The present invention relates to grilles formed by a series of horizontal bars interconnected by substantially vertical links and which are used as metallic shutters for the closure of bays and are supported by a shaft mounted transversely in the top portion of the bay.

Until now, these grilles were arranged like shutters, which means that they were rolled up upon the supporting shaft. For reason of the difficulties involved with the rolling up of a grille upon a shaft, this system was not successful and its use has been limited to bays of small dimensions where such drawbacks are less perceptible. According to the invention, the rolling up of the grille upon the shaft is abandoned by arranging the grille and its support in such a manner that the grille can pass over the shaft to be folded behind the latter, in a small volume. It is no longer necessary to provide around the shaft a considerable space for lodging the rolled up grille, and furthermore, the strain upon the shaft is considerably reduced as the total weight of the lifted grille is no longer supported by the shaft.

In order that the horizontal elements of the grille may keep their alignment while passing over the shaft to be regularly folded therebeyond, the shaft is provided with toothed wheels spaced apart and in the mesh-like structure of the grille are arranged portions capable of meshing with the teeth of the said pinions.

In the case of a shaft of great length, it is necessary to support it between its ends to avoid bending. The use of an ordinary bracket-bearing as intermediate support for the shaft would only be possible under condition that the grille is interrupted at the place of the bracket, a solution which obviously gives no satisfaction. The difficulty is avoided, according to the invention, by using for supporting the shaft of the grille one or more bearings for chain wheels supported at their periphery according to a new construction, which bearings give passage to the grille between the wheel and its peripheral support.

The invention provides for folding the grille upon horizontal and upright supporting means beyond the shaft.

A drawback in known linked grilles is that they are insufficiently rigid when lowered in front of the bay, this constituting a considerable defect when they must protect a show-window for instance. In this case there is a risk of the window being broken when the grille oscillates under a thrust or a shock. According to the invention, the lowered grille is steadied by stretching it transversely by traction upon the lateral edges.

The invention has also for its object a bearing for chain wheels which is constructed so as to allow the chain to pass through the bearing, for instance to allow a chain of considerable width, similar to the linked grille, to pass over a shaft coaxial with the wheel.

For this purpose, in the bearing according to the invention, the chain wheel is supported not by its axis, as in ordinary bearings, but at its periphery by means of an arched support, in which a space is reserved between the support and the bottom portion of the inter space of the teeth of the wheel which is sufficient for the passage of the link pins of the chain through the bearing when the wheel rotates with respect to its support.

The connection of the wheel with the support is secured by the ends of the teeth of the wheel, which are provided with lateral projections in engagement with arch-shaped guide-ways. For reducing friction, the lateral projections of the wheel or the guide-ways of the bearing are provided with rollers or like elements. The bearing may be constructed so that the guide-ways of the support are outside or inside the wheel.

A considerable advantage of the bearing for chain wheels according to the invention resides in the fact that, due to the possibility of making the chain pass through the bearing, the latter may be used as an intermediary support for a shaft coaxial with the wheel.

The description hereafter with reference to the accompanying drawings, given by way of example, will make the different features of the invention well understood.

Fig. 1 illustrates diagrammatically a closed grille in front view; Fig. 2 is a section, on larger scale, of one link connection of the grille; Fig. 3 illustrates also on a larger scale an intermediary bearing for the supporting shaft of the grille and two folding devices; Fig. 4 is a horizontal section of a stretching device for the grille by means of a movable slide; Fig. 5 is a similar view of a removable stretching device and Fig. 6 illustrates the removable stretching device in elevation but on smaller scale; Figs. 7 and 8 illustrate in detail a bearing for chain wheel with outer support, respectively in side elevation and in section on line VIII—VIII of Fig. 7; Figs. 9 and 10 are similar views of a bearing with outer support, the section in Fig. 10 being made on line X—X of Fig. 9; Figs. 11 and 12 illustrate a modification of
the bearing with inner support, in side elevation and in section on line XII—XII of Fig. 11 respectively;

Fig. 13 is a view in section of a modification of the bearing with outer support.

The horizontally linked grille shown in Figs. 1 and 2 is formed with horizontal bars I connected by links 2, which, in this example, are alternately straight and curved. These links 2, provided with eyes at their ends, are pivoted upon studs 4 connecting end to end two portions of a tubular bar 1, as illustrated in Fig. 2.

