Feb. 4, 1936. R. B. ZUBER 2,029,456

TRIPPING MECHANISM

Filed April 16, 1931 5 Sheets-Sheet 1

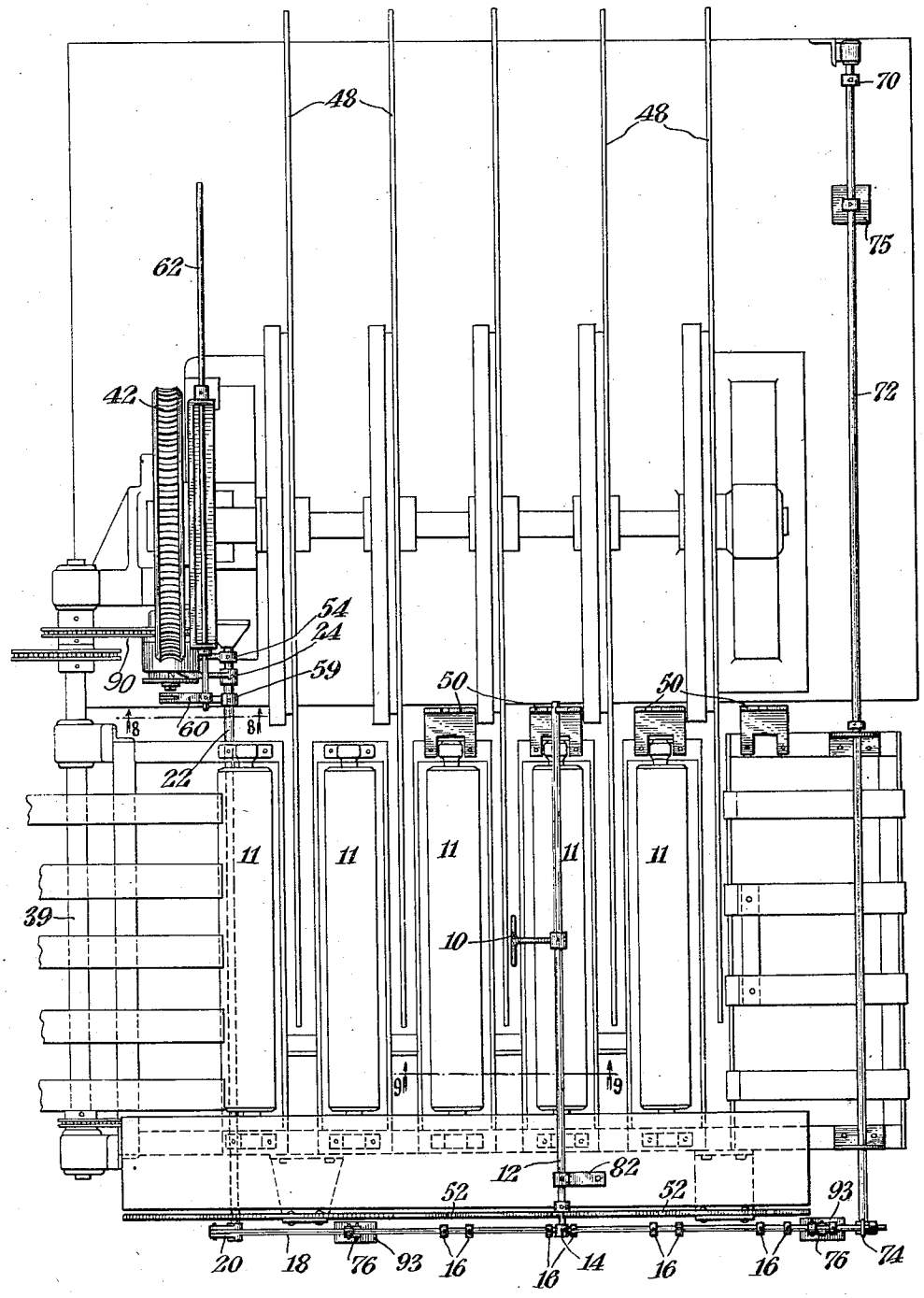


Fig. 1.

