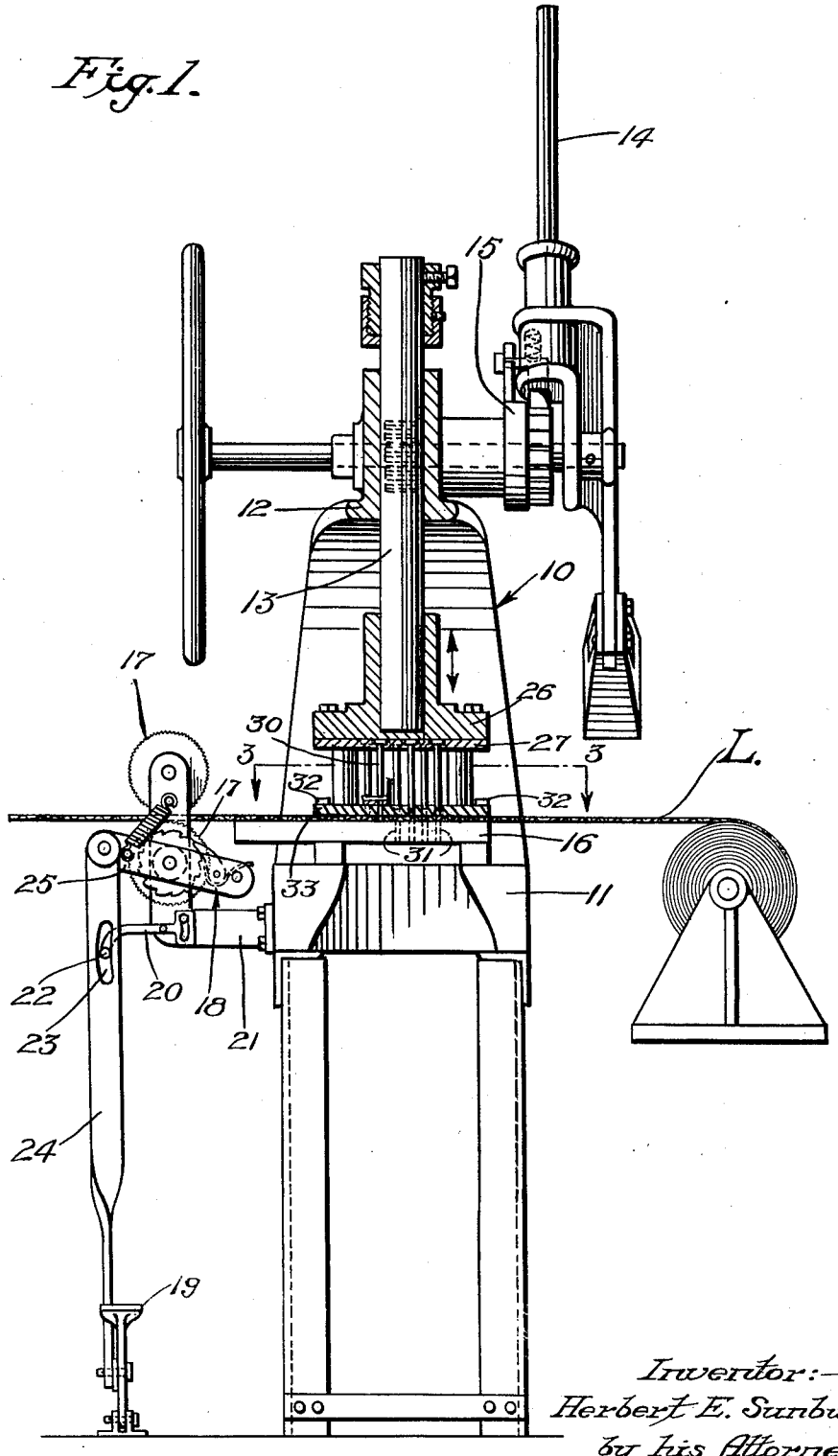
May 29, 1934. H. E. SUNBURY 1,960,881

LINING PLUGGING MACHINE

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Fig. 1.



