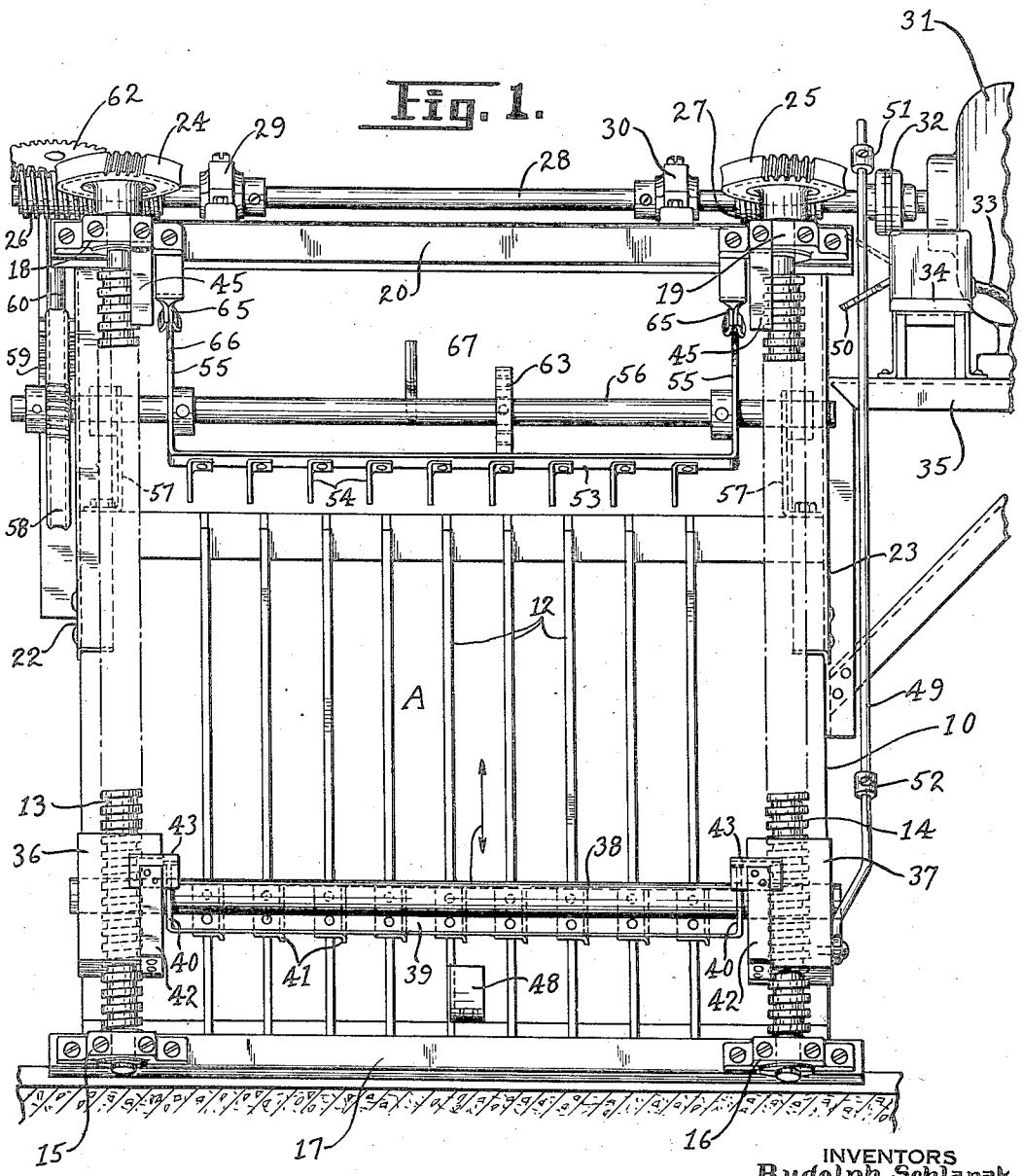
March 10, 1936. R. SCHLAPAK ET AL 2,033,653

SLUICE RACK CLEANER

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Fig. 1.



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Fig. 2.