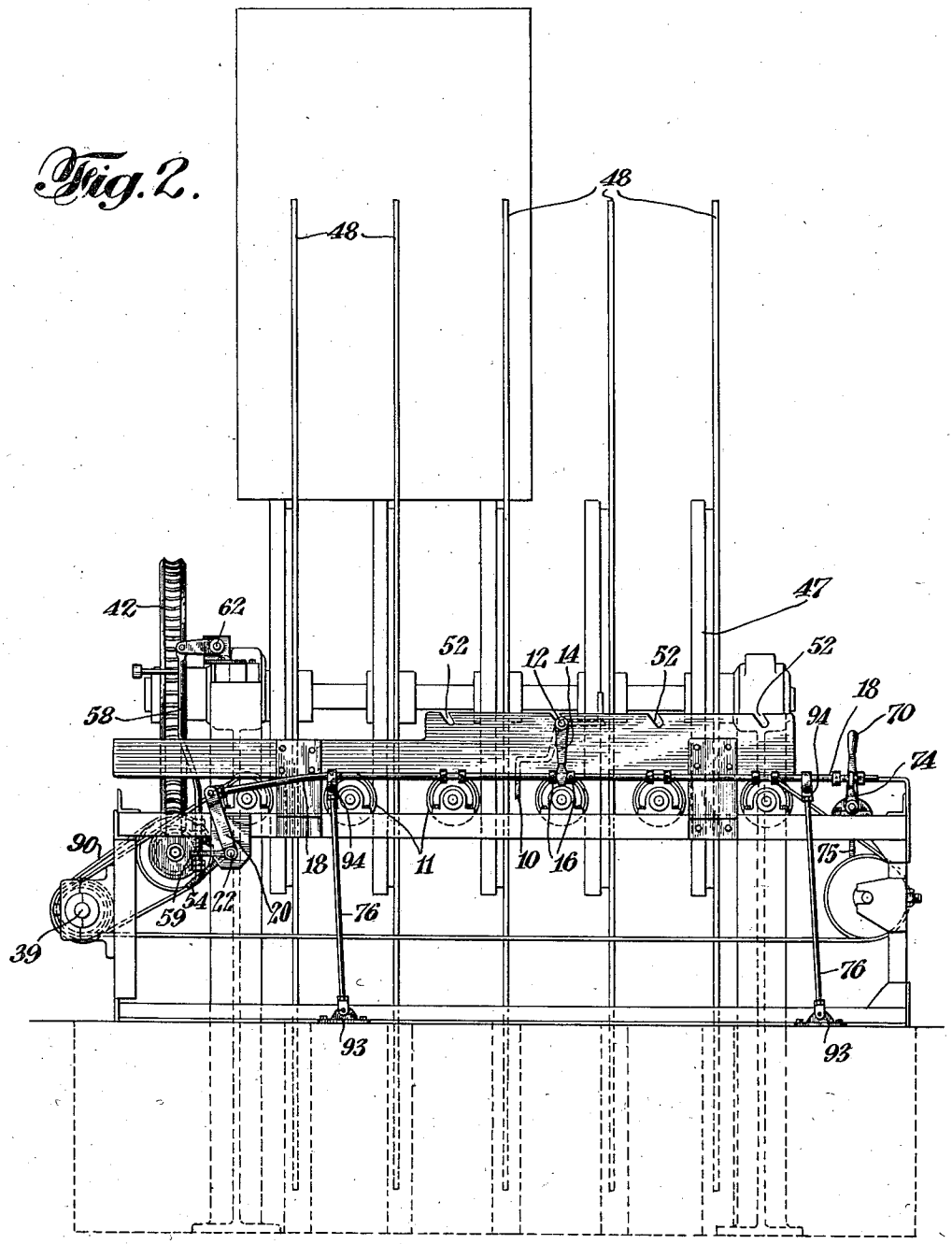
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TRIPPING MECHANISM

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Fig. 2.



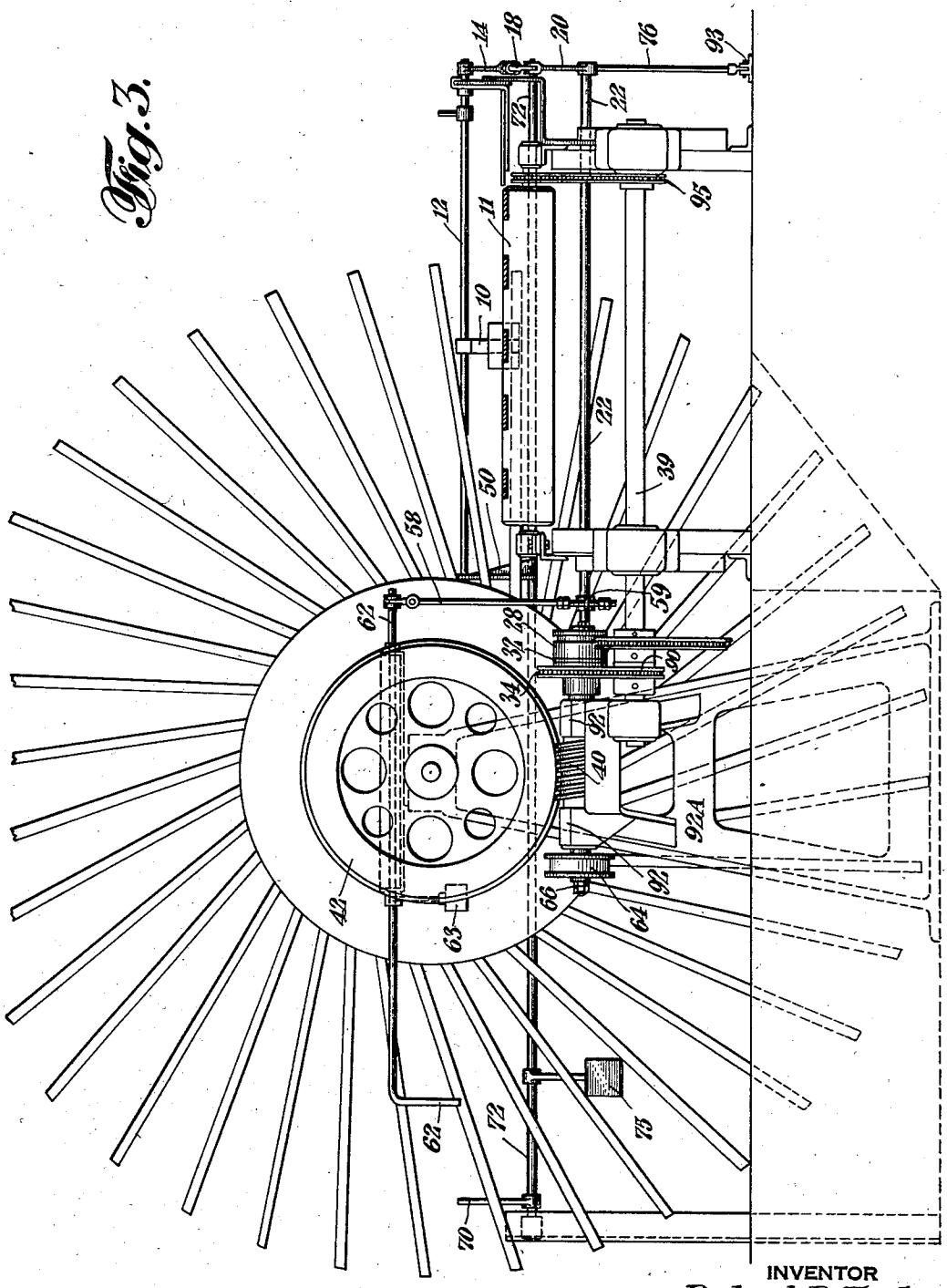
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TRIPPING MECHANISM