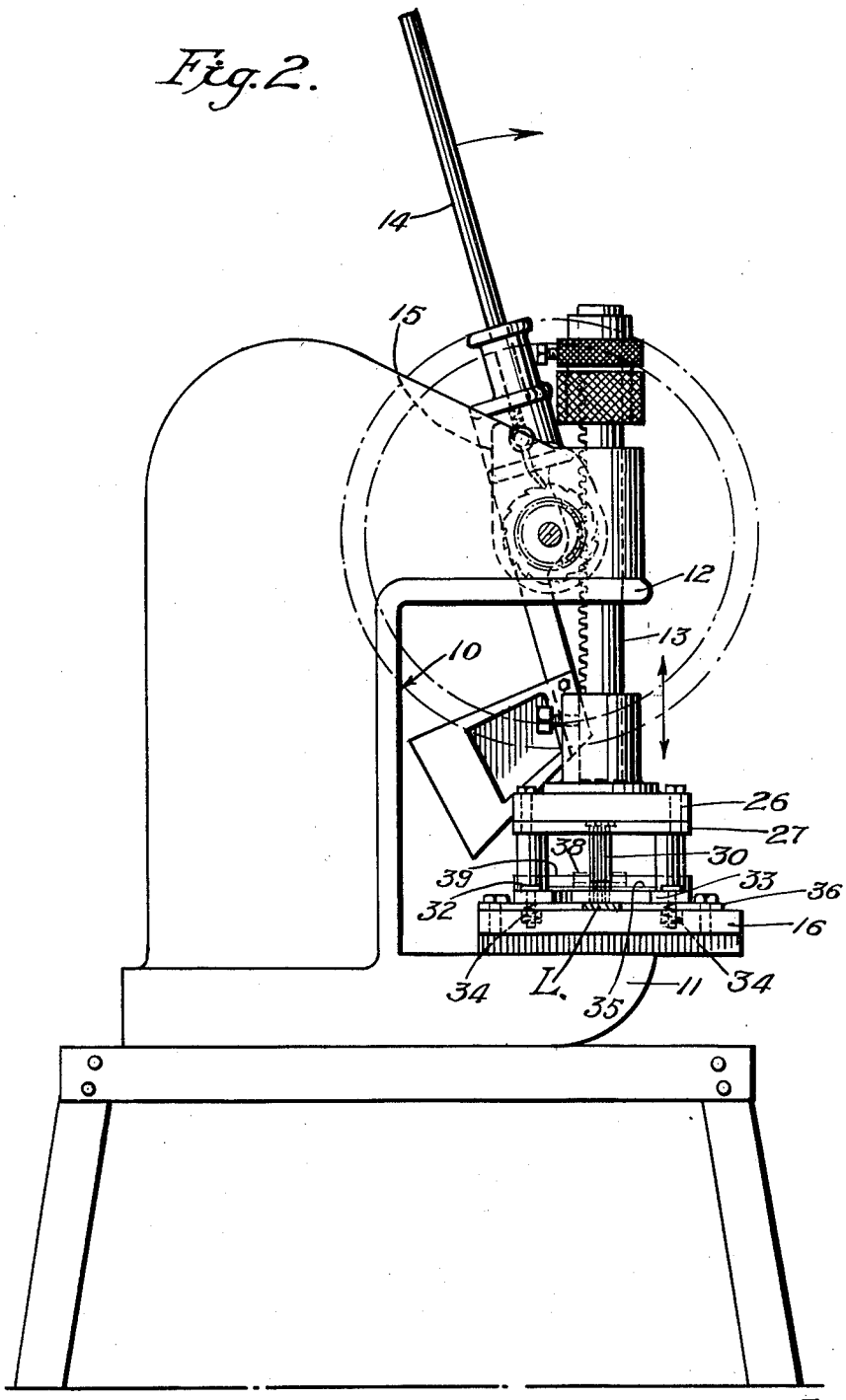
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LINING PLUGGING MACHINE

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Fig. 2.