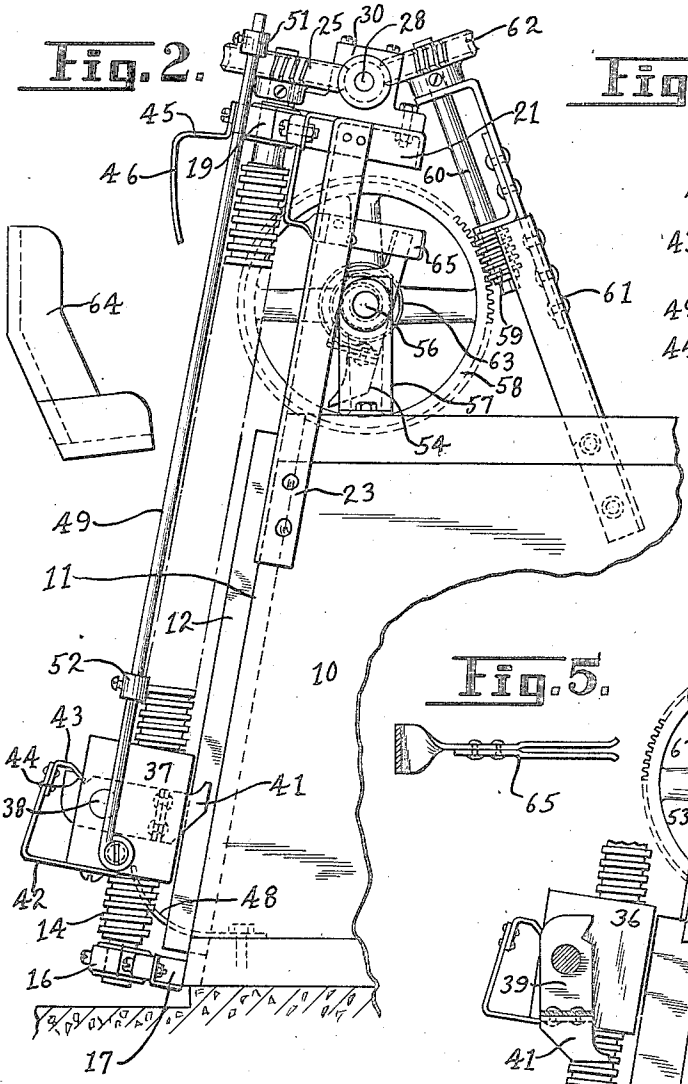


Fig. 3.

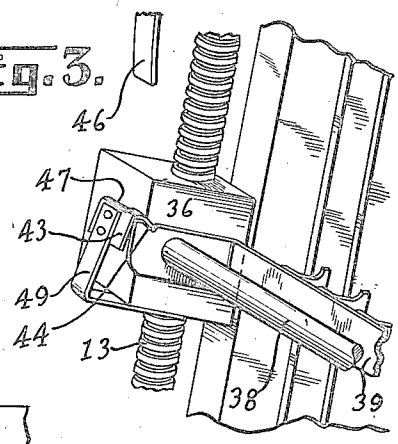


Fig. 4.

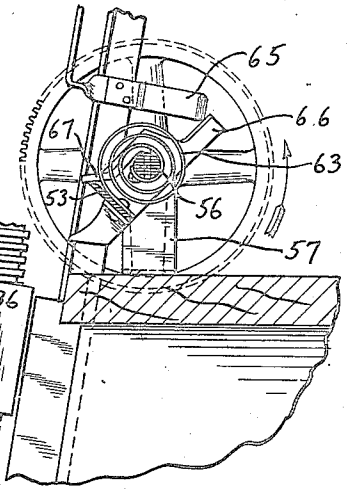
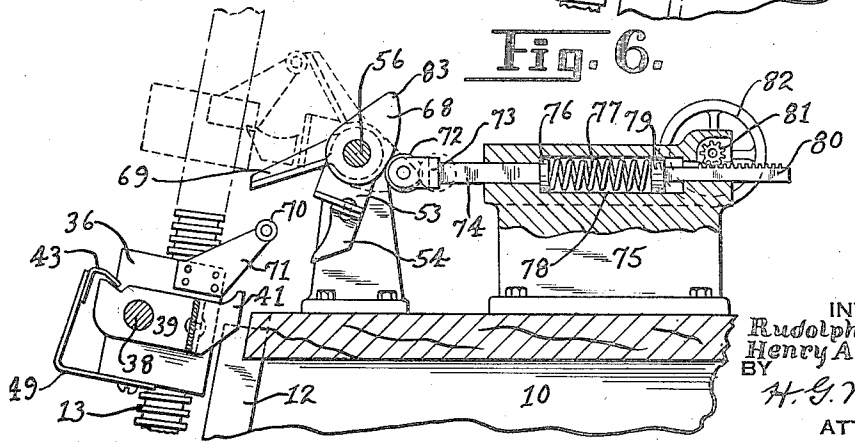


