Oct. 4, 1932. W. C. McBAIN 1,881,056

TENSION DEVICE

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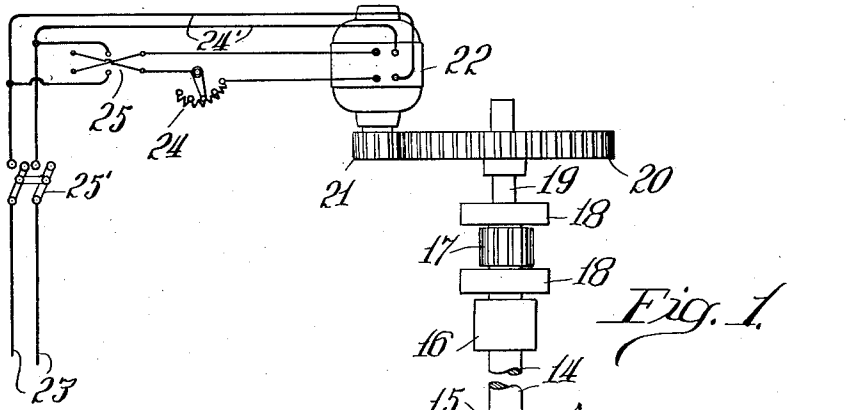


Fig. 1.

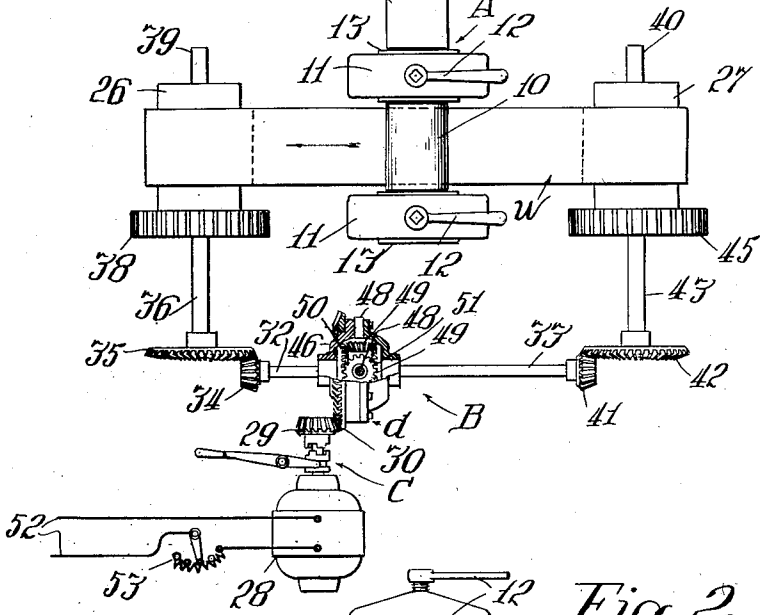
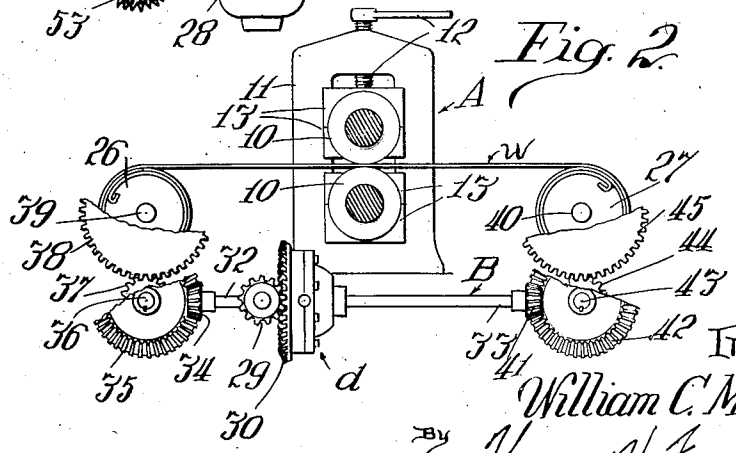


Fig. 2.



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Fig. 3.

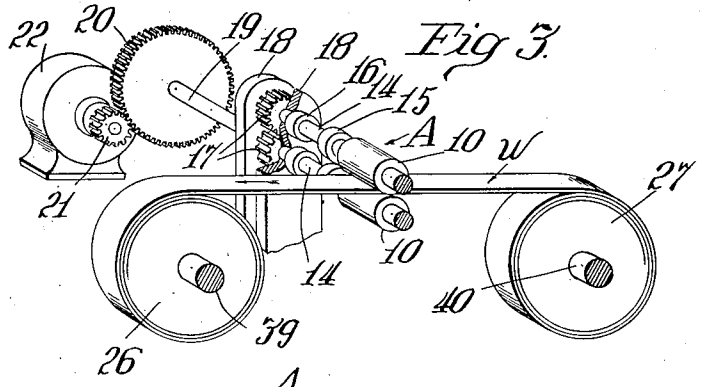


Fig. 4.

