F. W. WATERMAN.

LOOPING DEVICE FOR ROLLING MILLS.

APPLICATION FILED OCT. 18, 1911.

1,072,676.

Patented Sept. 9, 1913.

3 SHEETS—SHEET 1.

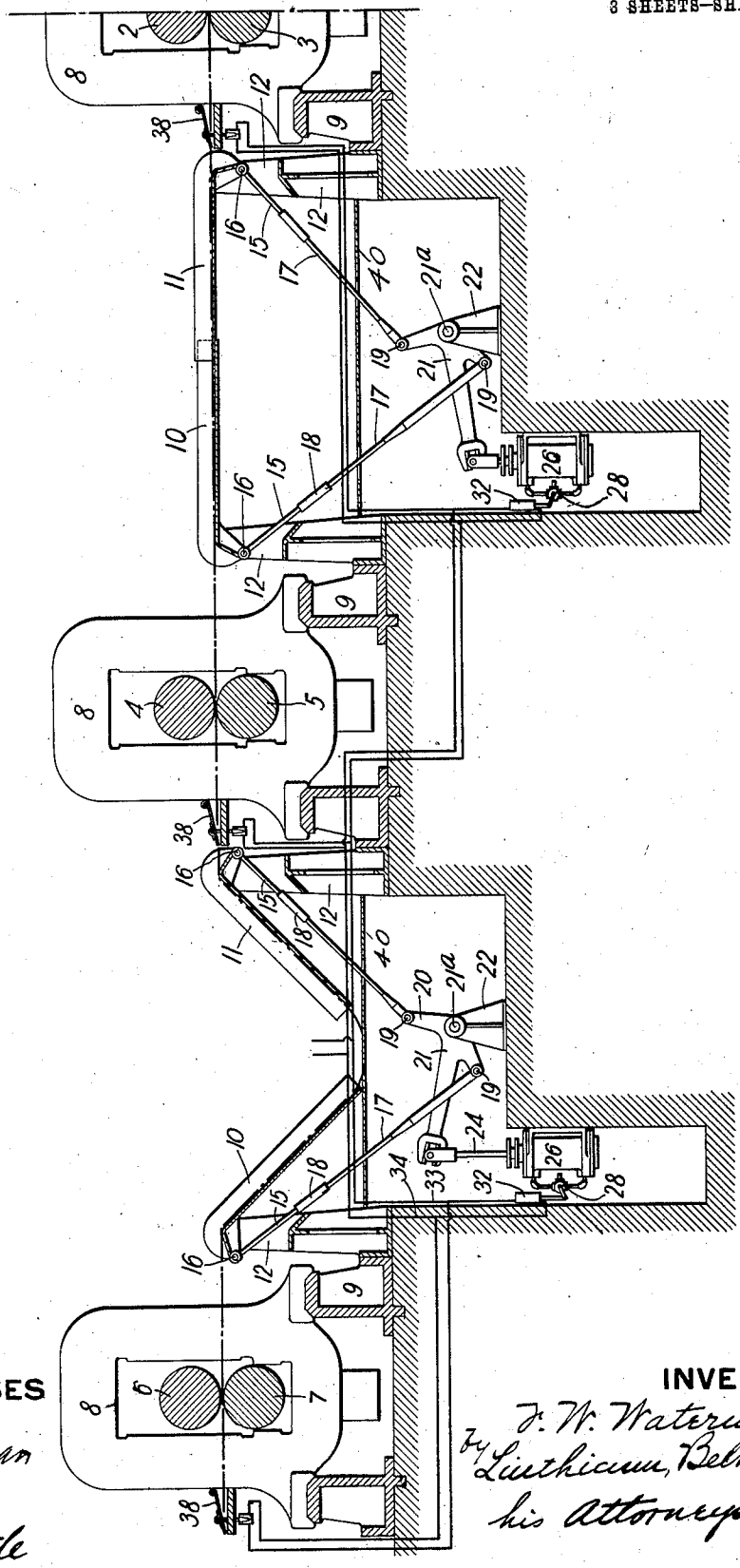


FIG. 1