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Fig. 3.



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TRIPPING MECHANISM

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Fig. 5.

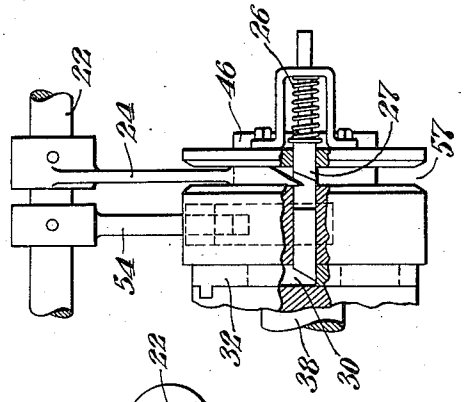


Fig. 6.

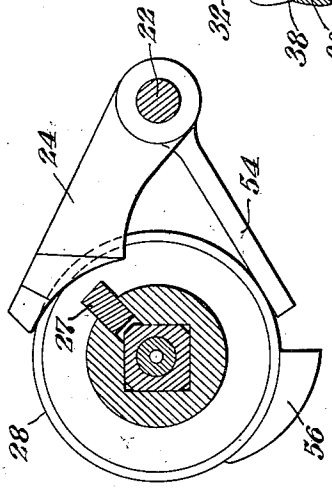


Fig. 7.

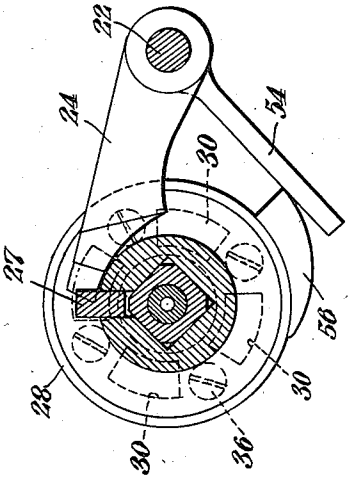
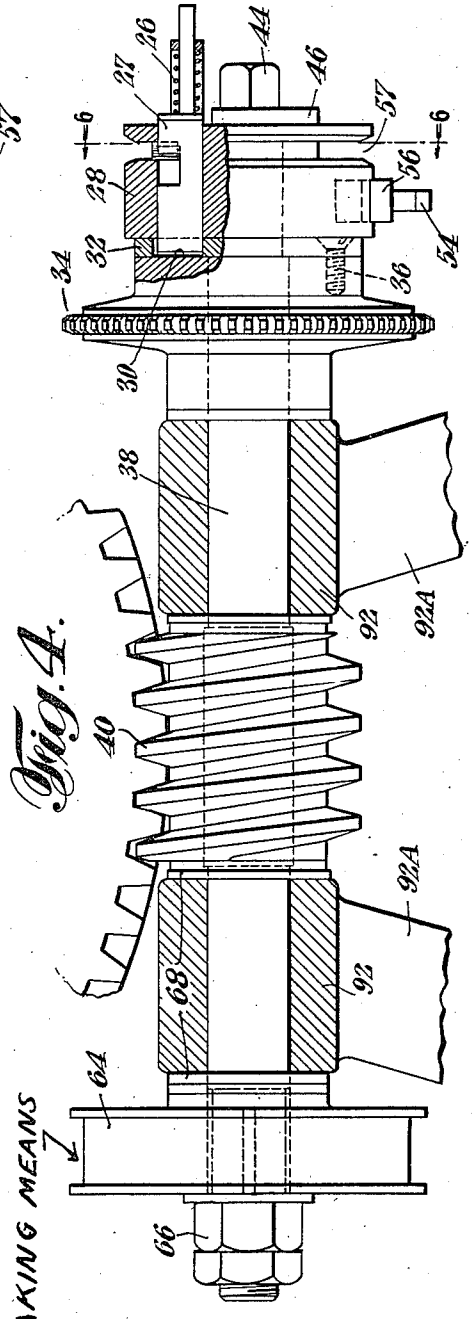


Fig. 4.