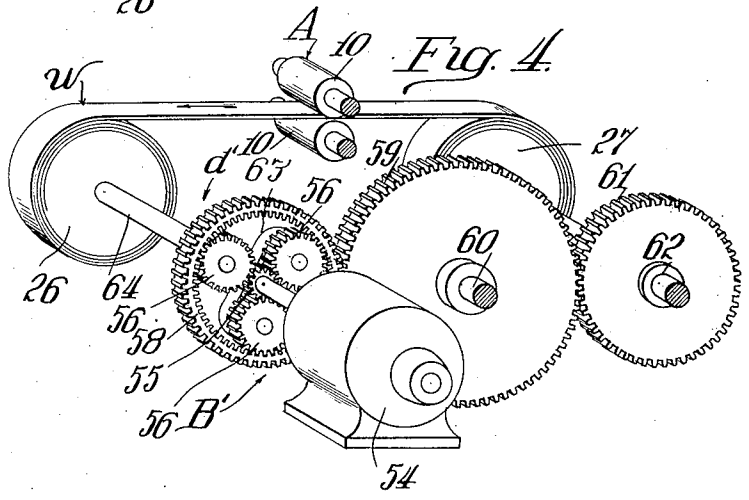
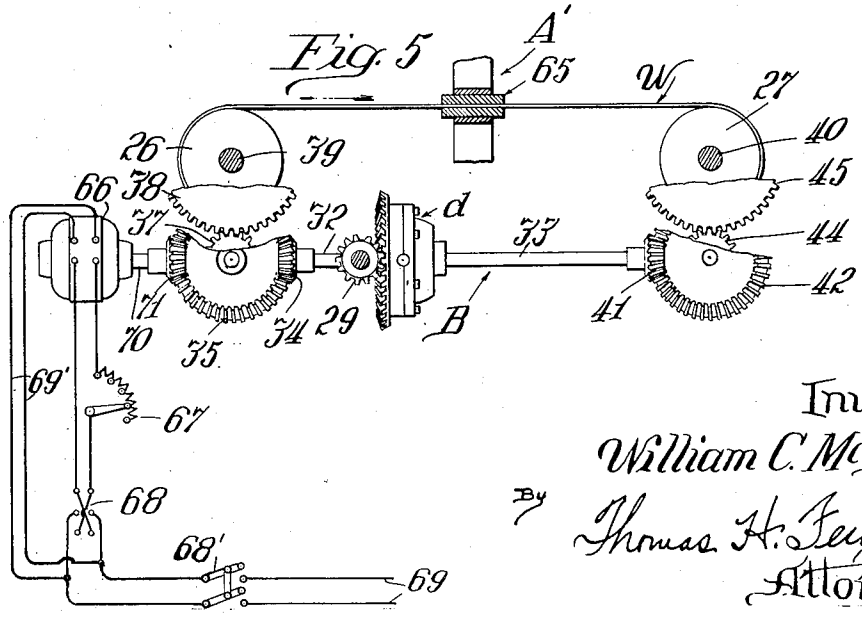


Fig. 5



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Fig. 6.

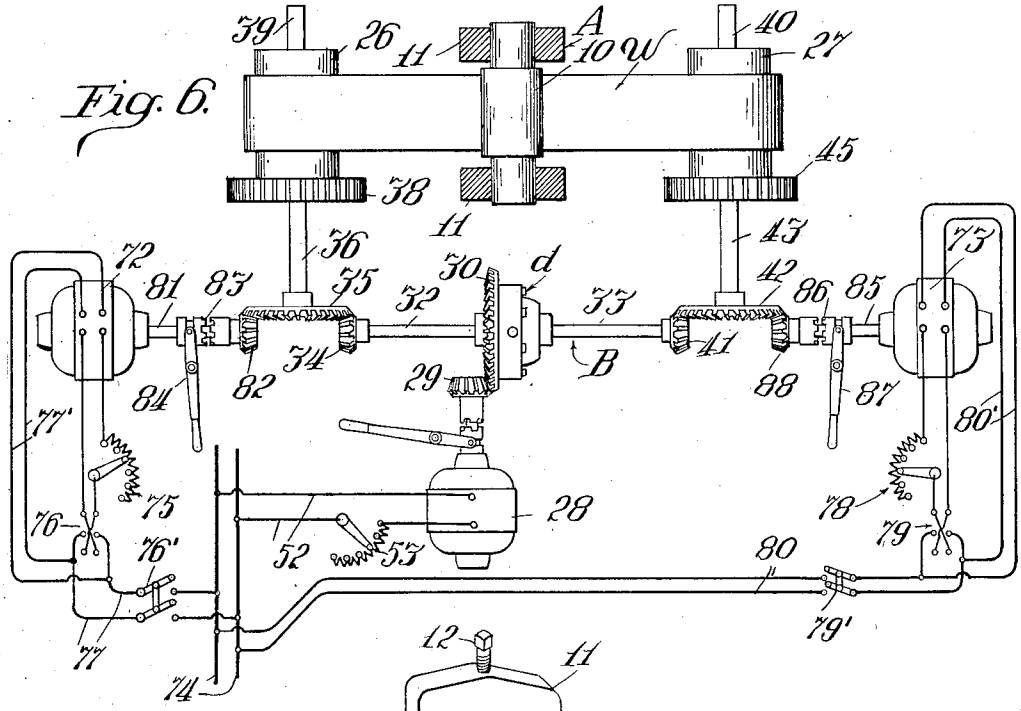
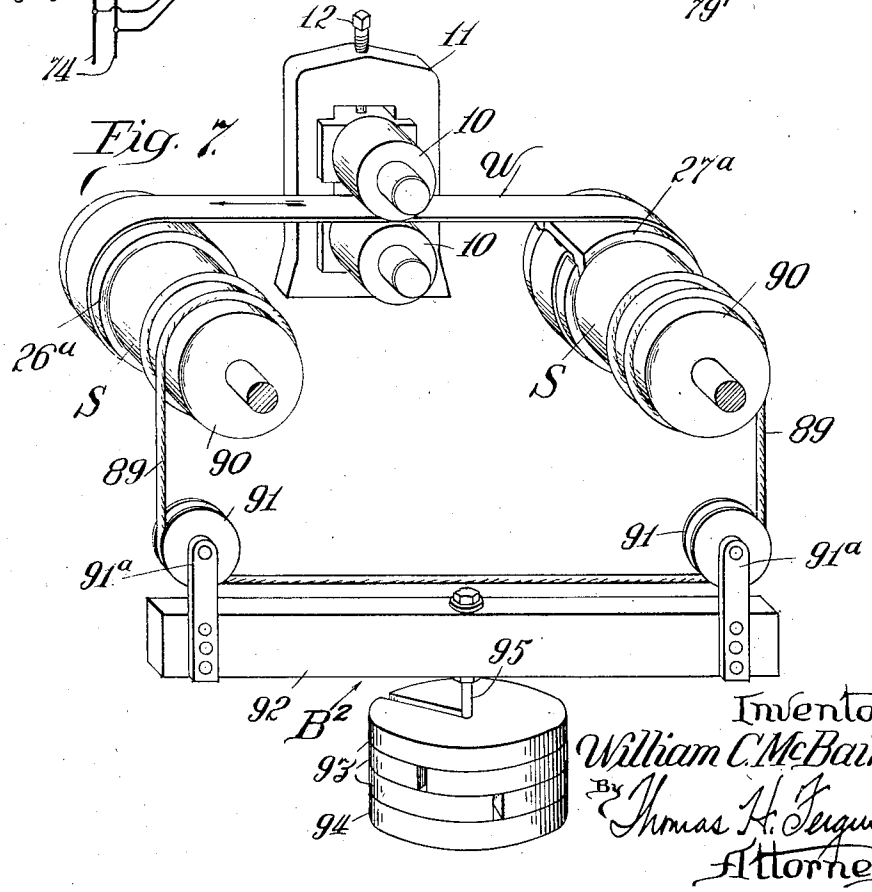