In this mesh-like structure lines 5 are provided where the bars 1 are spaced over a convenient width to mesh in the manner of the pins of a roller chain with driving pinsions. Intermediate the meshing lines 5, the grille comprises lines of interruptions 6, in which every other one of the bars 1 is interrupted between two adjacent links, for the purpose of folding the grille.

The grille is supported in the top of the bay by a horizontal shaft 7, mounted in bearings 8 and which is provided with toothed pinsions 9 arranged apart in alignment with the meshing lines 5 of the grille.

Between some of these pinsions, the shaft 7 is itself supported in intermediary bearings 10, so that it may not warp under the weight of the grille. At one end of the shaft or at both ends are provided a driving chain 11 with compensating counterweight 12.

The shaft 7 acts only as an element for supporting and lifting and not as a rolling up device for the grille, which, when the shaft is caused to rotate, meshes with the pinsions like a chain, passes over the shaft and is folded up beyond as illustrated in Fig. 3.

This figure also illustrates the detail of an intermediary bearing 10, constructed so that the grille passing over the shaft may pass through the bearing itself. For this purpose, the bearing 10 comprises a rotary portion 13 in the shape of a toothed wheel, engaged upon the shaft 7 supported at its periphery by arch-shaped guide ways 14, in which run the rollers 15 mounted at the ends of the teeth of the wheel. A passage 16 left between the fixed portion and the rotary portion of the bearing allows the passage of the bars 1 of the grille lodged in the interspaces of the teeth of the wheel 13, through the bearing for passing over the shaft 7. The wheel 13 has the same diameter and the same number of teeth as the pinsions 9.

Beyond the shaft 7 and resting thereon by rollers 17, are arranged at right angles a number of horizontal arms 18, supported at their other end in a fixed point 19. There are as many arms 18 as lines of interruptions 6 in the grille, and they are arranged in alignment with these lines, as illustrated in Fig. 1. In Fig. 3 the interrupted bars of the grille are designated by 1a, whereas the continuous bars with which they alternate are designated by 1.

While passing over the shaft 7, the continuous bars 1 slide over the curved end 20 of the arm 18, the outer edge of said end 20 being at a level with the bottom portion of the interspaces of the teeth of the wheel 13. In a point lower than the upper end of the guide-ways 14, in order to allow the bars 1 to leave the passage 16 of these bearings, the arm 18 makes an upward bend and presents a slope 21, upon which the continuous bars 1 collected by the end 20 are caused to ascend, whereas the interrupted bars 1a continue a downward movement. In this way, the grille is folded up along the arm 18, the links 2 being placed vertically and progressing with the supporting bars 1, which slide over the horizontal portion of the arm after having passed beyond a projection 22, which is intended to prevent them from again going down the slope 21 when a less supple link would interfere with the folding.

According to the modification illustrated in Fig. 4, the grille leaving the wheel 13 after having passed over the shaft 7 is folded in a vertical receptacle 23, whereas links 2 lie flat in superposition. The regularity of the folding is secured by a curved guide 24, 25 which selects the continuous bars 1 of the grille at their exit from the passage 16 and directs them towards one side of the receptacle 23, whereas the interrupted bars 1a, which are not retained by the guide, are automatically directed towards the other side of the receptacle. For this flat folding of the links it is not essential that the bars 1a be interrupted, if only guides 24 are provided for the end portions of the bars; in this case one bar upon two is provided with an extension 2b (Fig. 1).

On either side of the bay, the edges of the grille are guided in fixed or movable elements.

In Fig. 4 is illustrated a fixed U-shaped guide 25 containing a movable bar 25a which may be pulled sidewaysly by means of a nut 26 screwed upon a threaded bolt 27 fixed to the movable bar 25a and passing through a hole of the fixed guide channel.

The ends of the bars 1 of the grille engaged in the horizontal groove of bar 25a are retained therein by the last link 2 or by a convenient projection.

It may be sufficient to stretch the grille over a portion of its height only. In this case removable stretchers may be used, such as those illustrated in Figs. 5 and 6 and which comprise a comb 28, the teeth 29 of which are engaged over the projections 30 of the bars 1 of the grille when the stretcher is applied to the fixed guide 25, 45 A screw 31 screwing in the rear end of a flange 27 from the comb and abutting the outside side of the guide 25 allows the pulling out of the comb and the grille hooked thereto. Flap 22 is added to the guide 25 and which engage the transverse button hole slots 33 of the stretcher secure the support of the latter upon the guide. A handle 34 allows the stretcher to be put in place and removed easily. The grille partially illustrated in Fig. 6 is of a different type than that illustrated in Figs. 1 and 2.