WITNESSES

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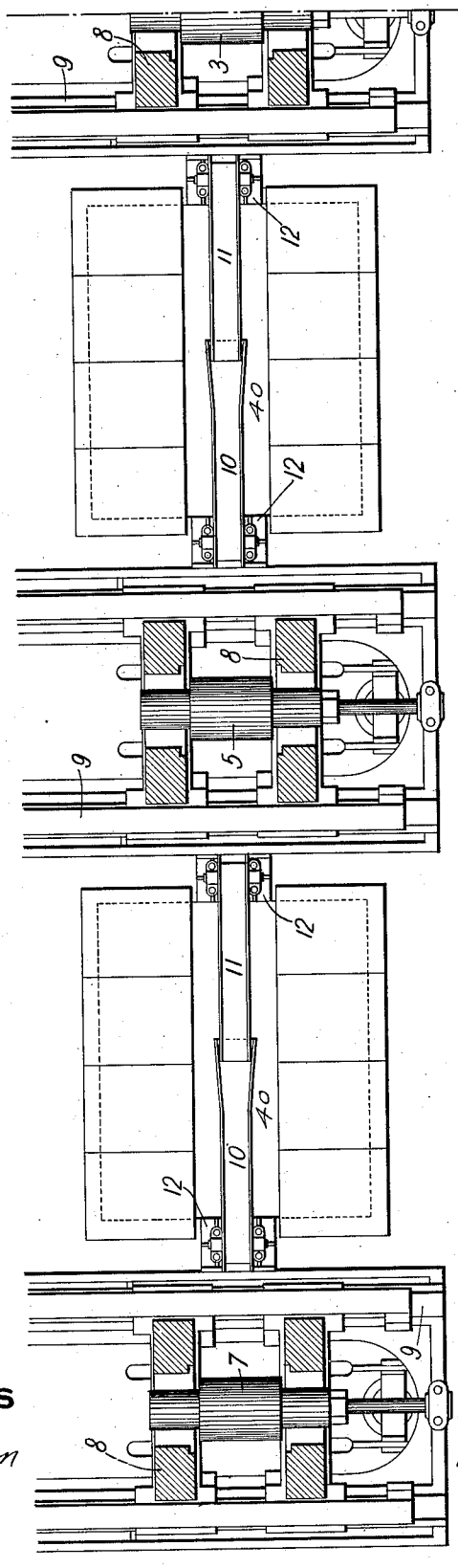


FIG. 2

WITNESSES

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3 SHEETS—SHEET 3.

