and down the flat sealing surface. This spherical bearing 52 may, when desired and conditions permit, be used to allow a limited movement in any direction, and it may also bear and slide on a bearing fixed to the oscillating portion of the equipment and not on the recoiling portion of the gun $40^x$. The plate $24^y$, constructed to conform with the bars $7^y$ and attached to them by the chain $11^y$, is divided on the center line at right angles to the bars and is secured by the bolts 53 passing through lugs on the plate $24^y$

Where an observation or sight hole is necessary, it may be placed on either or both sides of the closure, as shown by $28^y$.

Where the closure requires the bars 7y to be vertical, it would be necessary to employ ball or roller bearings at the lower end of the bars, as shown by Fig. 6.

The ends of the closure not in contact with the sealing surface 6z may be stowed or housed in housings such as shown by 30y and by 31y secured and supported in any approved manner.

In closures where it is desired, and conditions permit, the sprockets and driving mechanism may be omitted and the flexible port closure may be actuated entirely by the movement of the equipment, or the equipment may be actuated by the driving mechanism for the movement of the flexible port closure.

The sealing surface may be anything from radial, with the pivotal center of the equipment, to straight. In any seal but radial the spherical and sliding member is necessary, varying in extent and size according to the curvature of the sealing surface, the largest being required in the straight or plane surface type for equipment of equal size.

Where it is required, and conditions permit, the port closure may be extended to seal a twin or triple port.

It can readily be seen from the foregoing description that such arrangements will produce an all-metal (preferably) seal that is inexpensive and effective in protecting the operating personnel against machine gun fire and bursting shell fire, weather, rain, water, dust, gas, smoke, and the like. It will produce a closure that can be manufactured to withstand any usual shock or gun fire and that will not be affected by ice coating or the like and that can be constructed to meet any requirements for which it is intended.

It is simple in construction, manufacture, assembly and disassembly, with the parts readily replaceable at any time. It is not intended to hold any of the designs to the shape or form above shown in the drawings, or for the uses heretofore specified. Any change in the details may be made so long as the same conditions are met.

The idea is new and unique in purpose, construction and effectiveness, making a seal for port openings which I have called a "flexible port closure."

From the description, taken in connection with the accompanying drawings, it is thought that the construction, uses and advantages of the invention will be readily apparent to those skilled in the art.

What I claim is:

1. In combination with a housing having a port through which a suitable equipment projects, of a flexible port closure apron comprising a series of parallel bars, and means to maintain such of said bars as lie over the port opening in fluid-tight contact with one another and with the portion of the housing surrounding said port.

2. In combination with a housing having a port through which a suitable equipment projects, of a flexible port closure apron comprising a series of parallel bars, means to maintain such of said bars as lie over the port opening in fluid-tight contact with one another and with the portion of the housing surrounding said port, said contact maintaining means including adjacent true faces of the bars, articulated members connecting adjacent bars together, and resilient means to press the bars toward the wall surrounding the port opening.

3. In combination with a housing having a port through which a suitable equipment projects, of a flexible port closure apron, resilient means continuously tending to maintain sealing contact between said apron and the wall surrounding said port, and means to protect said resilient means against injury should said apron be forced back out of contact with said wall.

4. In combination with a housing having a port through which a suitable equipment projects, of a flexible port closure apron, resilient means continuously tending to maintain sealing contact between said apron and the wall surrounding said port, and means to protect said resilient means against injury should said apron be forced back out of contact with said wall, said protecting means comprising guide rails.

5. A means for sealing a port in a housing, said means comprising a movable apron which includes a plurality of bars or slats having true side faces for contact with one another and having true front faces, a flange secured to the housing around the port, said flange having a true sealing face for contact by the front faces of said apron's bars, means continuously urging those of said front faces which overlie the flange into sealing contact with the flange's sealing face, and means connecting adjacent bars held over said port together to hold their side faces in sealing contact.

6. A means for sealing a port in a housing, said means comprising a movable apron which includes a plurality of bars or slats having true side faces for contact with one another and having true front faces, a flange secured to the housing around the port, said flange having a true sealing face for contact by the front faces of said apron's bars, means continuously urging those of said front faces which overlie the flange into sealing contact with the flange's sealing face, and articulated means connecting adjacent bars held over said port together to hold their side faces in sealing contact.

7. A means for sealing a port in a housing, said means comprising a movable apron which includes a plurality of bars or slats having true side faces for contact with one another and having true front faces, a flange secured to the housing around the port, said flange having a true sealing face for contact by the front faces of said apron's bars, means continuously urging those of said front faces which overlie the flange into sealing contact with the flange's sealing face, means connecting adjacent bars held over said port together to hold their side faces in sealing contact, and means to protect said urging means against injury should the apron be forced inwardly away from the port flange.