Fig. 5.

Fig. 6.



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SLUICE RACK CLEANER

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7 Claims. (Cl. 210—176)

This invention relates to improvements in automatic apparatus for cleaning a straining rack of a sluiceway or flume, and more particularly to a machine for intermittently raking debris from the bars of said straining rack.

One object of this invention is to provide a cleaning device of the above nature having a reciprocating rake which operates on its up-stroke to clean the flume rack.

A further object is to provide a flume rack cleaning device of the above nature having means for ejecting all of the debris collected by said rake, when the latter is at the top of its stroke.

A further object is to provide a device of the above nature which will be comparatively simple in construction, inexpensive to manufacture, easy to install and manipulate, compact, and very efficent and durable in use.

With these and other objects in view there have been illustrated on the accompanying drawings, two forms in which the invention may be conveniently embodied in practice.

In the drawings:

Fig. 1 represents a front elevation of the sluice-rack cleaner.

Fig. 2 is a right end view of the same, with the motor unit and supporting bracket removed.

Fig. 3 is a fragmentary perspective view showing one of the worm shafts and the reciprocating rake as it appears when approaching its uppermost extremity.

Fig. 4 is a detail view of the mechanism for ejecting the debris collected by the rake.

Fig. 5 is a plan view of the spring jaws forming a part of the debris-ejecting means.

Fig. 6 is a sectional view of a modified form of ejecting means.

Referring now to the drawings in which like reference numerals denote corresponding parts throughout the several views, the numeral **10** indicates a flume channel or sluice-way through which water is adapted to flow for any desired purpose, as for supplying power to a power plant. At the open end **11** of the sluice-way, provision is made of a slightly inclined grating or rack A comprising a plurality of spaced parallel bars **12**. The rack A serves to prevent all floating matter, such as sticks, and leaves, from passing into said sluice-way.

Located in front of the rack A on opposite sides thereof are a pair of inclined worm shafts **13** and **14** having their lower ends journaled in a pair of bearings **15** and **16** secured to a horizontal cross member or beam **17** positioned at the base of said rack. The upper ends of the worm shafts **13** and **14** are journaled in a similar pair of bearings **18** and **19** secured at the opposite ends of a cross beam **20**. The beam **20** is supported in a horizontal position above the sluice-way and rack A by means of a frame structure **21** which is preferably supported by means of a pair of angle irons **22** and **23** made rigid with the side walls of the sluice-way **10**.

Motion is transmitted to the worm shafts **13** and **14** through a pair of worm wheels **24** and **25** secured to the top extremities of said shafts **13** and **14** above the bearings **15** and **16**, said wheels **24** and **25** being adapted to engage a pair of worms **26** and **27**. The worms **26** and **27** are rigid on a horizontal power shaft **28** rotatably journaled in a pair of bearing blocks **29** and **30** superimposed on the frame **21**, and said shaft **28** is adapted to be driven from any suitable source of power, such as an electric motor **31**, to which said shaft **28** is coupled by means of a flexible coupling **32**.

The motor **31** is of the reversible type and is electrically connected through a cable **33** to a switch unit **34**. Both the motor **31** and switch **34** are supported on a frame bracket **35** attached to the right-hand side of the sluice-way **10**, as viewed in Fig. 1.

Reciprocating rake

The rake mechanism, which is illustrated in Figs. 1 and 2, adjacent the end of its down-stroke, is driven up and down by a pair of traveling nuts or worm blocks **36** and **37** engaged on the opposite worm shafts **13** and **14**. The blocks **36** and **37** are connected by a horizontal rake bar **39** and a heavy cylindrical shaft **38** parallel to said bar **39**. The rake bar **39** has its opposite ends **40** bent rearwardly to form bearings for pivotal engagement on the shaft **38**.