It results from the foregoing description that the invention allows the practical construction of grilles for the closure of bags of any width and height, working in perfect security and presenting numerous advantages with relation to construction, mounting and reduced encumbrance. Obviously, the constructional details described and illustrated by way of example may be modified without departing from the scope of the invention.

Referring now to Figs. 7 and 8, the ends of the teeth 41 of the chain wheel 42 are provided at their outer sides with rollers 43, for instance four in number for each tooth and mounted by 10 pairs upon spindles 44, rollers which actually constitute the lateral projection by which the wheel 42 is supported at its periphery. The rollers 43 run on both sides of the wheel 42 in curved guide ways 45, formed by two grooves provided
coaxially to the axis of the wheel, inside a support or seat 46 which embraces the wheel over about one half of its circumference. The wheel 42 is thus suspended in the bearing 46, by the engagement of the rollers 47, by the grooves of the different parts being such that the wheel is supported and guided so as to be capable of rotating about its axis. An ordinary bearing would require one or two flanges embracing the wheel for supporting its shaft, the present construction leaving the grooves at the ends of the teeth 41 engaging in the support 46 at the upper portion of the wheel.

As may be seen in Fig. 7, the base of the teeth 41 is not engaged in the support 46, so that there remains between the bottom of the interspace of the teeth of the wheel and the arched end of the support, a free space 47 constituting a passage through the bearing for the pins 48 of the chain 49 which meshes with the wheel. The sides of the latter being free, the chain may have a width much larger than that of the wheel, without its passage around the wheel being interfered with.

In the axis of the wheel 42 is engaged a tubular shaft 50, which is suspended from the support 46 by means of a bracket, to which it is relative for instance by means of flanged collars 51, fixed on the one hand to the shaft, by screws 52, and on the other hand to the wheel by bolts 53 passing therethrough. The shaft 50 may drive the wheel 42 and thus cause the movement of the chain 49, or otherwise the chain may actuate the wheel which then drives the shaft. In each case the chain passes over the shaft by passing through the bearing supporting the latter.

This construction is particularly useful upon the shaft of the grille or grate described herebefore with reference to Figs. 1 to 6.

In the modified embodiment illustrated in Figs. 9 and 10, the chain wheel 42 is constituted by two discs 42a, pressed against a core 42b by bolts 53a, which at the same time connect to the wheel the flanges 51a of two shaft ends 50a. The discs 42a of the wheel are provided at the inner side, at the end of the teeth 41, with rollers 43a engaging in outer guide ways 45a of the bearing 46.

Instead of being mounted upon the wheel, the running rollers may also be arranged within the bearing 46, as illustrated at 43b in Figs. 11 and 12, so as to constitute a run way for the segmentary lateral projections 44a provided at the ends of the teeth 41 of the wheel. In this example, the segmentary projections 44a are formed by the edges of the discs 42a folded inwardly, and the bearing 46 has a T-section.

In the modified, the teeth 41, in such a manner that the segmentary lateral projections 44b (Fig. 13) may be turned outwards. The bearing 46 may then have a reversed U-section and support the rollers 43b inside its flanges.

Numerous other constructions are obviously possible. Instead of being suspended from the support, the wheel may rest upon the latter, the concavity of the support being then turned upwards and the guide or run ways being arranged accordingly.

I claim:

1. In a grille for bays formed by a series of horizontal bars interconnected by substantially vertical links, a top shaft supporting the grille, means to rotate the shaft, pinions spaced apart and mounted on said shaft, the arrangement being such that the teeth of said pinions mesh with a series of links and intermediate bearings supporting the shaft, the construction of said bearings being such that a series of links of the grille may pass therethrough and comprising namely a toothed wheel rotatably supported at its periphery in an arched support so that the horizontal bar portions of the series of links involved may pass between the wheel and its support while engaging the space intermediate the teeth of the wheel.

2. In a grille for bays formed by a series of horizontal bars interconnected by substantially vertical links, a top shaft supporting the grille, means to rotate the shaft, pinions spaced apart and mounted on said shaft, the arrangement being such that the teeth of said pinions mesh with a series of links, and substantially horizontal guide bars arranged at right angles to the shaft and close thereto for collecting and folding the grille thereon.