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Fig. 9.

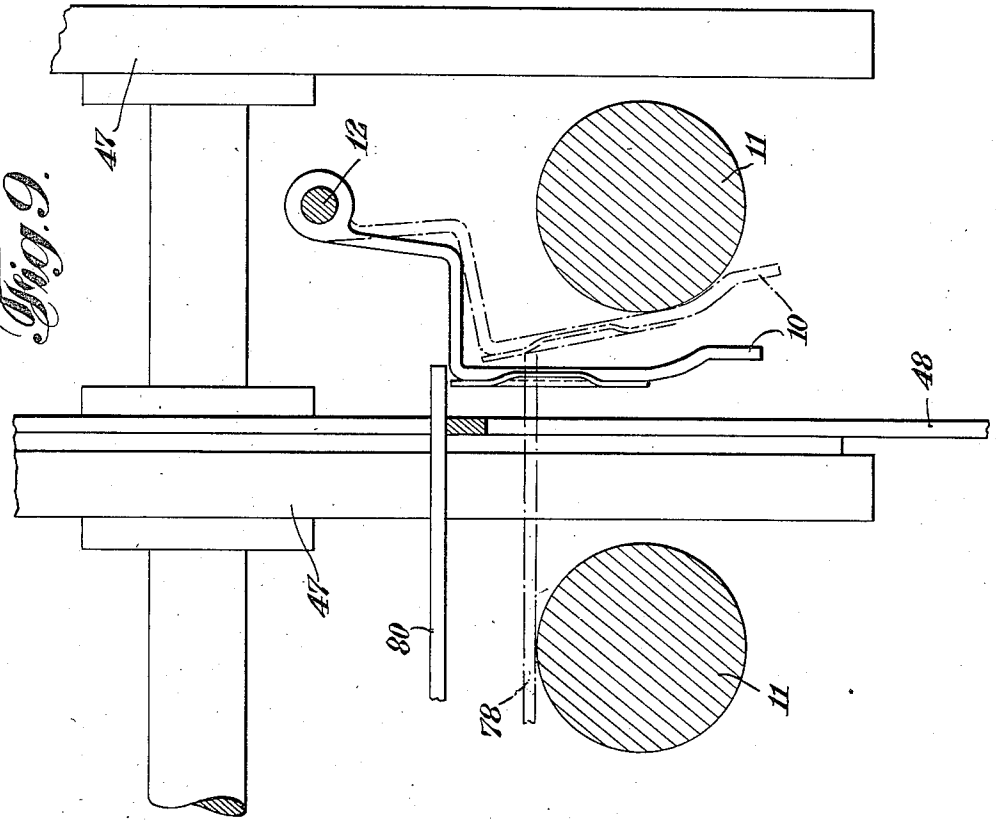
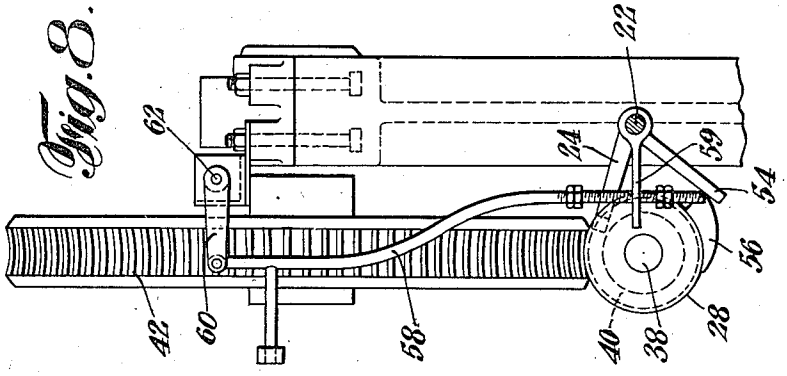


Fig. 8.



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UNITED STATES PATENT OFFICE

2,029,456

TRIPPING MECHANISM

Robert B. Zuber, Birmingham, Ala.

Application April 16, 1931, Serial No. 530,717

9 Claims. (Cl. 198—21)

This invention relates to tripping mechanism, and in particular to tripping mechanisms whereby machines are intermittently engaged with and disengaged from power driving means, and specifically to such mechanism when used in connection with cooling wheels of galvanizing equipment utilized to cool hot sheets as they come from the molten spelter bath of a galvanizing pot.

One of the objects of the present invention is to provide an adjustable automatic trip mechanism.

Another object of the present invention is to provide a trip mechanism which may be readily removed.

Another object of the present invention is to provide an adjustable and removable automatic trip mechanism which may also be manually operated in case of an emergency.

Still another object of the present invention is to provide automatic trip means to intermittently engage a cooling wheel of a galvanizing equipment machine with its power driving means and, at the termination of a predetermined degree of rotation of said wheel, to provide additional means to positively disengage the wheel from its driving means.