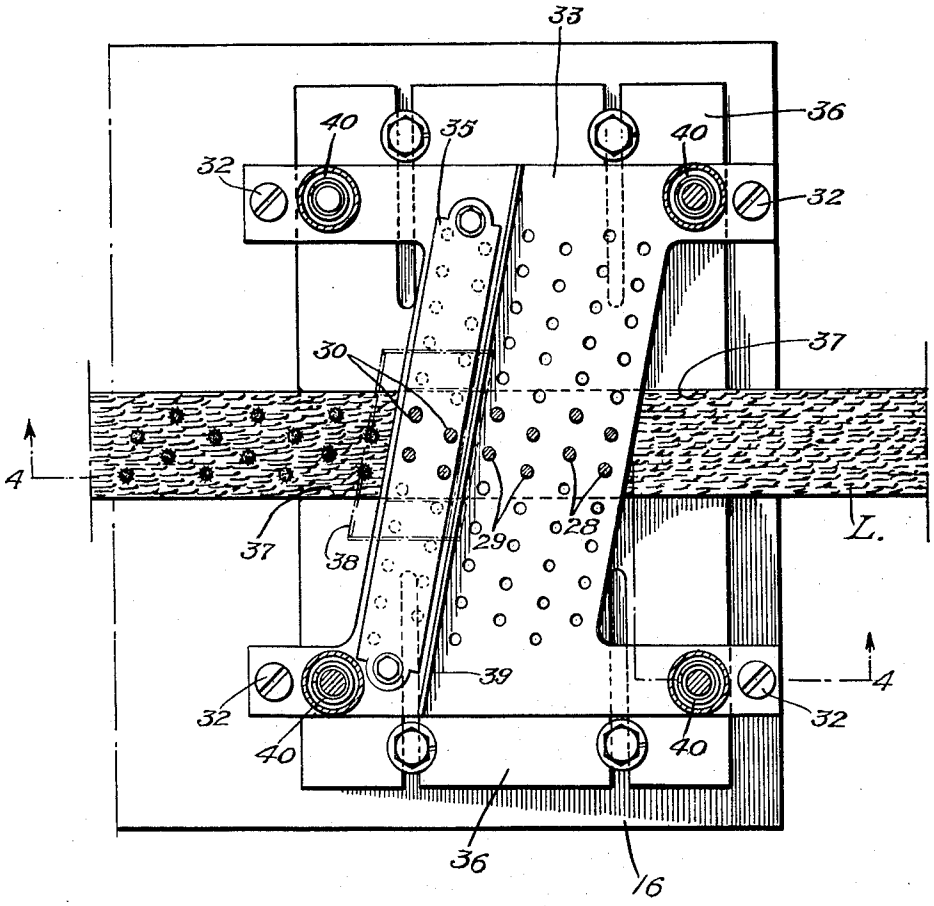
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LINING PLUGGING MACHINE

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Fig. 3.



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LINING PLUGGING MACHINE

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Fig. 4.