Fig. 7.



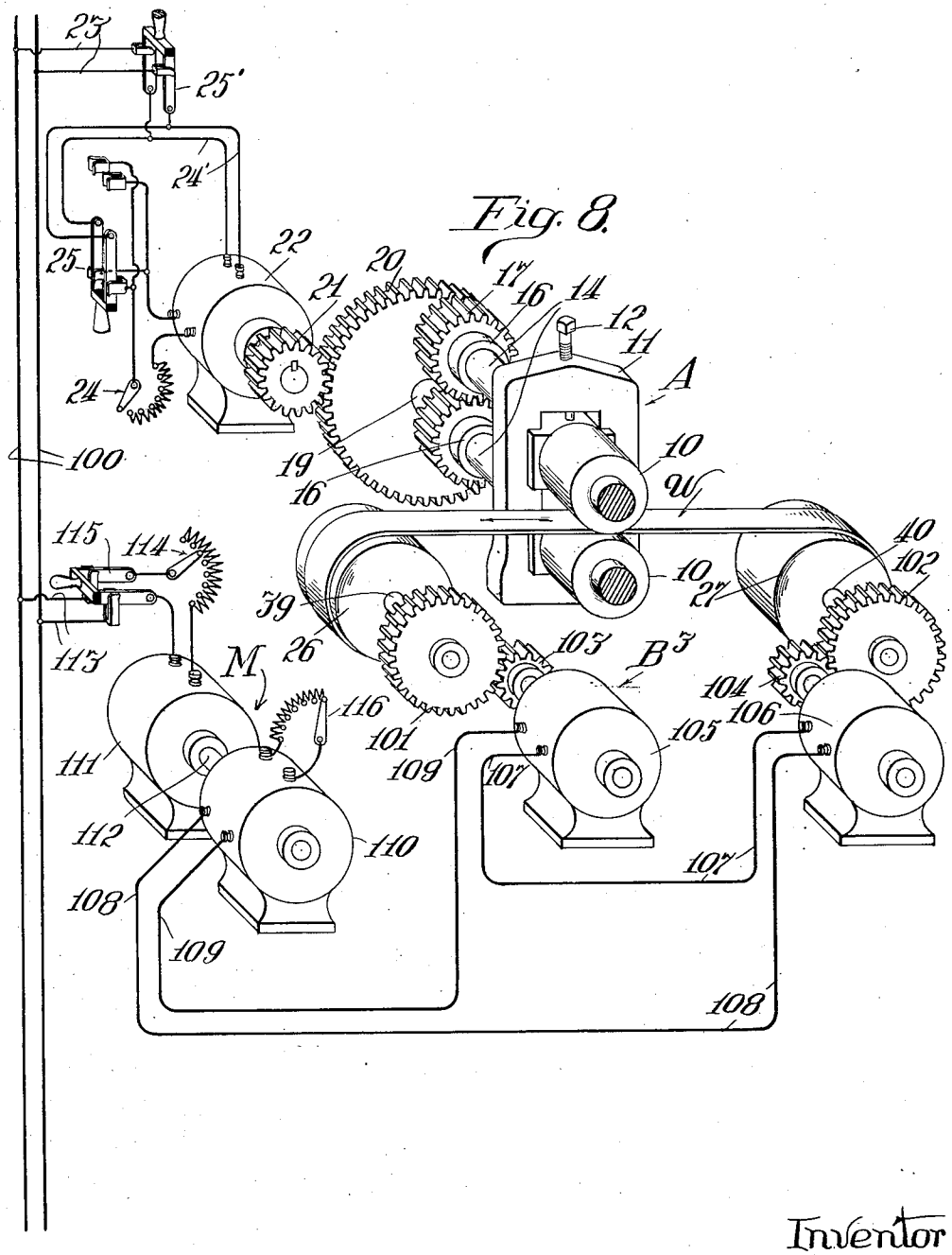
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Fig. 8.