A plurality of rearwardly projecting tooth members **41** are secured on the forward end of the bar **39**, as by riveting. The front extremities of the teeth **41** are curved upwardly, as shown in Fig. 2, and are adapted to project between the adjacent bars **12** of the grating or rack A.

During the up-stroke of the rake mechanism, the rake bar **39** and its attached teeth **41** are operative to remove the debris from the grating A. The bar **39** of the rake is adapted to be locked in this position by means of a pair of angular spring members **42** secured to the underside of the worm blocks **36** and **37** and having attached to their upper free ends a pair of offset detent dogs **43**. The dogs **43** in turn are engaged in a pair of catch recesses **44** formed in the upper edges of the journaled ends **40**, and said dogs **43** serve to effectively hold the rake bar **39** in the position shown in Fig. 2 until the rake mechanism approaches the end of its up-stroke, in which case the dogs **43** are automatically released from the recesses **44** by means of a pair of resilient curved strips **45** attached to the bearings **18** and **19**.

The strips **45** are in vertical alinement with the dogs **43** and as the rake mechanism approaches the limit of its up-stroke, the lower ends **46** of said strips **45** engage a pair of shoulders **47** (see Fig. 3) on the dogs **43** and force the latter out of the recesses **44**. When thus released, the rake bar **39** will swing about the shaft **38** and drop to the depending position shown in Fig. 4.

The rake bar **39** will remain in the depending position during the entire down-stroke, and at the end of said stroke will be relocked in its normal raking position by striking against a curved deflecting bracket **48** secured to the base of the sluiceway **10**. The rake will be thereby rocked **90** degrees about the supporting shaft **38** until the dogs **43** are again caught by the catch recesses **44**, whereby the rake will be held in the normal position, shown in Fig. 2, for the up-stroke.

In order to cause the rake to reverse its motion at the end of each up and down stroke, provision is made of a long slender reversing rod **49**, rigidly secured to the side of the worm blocks **37** and extending upwardly parallel to and alongside the right-hand worm shaft **14**. The rod **49** is slidably mounted within a switch-operating arm **50** extending out of the switch unit **34**. The rod **49** is provided adjacent its upper and lower ends with a pair of adjustable collars **51** and **52**.

As will be clear from this construction, the lowermost collar **52** will engage the switch arm **50** at the top of the up-stroke, and move it to the position shown by dotted lines in Fig. 1, reversing the direction of rotation of the motor **31**, and causing the rake mechanism to start on the down-stroke, at the end of which the uppermost collar **51** on the rod **49** will engage the arm **50** to move the switch downwardly and again reverse the motor **31**.

Rake cleaning mechanism

In order to clean off the debris from the teeth **41** of the rake bar **39** at the top of each up-stroke, provision is made of an ejector bar **53** carrying a plurality of teeth **54**. The bar **53** has its ends **55** bent at right-angles, and said ends are pivotally supported on a horizontal shaft **56**. The shaft **56** in turn is rotatably journaled in a pair of bearing brackets **57** secured to the top part of the flume **10**. Attached to the left-hand end of the shaft **56**, as viewed in Fig. 1, is a substantially large worm wheel **58** intermeshed with a worm pinion **59** attached to the lower end of an oblique stud shaft **60** (see Fig. 2). The oblique shaft **60** is supported by means of a frame **61** attached to the flume **10** and is rotatably driven by means of a worm wheel **62** attached to the upper end of said shaft **60**, said wheel **62** meshing with the worm **26** on the power shaft **28**. The gear ratio between the worm wheel **58** and the driving pinion **59** is such that the shaft **56** makes one complete revolution during each stroke of the rake mechanism.

The normal position of the ejector bar **53** is shown in Figs. 1 and 2, and when the rake is at the top of its up-stroke, the bar **53** will be automatically swung suddenly in a clockwise direction about the shaft **56** for cleaning the débris from the rake teeth anad delivering it into a chute **64** located at one side thereof.