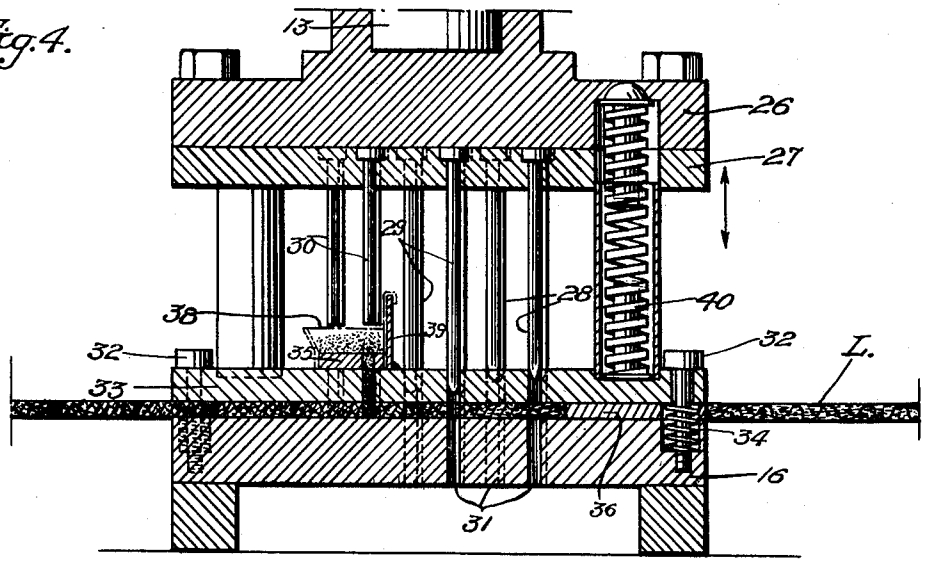
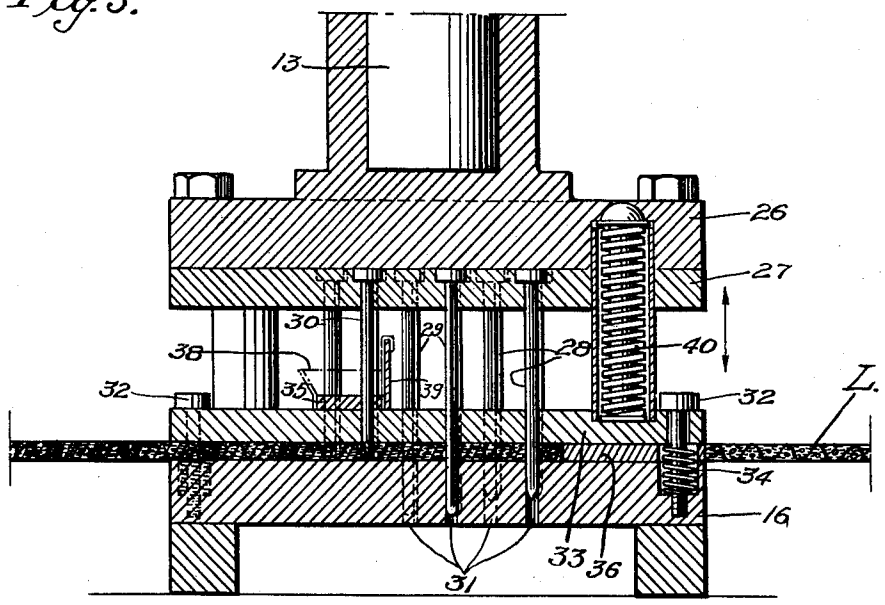


Fig. 5.



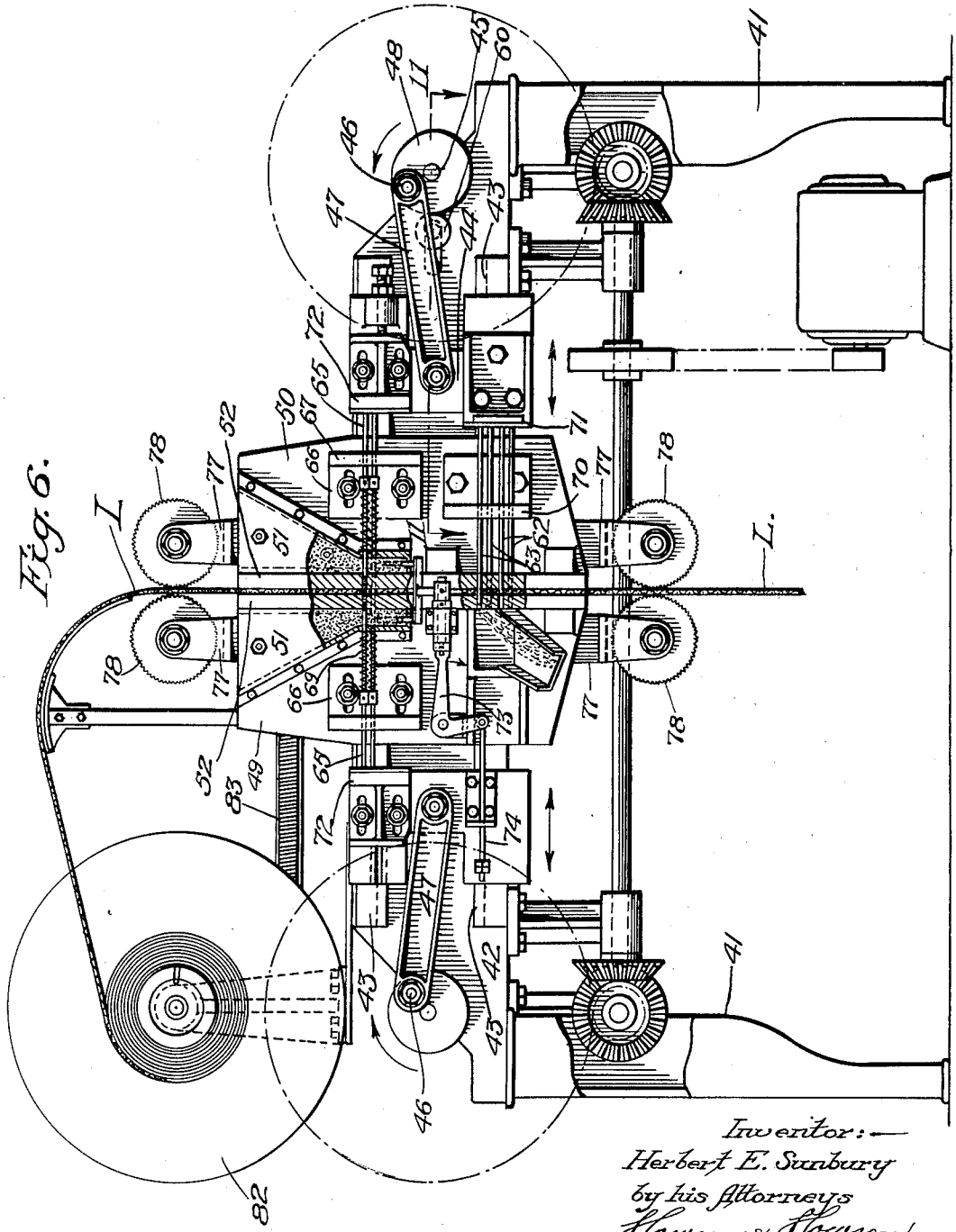
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LINING PLUGGING MACHINE