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Patented Oct. 4, 1932 1,881,056

UNITED STATES PATENT OFFICE

WILLIAM C. McBAIN, OF YOUNGSTOWN, OHIO

TENSION DEVICE

Application filed July 5, 1928. Serial No. 290,534.

The present invention relates to tension devices for use in handling elongated pieces of work, such as metal strip, bar, wire, and the like, while they are being worked upon by the rolls or dies of a rolling mill or other machine.

The invention is especially suited to strip mills and will be described in that connection, although it should be understood that the same has a broader field and may be used upon other shapes than strip and in many other relations, as will be apparent as we proceed with the description.

It is well known that in prior strip mill practice the coiled strip is commonly placed as a coil over a bar or unwinding reel on the feeding-in side of the mill and the end is then passed through the mill and attached to a winding-up reel located on the delivery side of the mill. Power is commonly applied to the winding-up reel to wind up the strip into a coil on the reel. Where an unwinding reel is used, instead of a simple bar, sometimes a brake is added to retard the unwinding action of the reel and thus place a drag on the strip on its way to the mill. By this practice much energy is lost at the brake. The same is merely dissipated as heat. One object of the present invention is to devise a novel control that will do all that the braked unwinding reel control will do but will also save the energy wasted by it and apply the same to useful work. Preferably, this is accomplished by transmitting the energy imparted to the unwinding reel by the pulled strip, directly to some portion of the mill mechanism where power is required, such as the winding-up reel, and using it there to assist in winding up the strip.

In that prior art practice, just described, wherein the unwinding reel is braked, it will be seen that a reversal in the direction of feed of the strip can only be accomplished by the use of duplicate braking means and the changing over or substitution of driving means. Another object of the invention is to facilitate this reversing operation. In the preferred embodiment this is accomplished by merely slowing down the strip driving motor and reversing the same. Thus a complete reversal is most easily accomplished, a single operation sufficing.

In that same prior art practice, that is the practice wherein an unwinding reel and a brake are used, the strip is held under tension before entering and after leaving the rolls by independent devices, namely, the driving motor by which the winding-up reel is rotated, and the brake mechanism by which the unwinding reel is retarded. Another object of the invention is to simplify the mechanism for applying tension to the piece of work. Preferably this is accomplished by driving the two reels from a common source of power through differential gearing. In this way the applied power is divided between the reels as required.

The several objects and features of the invention will be more fully understood upon reference to the following detailed description taken in connection with the accompanying drawings, while the scope of the invention will be particularly pointed out in the appended claims.

In said drawings, Fig. 1 is a diagrammatic plan view of a strip mill and tension device constructed in accordance with the present invention; Fig. 2 is a front elevation of the same, parts being broken away for clearness and the driving motors being omitted; Fig. 3 is a perspective view of the arrangement of Fig. 1, illustrating more particularly the gearing by which the reducing rolls are driven; Fig. 4 is a similar view illustrating the rolls of the same mill provided with a modified form of tension device wherein spur gears are employed in the differential instead of miter gears; Fig. 5 is a view similar to Fig. 2, illustrating a die, instead of rolls, for reducing the work and an auxiliary electric motor cooperating with the main electric motor in advancing and tensioning the work; Fig. 6 is a plan view of an arrangement wherein two auxiliary electric motors cooperate with the main differential operating motor in handling the work; Fig. 7 is a perspective view of a modified tension device of simple form wherein weights acted upon by gravity provide the necessary tensional forces; and Fig. 8 is a similar view of a still further modification

wherein electric machines, capable of functioning either as motors or generators, provide the necessary advancing and braking forces. Throughout these views like characters refer to like parts.

Referring to the drawings in detail, A designates a strip mill of any preferred construction, and B one form of the tension device of the present invention. In the mill we have the usual reduction rolls 10 journaled in housings 11. As usual, the upper roll 10 is adjustable by means of screw-down mechanisms 12. The latter includes screws which bear upon journal boxes 13 above the bearings of the upper roll. The screw-down mechanisms are conventionally shown and may be of any desired construction. The rolls 10 are driven as usual through spindles 14 which are connected at one end by couplings 15 to the rolls, and at the opposite end by couplings 16 to the intermeshing pinions 17 journaled in the housings 18. Both pinions 17 have their shafts mounted for rotation in bearings in the housings 18, and the shaft 19 of the lower pinion extends beyond the outer housing and has keyed to it a reduction gear wheel 20. The latter meshes with a driving pinion 21 on the shaft of an electric motor 22. The motor 22 is supplied with current from a suitable supply through conductors 23 and the operation of the motor is controlled by a controller 24, a reversing switch 25 and a main switch 25'. The motor 22 is preferably a constant speed motor having the controller 24 and switch 25 in its armature circuit, and its field circuit included in parallel with the armature circuit by the conductors 24'. The main switch 25' controls the connection to the supply leads 23. The motor 22 provides power for positively driving the rolls 10. As clearly shown, the work W passes between the rolls 10, and as it does so it is reduced in thickness by the rolls, depending upon the position in which they are set by the screw-down mechanism 12. The direction of movement of the work is determined by the direction of rotation of the rolls 10 and the latter is dependent upon the direction of rotation of the driving motor 22. By using the reversing switch 25 in the armature circuit, the motor 22 may be driven in either direction.