8. A flexible port closure for a housing having a port through which a member projects, said closure comprising in combination with the housing and the projecting member, a face-flange rigidly mounted in the housing around its port, an apron composed of a set of parallel bars having side faces formed to lie in fluid-tight contact with one another when the bars are over the port and having front faces to engage with sealing contact said face-flange, yieldable means continuously tending to press said front faces to said face-flange, and articulated means connecting adjacent bars together into a unitary structure.

9. A flexible port closure for a housing having a port through which a member projects, said closure comprising in combination with the housing and the projecting member, a face-flange rigidly mounted in the housing around its port,

an apron composed of a set of parallel bars having side faces formed to lie in fluid-tight contact with one another when the bars are over the port and having front faces to engage with sealing contact said face-flange, yieldable means continuously tending to press said front faces to said face-flange, articulated means connecting adjacent bars together into a unitary structure, and means cooperating with said bars to protect said yieldable means against injury should the apron over the port be driven inwardly.

10. A flexible port closure for a housing having a port through which a member projects, said closure comprising in combination with the housing and the projecting member, a face-flange rigidly mounted in the housing around its port, an apron composed of a set of parallel bars having side faces formed to lie in fluid-tight contact with one another when the bars are over the port and having front faces to engage with sealing contact said face-flange, yieldable means continuously tending to press said front faces to said face-flange, and articulated means connecting adjacent bars together into a unitary structure, said articulated means comprising chains of links connecting the bars together at their tops and bottoms respectively.

11. In combination with a housing having a port through which a suitable equipment projects, of a flexible port closure apron comprising a series of parallel bars, means to maintain such of said bars as lie over the port opening in fluid-tight contact with one another and with the portion of the housing surrounding said port, said bars being vertically disposed, and means for slidably supporting said apron.

12. In combination with a housing having a port through which a suitable equipment projects, of a flexible port closure apron comprising a series of parallel bars, means to maintain such of said bars as lie over the port opening in fluid-tight contact with one another and with the portion of the housing surrounding said port, said bars being vertically disposed, and rollers at the lower ends of at least some of said bars for supporting the apron.

13. In combination with a housing having a port through which a suitable equipment projects, of a flexible port closure apron comprising a series of parallel bars, means to maintain such of said bars as lie over the port opening in fluid-tight contact with one another and with the portion of the housing surrounding said port, said bars being vertically disposed, and ball bearings located beneath the bottom of said apron on which the lower ends of bars ride.

14. In combination with a housing having a port through which a suitable equipment projects, of a flexible port closure apron comprising a series of parallel bars, means to maintain such of said bars as lie over the port opening in fluid-tight contact with one another and with the portion of the housing surrounding said port, said bars comprising channel bars, pieces fitted into the ends of said bars, said pieces having chain-link receiving slots, pins passing through said slots, and chain links connected by said pins to connect adjacent bars flexibly together.

15. In combination with a housing having a port through which a suitable equipment projects, of a flexible port closure apron comprising a series of parallel bars, means to maintain such of said bars as lie over the port opening in fluid-tight contact with one another and with the portion of the housing surrounding said port, said bars comprising channel bars, pieces fitted into the ends of said bars, said pieces having chain-link receiving slots, pins passing through said slots, chain links connected by said pins to connect adjacent bars flexibly together, guide rails for the upper and lower ends of said apron, and means cooperating with said rails and said pieces for continuously pressing said bars over the port into sealing contact with the housing.

16. In combination with a housing having a port through which a suitable equipment projects, of a flexible port closure apron comprising a series of parallel bars, means to maintain such of said bars as lie over the port opening in fluid-tight contact with one another and with the portion of the housing surrounding said port, said bars comprising channel bars, pieces fitted into the ends of said bars, said pieces having chain-link receiving slots, pins passing through said slots, chain links connected by said pins to connect adjacent bars flexibly together, guide rails for the upper and lower ends of said apron, and means cooperating with said rails and said pieces for continuously pressing said bars over the port into sealing contact with the housing, said last named means comprising springy extensions of said pins, and rollers thereon for engaging said guide rails.

17. In combination with a housing having a port through which a suitable equipment projects, of a flexible port closure apron comprising a series of parallel bars, means to maintain such of said bars as lie over the port opening in fluid-tight contact with one another and with the portion of the housing surrounding said port, said bars comprising channel bars, pieces fitted into the ends of said bars, said pieces having chain-link receiving slots, pins passing through said slots, chain links connected by said pins to connect adjacent bars flexibly together, guide rails for the upper and lower ends of said apron, means cooperating with said rails and said pieces for continuously pressing said bars over the port into sealing contact with the housing, said last named means comprising springy extensions of said pins, and rollers thereon for engaging said guide rails, said guide rails and said pieces having portions normally out of contact but which will contact before said extensions become injured should the apron be forced inwardly away from the port.

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