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Fig. 6.



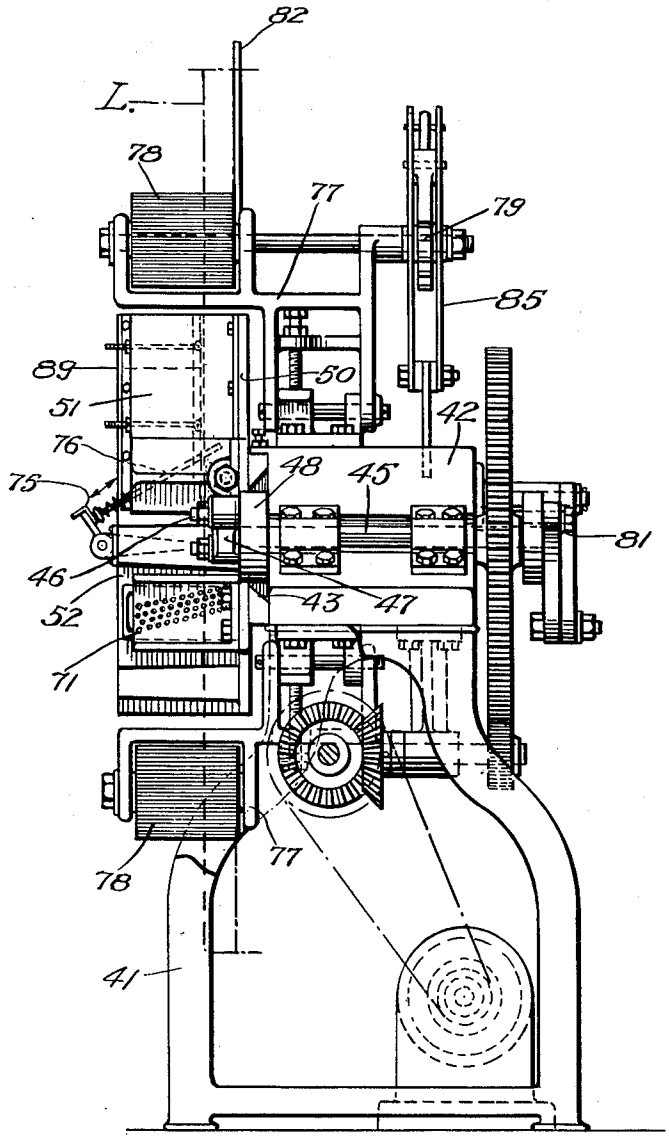
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LINING PLUGGING MACHINE

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Fig. 7.