The tension device B includes the reels 26 and 27 positioned on opposite sides of the rolls 10 so that the strip of work in passing from one reel to the other will pass between the rolls 10. If the work W in this form of the invention travels in the direction indicated by the arrows, then the reel 26 is a winding-up reel, and the reel 27 is an unwinding reel. Each reel is provided with means for attaching the end of the strip to it. Any suitable construction may be employed for this purpose. In whichever direction the work is traveling the winding-up reel receives driving power from an electric motor 28. As we shall see later part of the power for driving the winding-up reel comes at times from the unwinding reel and the latter may receive some of its power from the strip through the action of the rolls driven by motor 22. However, the motor 28 furnishes the desired initial tension in the work and compensates for its elongation in the mill.

The motor 28 has its pinion 29 in mesh with the bevel gear wheel 30 of the differential mechanism *d*. Preferably the pinion 29 is clutched to and unclutched from its shaft by clutch mechanism C. In some cases this clutch arrangement is desirable; in other it may be omitted. It may be used to advantage in some cases when installing new coils of strip to be rolled or when removing the coils that have been rolled. Continuing with the gear train it will be seen that shafts 32 and 33 are driven through the mechanism *d* from the pinion 29. The shaft 32 has a pinion 34 which meshes with a bevel gear 35 mounted on a shaft 36 associated with the reel 26. The end of the shaft 36 nearest the reel 26 is provided with a pinion 37 which meshes with a gear wheel 38 mounted directly on the shaft 39 of the reel 26. Similarly, the shaft 33 is operatively connected to shaft 40 of reel 27 through bevel pinion 41, gear wheel 42, shaft 43, pinion 44, and gear wheel 45.

The differential mechanism *d* may take various forms. In the instance illustrated the bevel gear wheel 30 is secured to the casing 46 which in turn is free to rotate about the axis of the shafts 32 and 33. The shell 46 carries four radial pivots 48 upon which are miter gears 49 which mesh with two bevel gear wheels 50 and 51 secured to the shafts 32 and 33 respectively. In the instance illustrated, the casing 46 floats upon the hubs of the wheels 50 and 51. The motion of the motor pinion 29 is transmitted through wheel 30 to casing 46 and the motion of the latter is transmitted by the equalizing pinions 49 to that one of the two bevel gear wheels 50 or 51 which offers the least resistance.

With this arrangement the energy of the motor 28 will be transmitted to the reels 26 and 27 in such a way as to maintain the work on opposite sides of the rolls 10 under the desired tension. Likewise, a pull upon the unwinding reel by the strip W will furnish energy to the unwinding reel which will not be wasted through brake action, as in the prior art previously referred to, but will, through the gearing and differential mechanism *d*, apply a force tending to wind up the strip upon the winding-up reel. The motor 28 is preferably designed so that it may be run at a very low speed and also stalled without burning out. It is preferably a constant-torque motor. Thus, it will always apply a force to the differential and the associated gearing which will maintain the requisite tensions in the portions of the work on the opposite sides of

the rolls 10. At the same time the energy given the unwinding reel by the strip will be transmitted through the gearing to the winding-up reel. The motor 28 is supplied with current from any suitable source, as by the wires 52, which may lead in from the shop mains or from a special generator as shown at M in Fig. 8. The controller 53 may be used to regulate the amount of electrical energy that flows to the motor 28 thereby regulating the amount of tension in the work W.

In lieu of the differential mechanism *d*, other differential mechanisms may be used with equally good results. Several such are illustrated in "Automobile Repairing Made Easy" by V. W. Page, published by Norman W. Henley Publishing Co., New York. Another is illustrated in Fig. 4 of the drawings wherein I show a second form of tension device B'. There the rolls 10 are driven as before. Assuming the direction of travel to be that indicated by the arrow, then the reel 26 is the winding-up reel, and the reel 27 is the unwinding reel. Both reels are differentially driven as required, by an electric motor 54 which performs the same functions as the motor 28 in the previously described embodiment of my invention. This motor is also preferably a constant-torque motor. The pinion 55 of the motor meshes with planetary spur gears 56 of the differential gear mechanism *d'*. The wheels 56 mesh with the internal teeth upon the rim 58, and external teeth upon the same rim mesh with gear wheel 59, mounted upon a suitable shaft 60. The wheel 59 in turn meshes with wheel 61, mounted upon shaft 62. The latter shaft is the one upon which the reel 27 in the present embodiment is keyed. The planetary gear wheels 56 are mounted upon a carrier 63 positioned within the rim 58 and secured to the shaft 64 of the reel 26. With this construction the action is similar to that of the tension mechanism previously described. The motor must be controlled as before pointed out. Differences in tension upon opposite sides of the work are taken up through the differential mechanism *d'*. Likewise, the energy supplied to the unwinding reel by the pull of the work upon it is transmitted through the gearing to the winding-up reel.