During the up-stroke of the rake mechanism, the horizontal shaft **56** will rotate in a clockwise direction, as viewed in Figs. 2 and 4, and while it is thus rotating, the ejector bar **53** will be held in the normal position shown in Fig. 2 by means of a pair of spring gripping fingers **65** (Fig. 5), having tight frictional engagement with a pair of extended knife edge ends **66** forming integral parts of the bent ends **55**. The shaft **56** is provided with a transverse projecting pin **67** which is adapted to engage said bar **53** for rotating it with the shaft **56** to release the ends **66** from the gripping fingers **65**, whereupon the bar **53** will be rapidly rotated in a clockwise direction about the shaft **56** by the influence of a spring **63**.

During the down-stroke of the rake mechanism, the shaft **56** will be rotated in a counterclockwise direction, and just prior to the end of said stroke, the pin **67** will strike against the opposite side of the discharge bar **53**, and again force the knife blade ends **66** into the fingers **65** to hold said bar **53** in its normal position, the spring **63** being thus fully wound up during said up-stroke (see Fig. 4).

Operation

In the operation of the flume cleaner, during the up-stroke, the teeth **41** of the rake bar **39** will collect any sticks, or other débris which may be caught on the grating A, carrying such débris to a position directly in front of the ejector bar **53** at the top of the up-stroke. At this time, the bar **53** will be automatically released from the gripping fingers **65**, permitting the teeth **54** to spin around the shaft **56** and throw the débris into the chute **64**.

As the rake mechanism continues its upward stroke, the lower cam sections **46** of the two releasing members **45** will strike the shoulders **47** of the detent dogs **43** and force said dogs out of the recesses **44**. The rake bar **39** will thus be allowed to drop to the swinging depending ineffective position shown in Fig. 4. After the rake bar **39** has thus been released, the lower collar **52** on the reversing rod **49** will strike the arm **50** of the switch unit **34**, and reverse the motor **31**. The rake bar **39** will then proceed in its down-stroke, and as it approaches the bottom thereof, it will be engaged by the curved deflecting bracket **48** and rotated about the shaft **38** in a counterclockwise direction until the detent dogs **43** are snapped into the catch recesses **44** for locking the rake bar in its normal raking position. Immediately thereafter, the top collar **51** on the rod **49** will engage the arm **50** and cause the switch mechanism to again reverse the direction of the motor **31**. This cycle of operations continues as long as desired, and the grating A will be maintained free from debris for permitting an unobstructed stream of water to flow through the flume **10**.

Modified form

In the modified form of the invention shown in Fig. 6, the construction is identical in all respects to the first except in the form of the ejector mechanism. In the modified form, the ejector is caused to operate with a delayed action, which is effected by means of a cam **68** rigidly mounted on the shaft **56** outside of the ejector bar **53**. A radial arm **69** is attached to the shaft **56** adjacent the cam **68** and is adapted to normally extend forwardly into alinement with an abutment roller **70** journaled in the upper end of a supporting plate **71**. The plate **71** is attached securely to the worm block **36**.

A roller **72** is supported on the bifurcated end **73** of a reciprocating bar **74** slidably fitted in a housing **75** secured to the top of the flume **10**.

The reciprocatory bar 74 is preferably made square to prevent rotation and is provided upon its inner end with a piston head 76 for abutment against a substantially heavy helical spring 77 contained with a cylindrical chamber 78 in the housing 75. The tension of the spring 77 may be adjusted to any desired degree by means of another piston head 79 engaging the opposite end of said spring 77 and supported on the end of a toothed bar 80. The bar 80 is engaged by a pinion 81 which may be manually operated by a hand wheel 82 for causing the piston head 79 to move in the chamber 78. When adjusted properly, the hand wheel 82 may be locked by any suitable holding device (not shown).

In the operation of the modified form of the invention, at the top of the up-stroke of the rake mechanism, the abutment roller 70 carried by the worm block 36 will engage the arm 69 and rotate the shaft 55 and its attached ejector bar 53 through an angle of substantially 45 degrees from the full line position to the dotted line position shown in Fig. 6. During this rotation of the shaft 56, the plunger bar 74 and head 76 will be forced rearwardly to compress the spring 77 within the chamber 78. At the moment that the roller 70 leaves the arm 69 in its up-stroke, the cam roller 72 will ride over the nose 83 of the cam 66, and the spring 77 will come into action for causing the shaft 56 to rapidly rotate. Any debris which may be collected on the teeth 54 of the bar 53 will be thus thrown rearwardly away from the flume grating 11.