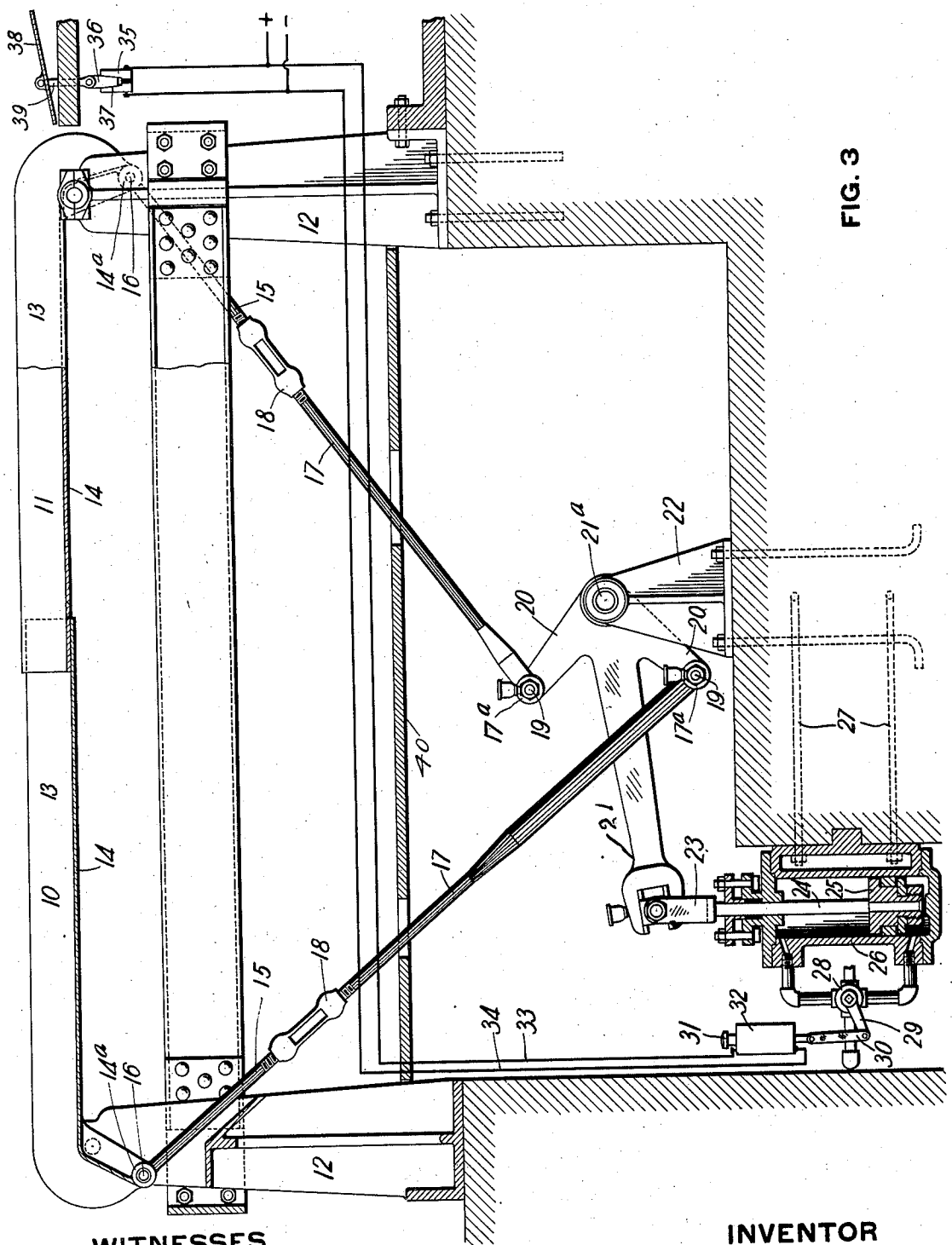


FIG. 3

WITNESSES

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UNITED STATES PATENT OFFICE.

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LOOPING DEVICE FOR ROLLING-MILLS.

1,072,676. Specification of Letters Patent. Patented Sept. 9, 1913.

Application filed October 18, 1911. Serial No. 655,389.

To all whom it may concern:

Be it known that I, FRED W. WATERMAN, a citizen of the United States, residing at Elyria, Lorain county, in the State of Ohio, have invented a new and useful Looping Device for Rolling-Mills, of which the following is a specification.

My invention relates to apparatus used in conjunction with rolling mills for regulating and controlling the lengthwise movement of long thin flexible pieces of metal in delivering such materials, from one stand to a succeeding stand of rolls, and more particularly relates to looping apparatus for continuous rolling mills employed in controlling and directing the lengthwise movement of the entering or forward end of long, thin and flexible materials while passing from one set of rolls to another and in caring for the overfeed caused by increase in length of the materials or due to variations in the speeds of the series of stands of reducing rolls during the rolling operations.

One object of my invention is to provide an improved looping device having novel means whereby the entering or forward end of each successive piece of metal being rolled is guided and caused to enter the receiving side of the successive stands of reducing rolls and novel means whereby the overfeed of the materials being rolled is cared for during such rolling operations.