It will also be apparent that the tension mechanism is capable of use in handling elongated pieces of work, whether the same be worked upon by reducing rolls or by other working means. As illustrative of this, I have shown in Fig. 5 the arrangement of Fig. 2, but have replaced the reducing rolls 10 of mill B by die 65 of a metal drawing machine A' through which the work W is adapted to pass. The change from the positively driven rolls to the fixed die has also necessitated a change in the driving means. It will be seen that with the equality in gear ratios illustrated, the motor 28 could not be relied upon to advance the work through the die for the reason that the power applied by the motor would be equally divided and consequently the forces applied to the work on the two sides of the die would be equal and opposite. Some provision must therefore be made for changing these forces. This may be done in several ways. One of these is to employ an additional motor 66 in association with one of the reels, such as reel 26. Such a motor is preferably a constant speed electric motor having its armature connected to a controller 67 and a reversing switch 68 adapted to be connected to supply leads 69 by a main switch 68'. The field windings of the motor 66 are connected in circuit by the conductors 69'. The shaft 70 of the motor is provided with a bevel pinion 71 which meshes with bevel gear wheel 35. The motor 66 pulls the work W through the die 65 but applies no tension to the work on the feeding-in side of the die. The motor 28 which drives the differential *d* will on the other hand provide the necessary tension in the work. Obviously this would be true also with any other form of passive work-reducing means. The representation of the die 65 is merely diagrammatic and it should of course be suited in design and details to the character of the piece of work on which it is to act.

It will be obvious that in case there is inequality in the leverages of the trains extending from the differential to the work at the opposite sides of the work-reducing means, these motors 28 and 66 will divide the work of pulling the strip through the reducing agency.

When it is desired to pull the work W in the opposite direction to that indicated by the arrow, then the direction of rotation of the motor 66 is reversed. In that case the power of the motor is transmitted through shafts 32, 33, and 43 to the reel 27 which then acts as the winding-up reel.

Instead of using one additional motor in association with the reels and reversing its direction of rotation for reversals of directions of travel of the work, as pointed out in describing the arrangement of Fig. 5, I may use two additional motors. This is the arrangement illustrated in Fig. 6. There, motor 72 is associated with the reel 26, and motor 73 with the reel 27. Both motors are supplied with current from supply mains 74 through suitable leads provided with the usual control apparatus.

In the case of motor 72 this apparatus includes an armature current controller 75 and a reversing switch 76 connected in circuit by leads 77 and a main switch 76'. The field windings are connected in circuit by conductors 77'. The corresponding parts associated with motor 73 are a controller 78, a reversing switch 79, leads 80, a main switch 79', and field winding conductors 80'. The shaft

81 of motor 72 is in line with the shaft of a bevel pinion 82 associated with the bevel gear wheel 35. A clutch 83, controlled by a lever 84, serves to connect and disconnect the aligned shafts and thus to throw the motor 72 into and out of driving engagement with the pinion 82. Similarly, the shaft 85 of motor 73 may be operatively connected by a clutch 86, controlled by a lever 87, with a pinion 88 in mesh with the gear wheel 42, associated with the reel 27.

With the arrangement of Fig. 6, it will be seen that the work may be moved first in one direction by the motor 72, and then in the opposite direction by the motor 73. When the motor 72 is running, the lever 84 may be actuated to operate the clutch 83 to bring the motor into driving relation. At such time clutch 86 of motor 73 should be left open. Upon a reversal of the direction of travel of the work W, the motor 72 is thrown out of clutching relation with its driving pinion 82, and motor 73 is thrown into clutching relation with its driving pinion 88.

As a further modification, I wish to call attention to the arrangement of Fig. 7. Here the same mill A is present but the tension device, designated B^2, is different. The work W passes as before between the reducing rolls 10. The latter are located between the reels 26^a and 27^a and are power driven. The reels have the usual surfaces for receiving the work but in each instance the remainder of the reel is differently constructed. Each is provided with a drum surface S. To these, the ends of a rope 89 are secured, one end to each drum. The rope ends are oppositely wound on the drums 90 as clearly illustrated. Thus a downward pull upon each depending portion of the rope tends to rotate the reels so as to apply tension to the work on opposite sides of the rolls 10. The intermediate portion of the rope 89 passes around pulley wheels 91 secured by straps 91^a to opposite ends of a bar 92 and the latter exerts a downward pull on the vertical portions of the rope 89 by reason of one or more removable weights 93 adapted to be located on a pendant weight 94 secured to the lower end of a rod 95 pivotally secured to the bar 92 midway of its ends.

It will be seen that this arrangement shows the principle of the invention in a simple form. The adjustable weights take the place of the differential motor 28, the rope 89 and its connections to the bar 92 and drums 90 constitute the gearing trains, and the action of the rope upon the pulley wheels 90 gives the necessary differential action. Although this simple form is not preferred, yet it works satisfactorily and well illustrates the principle of the invention.

There is still another embodiment of the invention to which I should like to call attention. It is illustrated in Fig. 8. There are two dynamo electric machines and while the work travels in one direction the one machine acts as a motor to coil the work upon the winding-up reel and the other acts as a generator of electricity which assists the supply circuit, and upon a reversal in the direction of travel of the work there is a reversal in the functions of the two machines.