Another object is to improve the automatic operation of galvanizing equipment machines of the type herein described by the provision therein of an adjustable and removable trip mechanism which may be manually operated if desired to effect the intermittent engaging and disengaging of a cooling wheel element of the machine, which trip mechanism is ordinarily operable by work pieces entering the machine.

These and other objects and advantages will become apparent as the invention is more fully disclosed.

The usual type of galvanizing equipment machines utilize a cooling wheel to cool the galvanized articles, particularly sheets before stacking, and in the common arrangement of elements the galvanized sheets move from the galvanizing pot on to a roller table to a position between rows of porcupine spokes that extend from the several hubs of the cooling wheel. Thereafter the porcupine spokes pick up the sheet and rotatively transfer the same about the axis of the wheel during which movement it is subjected to air cooling. At the end of this movement the sheet slides from between the rotating spokes thereby making room for a new sheet.

It is understood that there is a plurality of hubs, with spaced porcupine spokes extending therefrom, fastened to a shaft and collectively forming the cooling wheel. The several hubs of the wheel are so located on the shaft that the spaced spokes extend from the said several hubs, pass between the rollers of the roller table, and operate in such a manner as to pick up a sheet from the roller table after the roller table has performed its function of bringing the sheet to a position between rows of spokes.

In its normal operation, a cooling wheel is made to start when each sheet is loaded and to turn through an angle depending on the number of spokes on the wheel and is then brought to a stop for loading a following sheet, and this process is repeated for each sheet that is transferred from the roller table to the cooling wheel. Thus the cooling wheel is loaded by intermittent movements with one sheet between each row of spokes. Air passing between the sheets so separated on the cooling wheel cools the sheets as they are being conveyed from the front to the back of the cooling wheel and the sheets on reaching the back of the wheel slide from between the rows of spokes onto an inspection table.

Heretofore, fixedly positioned trip mechanisms have been provided for such machines to effect the automatic engaging and disengaging of the power driving means to the cooling wheel to effect the intermittent rotation of the wheel, but such tripping mechanisms have proven unsatisfactory. One reason is that it often happens that the weight of the sheet is insufficient to operate the clutch due to the excessive weight of the trip mechanism itself. Another reason is that due to variations in the lengths of sheets feeding into the cooling wheel, a following sheet may enter between the spokes of the wheel before the wheel is tripped into motion. By reason of the nonadjustability of heretofore provided trip mechanism, production is retarded and expensive shut-downs are experienced.

It is highly desirable to provide a trip mechanism for such devices which is so light in weight and so well balanced that the weight of a single sheet will operate the trip mechanism and therefore the clutch, without buckling the sheet. It is also highly desirable that such a tripping mechanism be adjustable to provide for an increase or a decrease in the weights of the objects actuating the same, and be adjustable with respect to its position upon the roller table to take care of dimensional variations in the objects actuating the mechanism.

In accordance with the objects of the present invention I have devised a trip mechanism which accomplishes these highly desirable results. Briefly, the tripping mechanism comprises a

clapper or tripper element located on the roller table of a galvanizing equipment machine in such a position thereon as to engage work pieces as they are positioned thereon and adapted so as to be adjustable along the length of the table to variations in the lengths of the work pieces, and which may be so nicely balanced that the weight of even light work pieces will certainly effect a rotation of the cooling wheel by the engagement of a clutch mechanism thereto in response to contact of a work piece with the trip mechanism before a succeeding work piece enters between the spokes of the wheel. I have also provided a tripper mechanism which is removable and may be readily repaired in case of trouble. I have also provided a manual control means in addition to automatic control means for the operation of the mechanism of the present invention.

Before further disclosing the nature and scope of the present invention reference should be made to the accompanying drawings wherein—

Fig. 1 is a plan view of a standard type galvanizing train cooling wheel and roller table showing my improved tripping mechanism attached;

Fig. 2 is a side view of Fig. 1;

Fig. 3 is an end view of Fig. 1;

Fig. 4 is an assembly view of worm shaft with clutch;

Fig. 5 is a plan view of part of Fig. 4;

Fig. 6 is a section on line 6—6 of Fig. 4 which shows the clutch operating means disengaged, while the clutch itself is engaged;

Fig. 7 is a similar section on line 6—6 of Fig. 4 which shows the clutch operating means beginning to disengage the clutch;

Fig. 8 is a section on line 8—8 of Fig. 1 showing the connection whereby the clutch may be hand operated;

Fig. 9 is a section on line 9—9 of Fig. 1 showing a movable arm or clapper that when hit by a moving sheet operates the trip mechanism of this invention.