Another object of my invention is to provide looping apparatus having improved means by which the apparatus is automatically actuated and caused to move into and out of its operative position while the material is in the passes of adjacent stands of rolls, and whereby the apparatus is automatically actuated to bring the looping device from its operative looping position into its operative guiding position as the ends of the materials pass through and emerge from each succeeding stand of reducing rolls.

Further objects of my invention will appear as the invention is more fully described hereinafter.

Referring to the accompanying drawings forming part of this specification, Figure 1 is a sectional elevation showing my improved looping device as applied for use in connection with adjoining sets of the reducing rolls in a continuous rolling mill. Fig. 2 is a plan, partly in section, of the apparatus shown in Fig. 1. Fig. 3 is a detail sectional side elevation, on a larger scale, of the apparatus shown in Figs. 1 and 2.

In the drawings, the numerals 2 and 3, 4 and 5, 6 and 7, designate sets of two-high reducing rolls comprising three stands of the rolls forming a continuous rolling mill. The sets of rolls are mounted in the usual manner in bearings in the housings 8 which are secured in position or housing shoes 9.

As shown, the sets of rolls 2 and 3, 4 and 5, 6 and 7, are arranged in tandem, and secured between the sets of rolls forming each stand is a guiding trough forming part of my improved looping device.

In the construction shown, the feed trough by which the forward end of the materials being rolled is guided from one stand of rolls to the next, is made in two sections 10 and 11. The trough sections 10 and 11 are pivotally secured adjacent to their outer ends to pivot stands 12 rigidly bolted in place on a suitable foundation provided therefor. The adjoining ends of the trough sections 10 and 11 overlap when in horizontal alinement (the position shown for the trough at the right in Fig. 1) and have vertical side walls 13 formed integral with the longitudinal side edges of the flat bottom portions 14. The bottom of the swinging trough section 10 at its inner end will rest upon the floor 40 covering the pit beneath the trough sections 10 and 11, as will be seen by reference to Fig. 1. Adjacent to the outer ends of the trough sections 10 and 11 the bottom portion 14 is inclined downwardly and terminates in an eye 14^a to which the ends of the links or connecting rods 15 are pivotally secured by means of the pins or bolts 16. The other ends of the links 15 are connected to the ends of the links 17 by means of turnbuckles or sleeve nuts 18, the ends of each link 15 and 17 having screw threads which engage with the right and left hand threads of the internally threaded turnbuckle or sleeve nut 18. One end of each rod 17 is provided with an eye 17^a for the pins 19 by which the rods are pivot-

ally secured to the outer ends of the arms 20 of the forked lever 21. The lever 21 is pivotally secured by the pin 21ª to a pivot stand 22 which is secured in place on the foundation for the stand 22. The forked lever 21 has the outer end of one arm slidingly connected by the strap 23 to the outer end of the piston rod 24 for the piston 25 and the piston 25 is mounted in the vertical fluid pressure cylinder 26 which is secured by bolts 27 to the cylinder foundation.

The ports of the cylinder 27 are connected by suitable piping to a four-way operating valve 28 having an operating lever 29. The operating lever 29 is connected by a link 30 to one end of a solenoid core 31 which is operatively mounted in a solenoid coil 32. Each coil 32 is connected by fed wires 33 and 34 to suitable switch contacts 35 and 37 having a movable tongue 36 which is arranged to move vertically in making and breaking the electrical connection between the contact 35 and the contact 37, connected to the ends of the two feed wires 33 and 34. The feed wires 33, 34 for each looping device are connected to the main feed wires which lead to a generator or other suitable source of electrical energy.