In the diagram of Fig. 8 the mill A is the same as heretofore described and its rolls 10 are positively driven by the motor 22 which receives its current through conductors 23 from the supply mains 100. The parts of the mill and the gear train by which it is operated are the same as heretofore described but the tension mechanism B^3 is different. The reels 26 and 27 in this case have their respective shafts 39 and 40 driven through gear wheels 101 and 102 meshing with pinions 103 and 104 keyed to the shafts of the electric machines 105 and 106 which are capable of serving either as motors or as generators according to the direction of travel of the work W. These machines are connected in series with an electric circuit comprising conductors 107, 108, and 109, which extends from the terminals of generator 110 of a motor generator set M. The latter has its motor 111 directly connected to the generator 110 by the shaft 112. The motor 111 has supply leads 113 which include in circuit a controller 114 for starting and a connecting switch 115. The field of the generator element 110 is connected in circuit with a rheostat 116. By shifting the rheostat arm the current delivered by the generator 110 to the circuit feeding machines 105 and 106 may be varied. By employing the motor generator set M or its equivalent I have at hand a very flexible and easily adjusted source of electrical energy.

In operation the motor 22 drives the mill A and the work W passes through the mill from one reel to the other. Thus, if the work travel from reel 27 to reel 26 as indicated by the arrow, then reel 26 is the winding-up or pulling reel and reel 27 is the unwinding or holding back reel. In such case machine 105 works as a motor to drive the reel 26 to coil up the work. At such time the work W pulls on the reel 27 to unwind it and the reel 27 in turn drives the machine 106 which acts as a generator and sends current into the circuit comprising wires 107, 108, and 109. Thus, machine 105, acting as a motor, is fed by current supplied partly by generator 110 of set M and partly by machine 106 acting as a generator. In case the direction of travel of the work W is opposite that indicated by the arrow, then machines 105 and 106 exchange functions and machine 106 becomes the driving motor and machine 105 becomes the retarding generator. The electric machines 105 and 106 are preferably designed to give

a comparatively constant torque when operating as motors regardless of their speed. Obviously, in this form of the invention the work W is kept under suitable tension by the action of the machines 105 and 106. That machine which at the time serves as a generator driven by its unwinding reel of course generates an electromotive force causing a decrease across its own terminals and allows a greater voltage across the terminals of the winding-up machine. In this way the work done upon the motor to tensioning the unwinding reel is used to assist in the operation of the winding-up reel in coiling up the work strip.

It is to be noted that the terms used herein when referring to the relations of work-treating means, work-holding means, etc., are used in a functional sense rather than in a positional sense.

The various arrangements heretofore set forth serve to show the scope of the invention. Obviously the same is capable of varied application. I therefore do not wish to be limited to the exact arrangements and details disclosed, but aim to cover by the terms of the appended claims all such alterations and modifications as rightly come within the spirit and scope of my invention.

What I claim as new and desire to secure by a patent of the United States is:

1. The combination with reducing rolls of a rolling mill, of unwinding and winding-up reels on opposite sides of said rolls for handling strip or the like passing through the mill, and means independent of the mill for differentially driving said reels to tension the strip on both sides of said rolls.

2. The combination with reducing rolls of a rolling mill, of unwinding and winding-up reels on opposite sides of said rolls for handling strip or the like passing through the mill, a drive shaft, and means actuated by said shaft tending to drive said reels in opposite directions to maintain tension in said strip at opposite sides of said rolls.

3. The combination with reducing rolls of a rolling mill, of unwinding and winding-up reels on opposite sides of said rolls for handling strip or the like passing through the mill, a drive shaft, a differential gear, and three independent gear trains, the first train connecting said differential gear to said drive shaft, the second train connecting said differential gear to one of said reels to apply power thereto tending to rotate said reel in one direction, and the third train connecting said differential gear to the other of said reels to apply power thereto tending to rotate said reel in the opposite direction.

4. The combination with reducing rolls of a rolling mill, of unwinding and winding-up reels on opposite sides of said rolls for handling strip or the like passing through the mill, and means for utilizing energy supplied to the unwinding reel by the pull of the strip therefrom, to assist in advancing the strip through the mill.

5. The combination with reducing rolls of a rolling mill, of unwinding and winding-up reels on opposite sides of said rolls for handling strip or the like passing through the mill, gearing between said reels to transmit power from said unwinding reel to said winding-up reel, and additional means for operating said gearing to maintain suited tension in said strip on both sides of said rolls as the strip elongates.

6. The combination with a plurality of holding means spaced apart and operative to apply tension to an elongated piece of work extending between said means, means for working on the piece at an intermediate point to increase its length, and means for applying power from a common source to said holding means differentially to maintain tension in the piece at both sides of said working means as the piece elongates.

7. The combination with pulling means, working means and retarding means arranged in tandem, said pulling and retarding means being adapted to engage an elongated piece of work at points spaced apart to hold it under tension as it is being treated by said working means, a driving shaft, and gearing between said shaft and pulling and retarding means to divide automatically the power taken from said shaft differentially between said pulling and retarding means according to changes in the length of the piece resulting from said working means.