Referring to the drawings (Figs. 1, 2 and 3), the adjustable automatic tripper mechanism of the present invention comprises a clapper 10 fastened to a rock shaft 12 that turns the rock shaft 12 when the clapper 10 is struck by a sheet passing over the roller table 11 of a galvanizing train. The lever arm 14 is fastened to the shaft 12 and has a forked end that fits between two trip collars 16 that are fastened to trip rod 18. Trip rod 18 is connected to lever arm 20 which in turn is fastened to one end of rod shaft 22. A cam lever member 24 is fastened near the end of rod shaft 22 and arranged with respect to the clutch so as to serve as an engaging and disengaging means thereon. This engaging and disengaging is effected by providing a one-revolution spring clutch element, more particularly disclosed in Fig. 5 in which a spring element 26 is provided and arranged to move clutch dog 27 on clutch 28 into engagement with clutch ring 32 when the cam lever 24 has been lifted to a position shown in Fig. 6 thereby releasing dog 27. The end of dog 27 is pushed by the spring 26 into one of the holes 30 in a clutch ring 32 fastened to a sprocket wheel 34 by machine screws 36 and thereby the engagement of sprocket wheel 34 to clutch 28 is effected. Sprocket wheel 34 turns idly on shaft 38 when not engaged with clutch 28 and is connected to a driving shaft 39 by suitable transmission means shown in the drawings as a chain and sprocket wheel 90. The driving means is not shown but may be of any convenient type such as an electric motor, gas motor or the like. The same driving means is utilized through sprocket wheel 95 to energize the roller table 11 substantially as shown.

When engaged with clutch 28, the sprocket wheel 34 revolves the clutch 28 and consequently the shaft 38 and worm 40. Worm 40 is meshed with worm wheel 42 which is fastened to the shaft of the cooling wheel. By a revolution of the worm 40 a rotation of wheel 42 in a predetermined degree may be obtained. Means are provided such as a cap screw 44 (Fig. 4) and a washer 46 to prevent the clutch 28 from sliding off the squared end of shaft 38. The cooling wheel as a whole is referred to as 47 (Fig. 2), and the spokes thereof as 48.

Instead of supporting trip rod 18 upon rigid vertical support members, as has heretofore been done, I provide relatively long trip rod supports 76 which are attached to the floor by any suitable hinging means 93, such as ball joints, swivel joints or hinge connections, as indicated, and similarly connect the supports 76 to shaft 18 as indicated at 94. This gives a flexibility of movement to shaft 18 not heretofore obtained.

Referring to Figs. 1, 2 and 3, it will be understood that the weight of cam lever 24, lever arm 59, lever arm 54, lever arm 20 and counterweight 82 operates to move trip rod 18 to the left, while the weight of clapper 10 operates to move said trip rod 18 to the right. A nice adjustment of these weights results in the balancing of the horizontal forces tending to move trip rod 18, so that the force required to trip clutch 28 is brought to a minimum.

To provide for the adjusting of the tripper mechanism to different lengths of sheets entering the rolls of roller table 11, a series of parallel spaced notched supports 50 and 52 (Figs. 1, 2 and 3) is provided along the length of the table 11. Rock shaft 12 may be placed in any pair of these supports with lever arm 14 engaging in a corresponding pair of collars 16 on trip rod 18.

To provide for positive disengagement of the clutch mechanism from the driving means, a lever arm 54 (Figs. 4, 5, 6 and 7) fastened to rod shaft 22 and a cam 56 integral with clutch 28, are utilized so as to compel the cam lever 24 to enter groove 57 on clutch 28 and further to compel the cam lever 24 to so function that clutch dog 27 is positively wedged out of engagement with clutch ring 32.

The operation of the trip mechanism of the present invention is substantially as follows: A sheet 78, shown on Fig. 9 moving on roller table 11, strikes clapper 10 as it is shown in full line position. This is the position of clapper 10 when cam lever 24 is holding dog 27 against the force of spring 26 and out of engagement with clutch ring 32. The sheet 78 moves clapper 10 from full line position to dotted line position. This rocks the rod shaft 12 and swings lever arm 14, resulting in a horizontal movement to the right of trip rod 18. This in turn swings lever arm 20, rocking shaft 22, and lifts the cam lever 24 into position, shown in Fig. 6, thereby releasing clutch dog 27, whereupon the clutch dog 27 is driven by spring 26 into engagement with the clutch ring 32 fastened to moving sprocket wheel 34. Thereupon clutch 28 and parts attached thereto are caused to revolve. Thus worm 40 receives its motion and being meshed with worm wheel 42 turns the cooling wheel 47.

The relation of parts is such that one revolu-

tion of the worm 40 will turn the cooling wheel 47 through an angle equal to that between any two spokes 48. It is necessary therefore to stop the worm 40 after each revolution so that a new sheet may pass on the roller table and between rows of spokes 48. This stopping of the cooling wheel 47 is accomplished by disengaging clutch 28 from its driving means and is effected by cam 56 striking lever arm 54 compelling the end of cam lever 24 to enter groove 57 so that the wedge end of the lever 24 will force dog 27 out of engagement with the clutch ring 32 thereby releasing the driving means from the driven means. The wheel 47 will then come to rest within a relatively short distance which may be readily estimated. To more positively insure that wheel 47 will stop rotating, braking means 64, as indicated in Fig. 4, may be provided, with or without additional friction braking means.

Sheet 78 has been lifted from roller table position (shown in dotted lines, Fig. 9) by the movement of cooling wheel 47 to a position marked 80 shown in solid lines (Fig. 9), and clapper 10 has been returned to position shown by full lines ready to trip clutch mechanism again into engagement when it is struck by a following sheet passing along roller table 11. In this manner a cycle of operation is completed.

The operation of the trip mechanism by automatic means, as above described, is the intended normal operation of the mechanism, but it can be operated manually from any point along trip rod 18, by moving this rod, as shown on Figs. 1 and 2, to the right to trip clutch 28 into engagement, and to the left to trip clutch 28 out of engagement.