Pivoted on the delivery side of each stand of rolls is a trigger 38 the free end of which is arranged to extend into the path of and be lifted by engagement with the material being rolled as it issues from between the rolls of the rolling mill. The lifting end of the pivoted trigger 38 is connected by a link 39 to the tongue or plug 36 in such manner that when the forward end of the material emerging from the rolls contacts with and lifts the trigger 38 the tongue 36 is lifted out of engagement with the terminals or electrical contacts 35 and 37 on the ends of the wires 33, 34, and the electrical circuit will be broken. When the circuit is broken, the solenoid coil 32 becomes deënergized and the solenoid core 31 then moves downwardly by gravity so as to shift the valve lever 29 and move the valve 28 into position to admit fluid pressure to the lower end of the cylinder 26 and cause the piston 25 to rise therein. Such movement of the piston 25, through the medium of the connected links 15 and 17 swings the pivoted trough sections 10 and 11 downwardly from the position of the trough sections shown at the right of Fig. 1 into the inclined position shown at the left of Fig. 1 and a loop is thereby formed in the material being rolled while extending between the sets of rolls.

So long as materials are being discharged from the strands of rolls, the tongue 36 will be held out of engagement with the contacts 35 and 37 and the trough sections 10 and 11 will be maintained in the position shown at the left of Fig. 1, with the bottom of the trough section 10 at its end in engagement with the floor 40 below the trough section. When the rear end of a piece of material being rolled emerges from between the rolls of any one stand of rolls, the trigger 38 moves downwardly and again brings the tongue 36 into engagement with the contacts 35 and 37 so as to again complete the electrical circuit in the feed wires 33 and 34, and once more energize the solenoid coil 32. The solenoid coil 32 when again energized, lifts the core 31 and the lifting movement of the core moves the valve 28 so as to admit fluid pressure to the upper end of the cylinder 26, and to connect the lower end of the cylinder 26 with the outlet opening in the valve. When the valve is in this position and fluid pressure is admitted to the upper end of the cylinder 26 the piston is caused to move the lever 21 into the position shown at the right hand of Fig. 1 and also shown in Fig. 3. This movement of the piston 25 in the cylinder 26 through the medium of the connecting mechanism, moves the trough sections 10 and 11 from the position shown at the left of Fig. 1 into that shown at the right in Fig. 1 and in full lines in Fig. 3.

The trough sections are then in position to receive the forward end of a piece of material being rolled as it emerges from one stand of rolls and to direct it into the succeeding stand of rolls. The forward end of each piece of material, when it emerges from the succeeding stands of rolls engages with the trigger 38 so as to again lift the tongue 36 and break the circuit in the feed wires 33, 34. This breakage in the electrical circuit again deënergizes the solenoid coil 32 and permits the weight of the solenoid core to again move the valve 28 into position so that the adjoining ends of the trough sections 10 and 11 are moved from their position in horizontal alinement with each other into the lowered position shown at the left of Fig. 1.

Instead of making provision for automatically raising and lowering the hinged trough sections, as has been described, these sections may be adjusted so as to bring the adjoining ends of the trough sections to the desired height and by then moving the valve 28 into closed position, secure the trough sections in such adjusted position. In such case the forward end of the materials being rolled will move down one and up the other section of the trough into the succeeding stand of rolls.

The advantages of my invention will be apparent to those skilled in the art.

The long lengths of thin flexible materials are automatically guided and controlled in passing from one set to the succeeding set of reducing rolls. The overfeed or looping caused by increase in length in the reducing operations or fluctuations in the speed of the

several sets of rolls is cared for mechanically and the necessity of hand labor or the attention of an attendant during the rolling operations is avoided and overcome.

Modifications in the construction and arrangement of the parts may be made without departing from my invention as defined in the appended claims.

I claim: —

1. In a continuous rolling mill, a looping device comprising a delivery trough divided transversely into sections located between successive stands of rolls and arranged to deliver materials being rolled from one stand into a succeeding stand of rolls, means on which the trough sections are pivotally mounted, and means for moving said trough sections to lift the adjoining ends thereof into substantially the same horizontal plane between successive rolling operations.