8. The combination with working means, interconnected pulling and retarding means on opposite sides of said working means, said pulling and retarding means being adapted to engage an elongated piece of work at points spaced apart and to advance it under tension past said working means, and means for driving said pulling and retarding means, respectively, from a common source to maintain tension in the piece at both sides of said working means as said piece advances and is elongated by said working means irrespective of the direction of travel of the piece.

9. The combination with reducing rolls of a rolling mill, of reels on opposite sides of said rolls for coiling upon one and uncoiling from the other strip or the like passing through the mill, and means for driving said reels from a common source to tension the strip on both sides of said rolls irrespective of the direction of travel of the strip.

10. The combination with reducing rolls of a rolling mill, of reels on opposite sides of said rolls for coiling upon one and uncoiling from the other strip or the like passing through the mill, the coiling and uncoiling operations changing from one reel to the other as the direction of travel of the strip

is reversed, means for driving said reels from a common source to tension the strip on both sides of said rolls irrespective of the direction of travel of the strip, and means for simultaneously reversing the direction of rotation of said reducing rolls and the direction of travel of the strip.

11. The combination with working means adapted to progressively treat an elongated piece of work, means on opposite sides of said working means for engaging the piece at points spaced apart and holding the same under tension, means for actuating said holding means from a common source to take up slack due to elongation of the piece irrespective of the direction of travel of the piece, and means for reversing the direction of travel of the piece.

12. The combination with working means adapted to progressively treat an elongated piece of work, of holding means on opposite sides of said rolls for moving the piece while under tension to and fro relative to said working means, one holding means pulling and the other holding back during one direction of travel of the piece and reversely the former holding back and the latter pulling during the opposite direction of travel, and means for supplying energy during each direction of travel from the holding means holding back on the piece to the holding means pulling on the piece.

13. The combination with working means adapted to progressively treat an elongated piece of work, of reels on opposite sides of said working means for coiling on one and uncoiling from the other the piece of work, the coiling and uncoiling operations changing from one reel to the other upon reversals of the direction of travel of the piece, and means for supplying energy during each direction of travel of the piece from the unwinding reel to the winding-up reel.

14. The combination of work-holding means, work-manipulating means and additional work-holding means arranged in tandem to handle and work upon elongated pieces of work, means for actuating both work-holding means to move the piece at one time in one direction and at another time in the opposite direction, in the first case said first mentioned work-holding means pulling on the piece and said additional work-holding means holding back on the piece and in the second case the former holding back and the latter pulling, and differential gearing between said work-holding means operative to transmit energy between them from the one at the time holding back to the one pulling.

15. The combination with working means adapted to progressively treat an elongated piece of work, of reels on opposite sides of said working means for coiling on one and uncoiling from the other the piece of work, and means for supplying energy received from the uncoiling reel to the coiling reel.

16. The combination with working means adapted to progressively treat an elongated piece of work, of reels on opposite sides of said working means for coiling on one and uncoiling from the other the piece of work, and gearing means interconnecting said reels and operative to automatically maintain tension in said piece at both sides of said working means at the same time.

17. The combination with working means adapted to progressively treat an elongated piece of work, of work-holding means on opposite sides of said working means for drawing upon the piece to tension it as it is being worked upon, common driving means, and separate driving means to transmit power from said common driving means separately to said separate work-holding means to tension the piece on both sides of said working means at the same time.

18. The combination with working means adapted to progressively treat an elongated piece of work, of work-holding means on opposite sides of said working means for drawing upon the piece to tension it as it is being worked upon, and power-transmitting means acting between said separate work-holding means to tension the piece simultaneously at both sides of said working means.

19. The combination with working means adapted to progressively treat an elongated piece of work, of work-holding means on opposite sides of said working means for drawing upon the piece to tension it as it is being worked upon, and power-transmitting means operative to transmit energy between said separate work-holding means.

20. The combination with working means adapted to progressively treat an elongated piece of work, of work-holding means on opposite sides of said rolls for handling the piece in its passage to and from said working means, and means for utilizing energy taken from the work-holding means at one side of said working means to assist in advancing the work.

21. The combination with a rolling mill and winding and unwinding reels for passing strip therethrough, of means independent of the rolling mill for exerting driving torques on both said reels such that the strip is tensioned.

22. In a rolling mill, strip-handling winding and unwinding reels, and means independent of the mill for driving both said reels so as to tension the strip.

23. The combination with a rolling mill and winding and unwinding reels on opposite sides thereof, of dynamo-electric machines for alternately operating as motors to drive the reels and as generators for braking them.

24. The combination with a rolling mill and winding and unwinding reels, of a dynamo-electric machine connected to the reels adapted to serve as a regenerative brake or as a driving motor therefor.

25. The combination with a rolling mill having winding and unwinding reels on opposite sides thereof, of a motor for driving said winding reel and a generator having driving connection with said unwinding reel.

In witness whereof, I hereunto subscribe my name this 21st day of June, A. D. 1928.

WILLIAM C. McBAIN.

DISCLAIMER

1,881,056.—*William C. McBain*, Youngstown, Ohio. TENSION DEVICE. Patent dated October 4, 1932. Disclaimer field September 1, 1939, by the assignee, *The Cold Metal Process Company*.

Hereby enters this disclaimer to claims 1, 4, 9, 10, 11, 12, 13, 15, 17, 18, 19, 20, 21, 22, 23, 24, and 25 in said specification.

[*Official Gazette September 26, 1939.*]