The trip mechanism can be manually operated by the operating lever 70 by means of elements 70, 72, 74 and 75 in cooperation with trip rod 18 in a manner to be next described. The operating lever 70 normally is in a substantially vertical position being held and balanced in this position by counterweight 75. Trip rod 18 works normally through a slot in lever arm 74 without engaging or moving the lever arm 74, but when operating lever 70, as shown in Fig. 2, is moved clockwise, lever arm 74 engages a collar on trip rod 18 and moves the trip rod 18 to the right which releases the dog 27 (Fig. 5) and thus trips the clutch 28 into engagement. Likewise when lever 70 is moved anti-clockwise, the trip rod 18 is moved to the left which trips the clutch 28 out of engagement.

The trip mechanism can also be manually operated by the operating shaft 62 (Fig. 2) by means of elements 58, 59, 60, 62 and 63 in cooperation with rod shaft 22 and in the manner to be next described. The bent end of operating shaft 62 as shown on Fig. 3, normally is in a substantially vertical position being held and balanced in this position by the counterweight 63. Lever arm 59 fastened to rod shaft 22 has a slot in it which normally works over rod 58 without engaging or moving the rod 58, but when operating shaft 62, as shown in Fig. 8, is turned clockwise, the lower stop on rod 58 engages lever arm 59 and lifts it, which trips the clutch 28 into engagement. Likewise, when the operating shaft is turned anti-clockwise, the upper stop on rod 58 engages lever arm 59 and moves it downwardly, which trips the clutch 28 out of engagement.

The principal advantage that the herein described trip mechanism has over mechanisms of former practice is in the feature of an easily adjustable and removable clapper assembly. In mechanisms heretofore used the clapper or trigger has been placed fixedly on the roller table which is designed for maximum length sheets and when short sheets are being handled the follow sheet must be suitably spaced so as to prevent the same from entering the same row of spokes wherein is the forward sheet before the forward sheet has tripped the driving means into an engagement with the cooling wheel. This slows down production materially. With the adjustable and removable clapper assembly the clapper assembly may be set into any pair of notched supports 50 and 52 to accommodate the mechanism to the various lengths of work pieces on the carrying means thereby saving the unnecessary travel of a short sheet on the roller table of the carrier means. It is thus possible to speed up production by decreasing the distance between the sheets on the roller table.

Another advantage of the easily removable clapper assembly of this invention is that it can be quickly and entirely removed in case of any trouble with the cooling wheel or inspection table, which will then allow the sheets to pass entirely over the roller table and over the end thereof onto buggies. Production is therefore not stopped or interrupted.

A means for effecting a positive disengagement of the clutch when the cooling wheel has turned the required distance to lift one sheet, as for instance, cam 56 and lever arm 54 shown in Figs. 6 and 7, is a decided improvement over designs of mechanisms heretofore used which are for the most part dependent on gravity acting through counterweights to effect the disengagement of the clutch. The positive acting means herein provided in cooperation with the brake mechanism insures the stopping of the cooling wheel in its proper relation to the roller table.

A further improvement in mechanism herein described over other mechanisms now known is in the provision of a brake mechanism to bring about a smooth starting and stopping movement of the cooling wheel 47. The brake 64 (Fig. 4) is held in place on shaft 38 by nuts 66. Running washers 68 working against bearings 92 that support shaft 38 are provided as may be necessary. Standards 92A are provided to support shaft 38 and cooling wheel.

A still further improvement in mechanism herein described over other mechanisms now known is the balancing of trip rod 18 on long approximately vertical supports 76 instead of sliding the rod through holes or bearings outstanding from the roller table structure, or from support members rigidly positioned with respect to the floor or supporting structure of the machine.

The design of clutch 28 is more or less immaterial and, while a practical design of a one-revolution spring clutch is described and illustrated in the drawings, it must be understood however that electric, steam, hydraulic and mechanical clutches of a design other than that shown, may be tripped into engagement by the herein described and claimed mechanism or modification thereof.

Having with particularity disclosed and described the broadest aspects and a specific embodiment of the present invention, it is apparent that there may be many modifications and departures made therein without departing essentially from the spirit and scope thereof and such departures and modifications as may be made are

contemplated by me, as may fall within the scope of the following claims.

What I claim is:

1. In apparatus of the type described, a cooling wheel, a conveyor to convey work pieces thereto, driving means therefor, clutch mechanism to connect the driving means to said wheel and automatically operating tripper mechanism to engage with said work piece at a determined position on said conveyor to thereby operate said clutch mechanism to rotate the wheel through a prescribed degree of orientation, said wheel operating during said rotation to lift the said work piece from said conveyor, means to disengage said clutch at the end of said prescribed degree of rotation and braking means to terminate the rotation of the wheel, and means to operatively support said tripper mechanism along said conveyor in a plurality of positions to accommodate the same to varying lengths in said work piece.