While there have been disclosed in this specification two forms in which the invention may be embodied, it is to be understood that these forms are shown for the purpose of illustration only, and that the invention is not to be limited to the specific disclosures, but may be modified and embodied in various other forms without departing from its spirit. In short, the invention includes all the modifications and embodiments coming within the scope of the following claims.

Having thus fully described the invention, what is claimed as new, and for which it is desired to secure Letters Patent, is:

1. In an apparatus for cleaning a flume grating, a pair of reversible vertical rotatable worm shafts located on opposite sides of the flume opening, a pair of traveling nuts mounted on said shafts and supporting a rake therebetween, and means for causing said rake to collect the debris from said grating while said rake is on its up-stroke, and spring actuated oscillatory means for ejecting said débris with a quick impetus from said rake at the top of said up-stroke.

2. In an apparatus for cleaning a flume grating, a pair of reversible vertical rotatable worm shafts located on opposite sides of the flume opening, a pair of traveling nuts mounted on said shafts and supporting a rake therebetween, and means for causing said rake to collect the débris from said grating while said rake is on its up-stroke, and detent-locked spring-actuated oscillatory means for suddenly ejecting said débris from said rake at the top of said up-stroke.

3. In an apparatus for cleaning a flume grating, a rake structure including a horizontal rod and a rake bar pivotally mounted thereon having a series of projecting teeth, means for vertically reciprocating said rake structure in front of said grating, means for locking said rake bar upon said rod during its upward stroke whereby said teeth will project through said grating for collecting debris therefrom, oscillatory means located at the top of said grating for clearing the debris from said rake teeth and discharging the same forwardly from said grating at the top of the up-stroke of said rake, and means for unlocking said rake bar at the end of the up-stroke to permit the teeth thereof to rock freely on said rod so as to be clear of said grating during the down-stroke thereof.

4. In an apparatus for cleaning a flume grating, a rake structure including a horizontal rod and a rake bar pivotally mounted thereon having a series of projecting teeth, means for vertically reciprocating said rake structure in front of said grating, means for locking said rake bar upon said rod during its upward stroke whereby said teeth will project through said grating for collecting debris therefrom, oscillatory means located at the top of said grating for clearing the debris from said rake teeth and discharge the same forwardly from said grating at the top of the up-stroke of said rake.

5. In an apparatus for cleaning a flume grating, a pair of reversible vertical rotatable worm shafts located on opposite sides of the grating, a pair of traveling nut blocks mounted on said shafts on the same horizontal plane, a rake supporting member located in front of said grating and carried by said blocks, a rake bar on said supporting member having a series of projecting teeth, means carried by said blocks for holding said rake bar in front of said grating with its teeth projecting through said grating during its up-stroke, means operative at the end of the up-stroke for automatically swinging the rake bar to cause the teeth to lie outside of said grating during the down-stroke thereof, means located at the bottom of the grating for automatically resetting the rake bar in debris-collecting position upon the support member at the end of its down-stroke, and rocking means behind said grating at the top thereof for removing the debris from the teeth of said rake at the end of each upstroke and ejecting said debris forwardly away from said grating.

6. In an apparatus for cleaning a flume grating, a rake in front of said grating including a series of teeth, means for vertically reciprocating said rake for causing the teeth of said rake to collect debris from said grating during the up-stroke of said rake, and power-driven oscillatory rake-cleaning means located at the top of and behind said grating for automatically clearing the debris from said teeth and for discharging it forwardly from said grating at the end of the up-stroke of said rake.

7. In an apparatus for cleaning a flume grating, a rake located in front of said grating, means for reciprocating said rake up and down to remove debris from said grating during the up-stroke thereof, oscillatory means behind said grating for cleaning said rake at the top of its stroke and discharging the debris forwardly, and means for causing the teeth of said rake to lie in vertical inactive position during the down-stroke.

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