3. In a grille for bays formed by a series of horizontal bars interconnected by substantially vertical links, a top shaft supporting the grille, means to rotate the shaft, pinions spaced apart and mounted on said shaft, the arrangement being such that the teeth of said pinions mesh with a series of links, and substantially horizontal guide bars arranged at right angles to the shaft and close thereto for collecting and folding the grille thereon.

4. In a grille for bays formed by a series of horizontal bars interconnected by substantially vertical links, a top shaft supporting the grille, means to rotate the shaft, pinions spaced apart and mounted on said shaft, the arrangement being such that the teeth of said pinions mesh with a series of links, and substantially horizontal guide bars arranged at right angles to the shaft and close thereto for collecting and folding the grille thereon.

5. In a grille for bays formed by a series of horizontal bars interconnected by substantially vertical links, a top shaft supporting the grille, means to rotate the shaft, pinions spaced apart and mounted on said shaft, the arrangement being such that the teeth of said pinions mesh with a series of links, and substantially horizontal guide bars arranged at right angles to the shaft and resting with one end thereon for collecting and folding the grille on the guide bars.

6. In a grille for bays formed by a series of horizontal bars interconnected by substantially vertical links, a top shaft supporting the grille, means to rotate the shaft, pinions spaced apart and mounted on said shaft, the arrangement being such that the teeth of said pinions mesh with a series of links, and substantially horizontal guide bars arranged at right angles to the shaft and resting with one end thereon for collecting and folding the grille on the guide bars.

7. In a grille for bays formed by a series of horizontal bars interconnected by substantially vertical links, a top shaft supporting the grille, means to rotate the shaft, pinions spaced apart and mounted on said shaft, the arrangement being such that the teeth of said pinions mesh with a series of links, a receptacle arranged beyond the shaft and substantially parallel to the plane of the closed grille, and vertical guide bars extending between the shaft and the inner space of the receptacle, the upper end of said guide bars being curved towards the shaft so as to engage a series of links for the purpose set forth.

8. In a grille for bays formed by a series of..
horizontal bars interconnected by substantially vertical links, a top shaft supporting the grille, means to rotate the shaft, pinions spaced apart and mounted on said shaft, the arrangement being such that the teeth of said pinions mesh with a series of links, and means for stretching the grille at each side when in the closing position.

9. In a grille for bays formed by a series of horizontal bars interconnected by substantially vertical links, a top shaft supporting the grille, means to rotate the shaft, pinions spaced apart and mounted on said shaft, the arrangement being such that the teeth of said pinions mesh with a series of links, and means for stretching the grille at each side, said means comprising fixed vertical guide means and movable guide means, said movable guide means being positively forced sideways with respect to the fixed guide means.

10. In a grille for bays formed by a series of horizontal bars interconnected by substantially vertical links, a top shaft supporting the grille, means to rotate the shaft, pinions spaced apart and mounted on said shaft, the arrangement being such that the teeth of said pinions mesh with a series of links, and means for stretching the grille at each side, said means comprising a fixed vertical guideway, a comb-shaped element, the teeth of which are adapted to engage the edge portion of the grille, and means for holding and moving the comb-shaped element with respect to the fixed guideway.

11. A bearing for a chain wheel comprising a toothed wheel to be engaged by the pins of the chain links, an arched support for the wheel, the arrangement being such that the wheel is rotatably supported by its periphery in said support, space being left between the support and the interspace of the teeth of the wheel for leaving passage for said pins.

12. A bearing for a chain wheel comprising a toothed wheel to be engaged by the pins of the chain links, an arched support for the wheel, the arrangement being such that the wheel is rotatably supported by its periphery in said support, said peripheral ends of the teeth having lateral projections engaging guideways provided upon the arched support for the purpose set forth.

13. A bearing for a chain wheel comprising a toothed wheel to be engaged by the pins of the chain links, an arched support for the wheel, the arrangement being such that the wheel is rotatably supported by its periphery in said support, said peripheral ends of the teeth having lateral projections and rolling means engaging guideways provided upon the arched support for the purpose set forth.

14. A bearing for a chain wheel comprising a toothed wheel to be engaged by the pins of the chain links, an arched support for the wheel, the arrangement being such that the wheel is rotatably supported by its periphery in said support which has outer flanges engaging over said peripheral ends.

15. A bearing for a chain wheel comprising a toothed wheel to be engaged by the pins of the chain links, an arched support for the wheel, the arrangement being such that the wheel is rotatably supported by its periphery in said support which being lodged in a peripheral groove of the wheel is engaged by inward projections of the teeth of the wheel, substantially as described.

ROGER AUBERT.