2. In apparatus of the type described, a cooling wheel, a conveyor to convey work pieces thereto, driving means therefor, clutch mechanism to connect the driving means to said wheel and automatically operating tripper mechanism to engage with said work piece at a determined position on said conveyor to thereby operate said clutch mechanism to rotate the wheel through a prescribed degree of orientation, said wheel operating during said rotation to lift the said work piece from said conveyor, means to disengage said clutch at the end of said prescribed degree of rotation and braking means to terminate the rotation of the wheel, and means to operatively support said tripper mechanism along said conveyor in a plurality of positions to accommodate the same to varying lengths in said work piece and means to delicately balance said tripper mechanism to render it responsive on contact with said work pieces regardless of the individual weight of said work pieces.

3. A machine of the type described comprising a rotatable cooling wheel, a conveyor to convey work pieces thereto, driving means operating said conveyor means, clutch means to connect the driving means to the said cooling wheel, tripper mechanism mounted on said conveyor and operative by work pieces contacting therewith to actuate the said clutch means to engage the said driving means to said wheel to rotate the said wheel through a prescribed degree of rotation, means to operatively support said tripper mechanism in a plurality of positions along the length of said conveyor, means to balance said tripper mechanism to be responsive to work pieces of different weights, means to disengage the said clutch means after said prescribed degree of rotation of said wheel, and braking means to terminate rotation in said wheel.

4. An apparatus as described and claimed in claim 3, the tripper mechanism for operating the said clutch means comprising a rock shaft supported above the said conveyor and transversely disposed thereto, a clapper member depending therefrom to adjacent the conveyor surface, a balancing weight therefor, a lever arm with a forked end depending therefrom at one end, a trip rod extending longitudinally along said conveyor, hinged support members therefor, spaced collar members on said trip rod adapted to engage the depending forked end of said lever arm, a second lever arm dependent from said trip rod and engaging a rod shaft extending at right angles thereto, said rod shaft carrying a cam lever adapted to engage and disengage said clutch means with said driving means when said shaft is rocked about its longitudinal axis in reverse directions.

5. An apparatus as described and claimed in claim 3, the tripper mechanism comprising parallel spaced notched support members positioned above and extending longitudinally along said conveyor, a rock shaft positioned across said supports and engaging oppositely positioned notches therein, a clapper member depending therefrom to adjacent the conveyor surface, a balancing weight therefor, a lever arm with a forked end depending therefrom at one end, a trip rod extending longitudinally along said conveyor, hinged support members therefor, a plurality of spaced collar members on said trip rod adapted to engage the depending forked end of said lever arm when the rock shaft is positioned in any one of said notches, a second lever arm dependent from said trip rod and engaging a rod shaft extending at right angles thereto, said rod shaft carrying a cam lever adapted to engage and disengage said clutch means with said driving means when said shaft is rocked about its longitudinal axis in reverse directions.

6. An apparatus as described and claimed in claim 3, the tripper mechanism comprising a rock shaft supported above the said conveyor and transversely disposed thereto, a clapper member depending therefrom to adjacent the conveyor surface, a balancing weight therefor, a lever arm with a forked end depending therefrom at one end, a trip rod extending longitudinally along said conveyor, hinged support members therefor, spaced collar members on said trip rod adapted to engage the depending forked end of said lever arm, a second lever arm dependent from said trip rod and engaging a rod shaft extending at right angles thereto, said rod shaft carrying a cam lever adapted to engage and disengage said clutch mechanism with said driving means when said shaft is rocked about its longitudinal axis in reverse directions, lever means to displace said trip rod to engage or disengage said clutch means, and lever means to rock said rod shaft to engage or disengage said clutch mechanism, each of said lever means being normally inoperative during the automatic operation of said tripper mechanism.

7. An apparatus as described and claimed in claim 3, the tripper mechanism comprising parallel spaced notched support members positioned above and extending longitudinally along said conveyor, a rock shaft positioned across said supports and engaging oppositely positioned notches therein, a clapper member depending therefrom to adjacent the conveyor surface, a balancing weight therefor, a lever arm with a forked end depending therefrom at one end, a trip rod extending longitudinally along said conveyor, hinged support members therefor, a plurality of spaced collar members on said trip rod adapted to engage the depending forked end of said lever arm when the rock shaft is positioned in any one of said notches, a second lever arm dependent from said trip rod and engaging a rod shaft extending at right angles thereto, said rod shaft carrying a cam lever adapted to engage and disengage said clutch means with said driving means when said shaft is rocked about its longitudinal axis in reverse directions, lever means to displace said trip rod to engage or disengage said clutch mechanism, and lever means to rock said rod shaft to engage or disengage said clutch mechanism, each of said lever means be-

ing normally inoperative during the automatic operation of said tripper mechanism.

8. A machine of the type described comprising a rotatable cooling wheel, a conveyor to convey work pieces thereto, driving means operating said conveyor means, clutch means to connect the driving means to said cooling wheel, a tripper mechanism on said conveyor operative by contact with the said work pieces to operate the said clutch means to engage the said driving means to the said cooling wheel, means to disengage said clutch means after a prescribed degree of orientation of said cooling wheel, braking means to terminate rotation in said wheel, means to operatively support said tripper mechanism along the full length of said conveyor, means to balance said tripper mechanism to render it responsive on contact with said work pieces regardless of the individual weight of said work pieces and lever means to engage and disengage the said clutch means.

9. An apparatus as described and claimed in claim 3, including means to engage and disengage the said clutch mechanism independently of said tripper mechanism.

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