2. In a continuous rolling mill, a looping device comprising a delivery trough divided transversely into sections located between successive stands of rolls and arranged to deliver materials being rolled from one stand into a succeeding stand of rolls, means on which the trough sections are pivotally mounted, means for moving said trough sections to lift the adjoining ends thereof into substantially the same horizontal plane between successive rolling operations and means for holding the trough sections in adjusted position.

3. In a continuous rolling mill, a looping device comprising a delivery trough divided transversely into sections located between successive stands of rolls and arranged to deliver materials being rolled from one stand into a successive stand of rolls, means on which the trough sections are pivotally mounted and means for moving said trough sections to lift the adjoining ends thereof into overlapping engagement between successive rolling operations.

4. In a continuous rolling mill, a looping device comprising a delivery trough located between successive stands of rolls and arranged to deliver materials being rolled from one stand to another of adjacent sets of rolls, said trough being divided transversely into sections, the adjoining ends of the trough sections being vertically adjustable to vary the height of the adjoining ends of the trough sections relatively to the opposite ends thereof, and means for maintaining the trough sections in adjusted position.

5. In a continuous rolling mill, a looping device comprising swinging trough sections located between adjacent sets of rolls and movable into and out of horizontal alinement, mechanism for moving said trough sections and means operated by contact with metal emerging from said rolls for causing the actuation of said trough moving mechanism.

6. In a continuous rolling mill, a looping device comprising swinging trough sections located between adjacent sets of rolls and movable into and out of horizontal alinement, mechanism for moving said trough sections, a solenoid operatively connected to said trough moving mechanism, and means in the path of the metal being rolled for causing the energizing of said solenoid in actuating the trough moving mechanism.

7. In a continuous rolling mill, a looping device comprising swinging trough sections located between adjacent sets of rolls and movable into and out of horizontal alinement, mechanism for moving said trough sections, a solenoid operatively connected to said trough moving mechanism, a switch for causing energizing and deënergizing of said solenoid to actuate said moving mechanism and a swinging trigger operated by engagement with the metal being rolled arranged to actuate the said switch.

8. In a continuous rolling mill, a looping device comprising a plurality of oppositely inclined swinging trough sections located between adjacent sets of rolls and movable into and out of horizontal alinement, mechanism for moving said trough sections and means controlled by contact with metal emerging from said rolls for actuating said trough moving mechanism.

9. In a continuous rolling mill, a looping device comprising a plurality of oppositely inclined swinging trough sections located between adjacent sets of rolls and movable into and out of horizontal alinement, mechanism for moving said trough sections, a solenoid operatively connected to said trough moving mechanism, and means in the path of the metal being rolled for causing energizing of said solenoid in actuating the trough moving mechanism.

10. In a continuous rolling mill, a looping device comprising a plurality of oppositely inclined swinging trough sections located between adjacent sets of rolls and movable into and out of horizontal alinement, mechanism for moving said trough sections, a solenoid operatively connected to said trough moving mechanism, a switch for causing the energizing and deënergizing of said solenoid to actuate said moving mechanism and a swinging contact operated by engagement with the metal being rolled arranged to actuate the said switch.

11. In a continuous rolling mill, a looping device comprising a sectional delivery trough located between successive stands of rolls and arranged to deliver materials being rolled therebetween, said trough sections being adjustable to move the bottom of said trough at an intermediate point lengthwise into horizontal planes differing from that of the ends thereof, and means for securing the trough in such positions.

12. In a continuous rolling mill, a looping device comprising a sectional delivery trough located between successive stands of rolls and arranged to deliver materials being rolled therebetween, said trough sections being adjustable to move the bottom of said trough at an intermediate point lengthwise into lower horizontal planes differing from that of the ends thereof, and means for securing the trough in such positions.

In testimony whereof, I have hereunto set my hand.

FRED W. WATERMAN.

Witnesses:
K. W. PLOCHER,
M. L. HAGEMAN.