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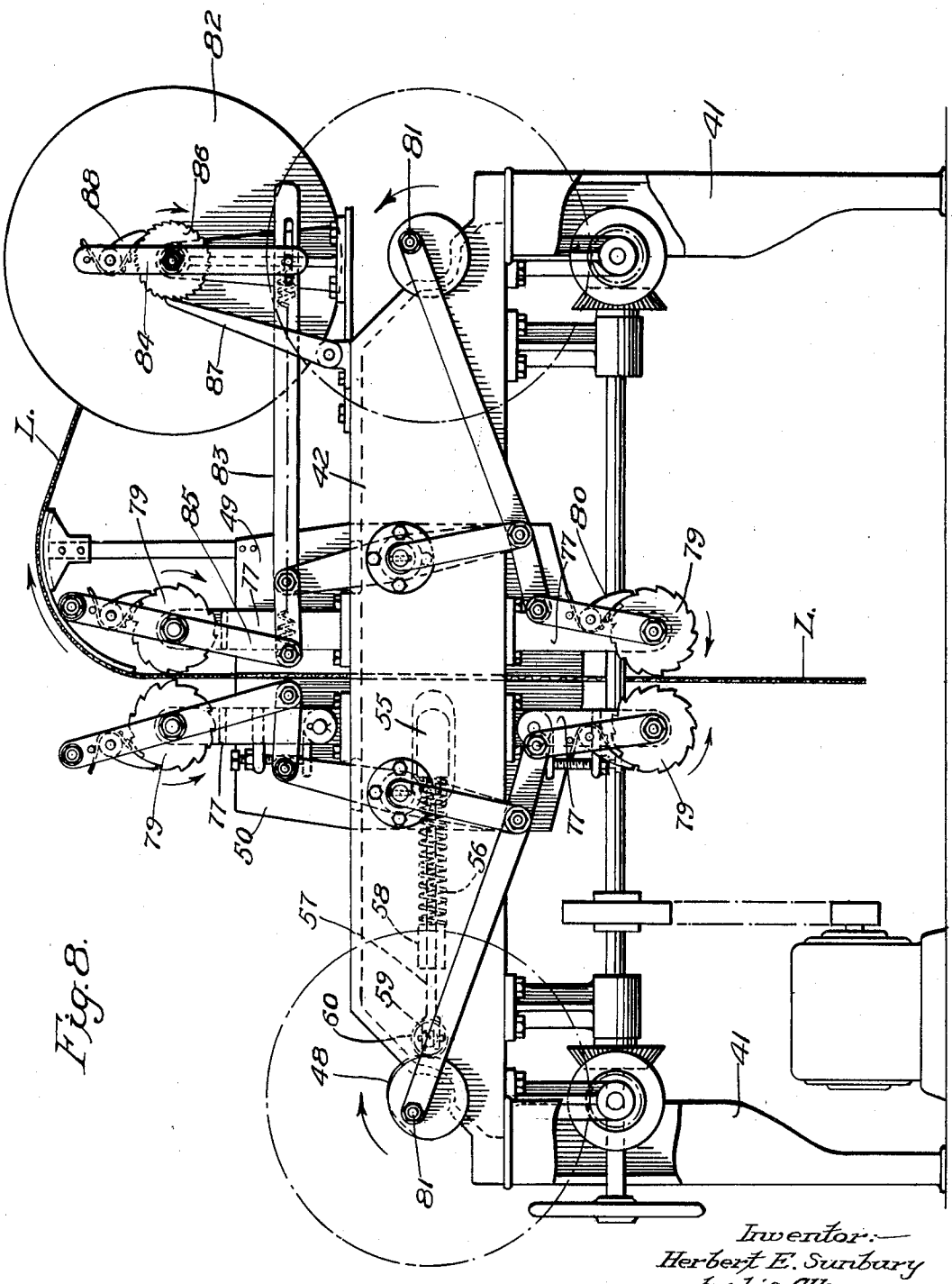


Fig. 8.

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LINING PLUGGING MACHINE

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Fig. 9.

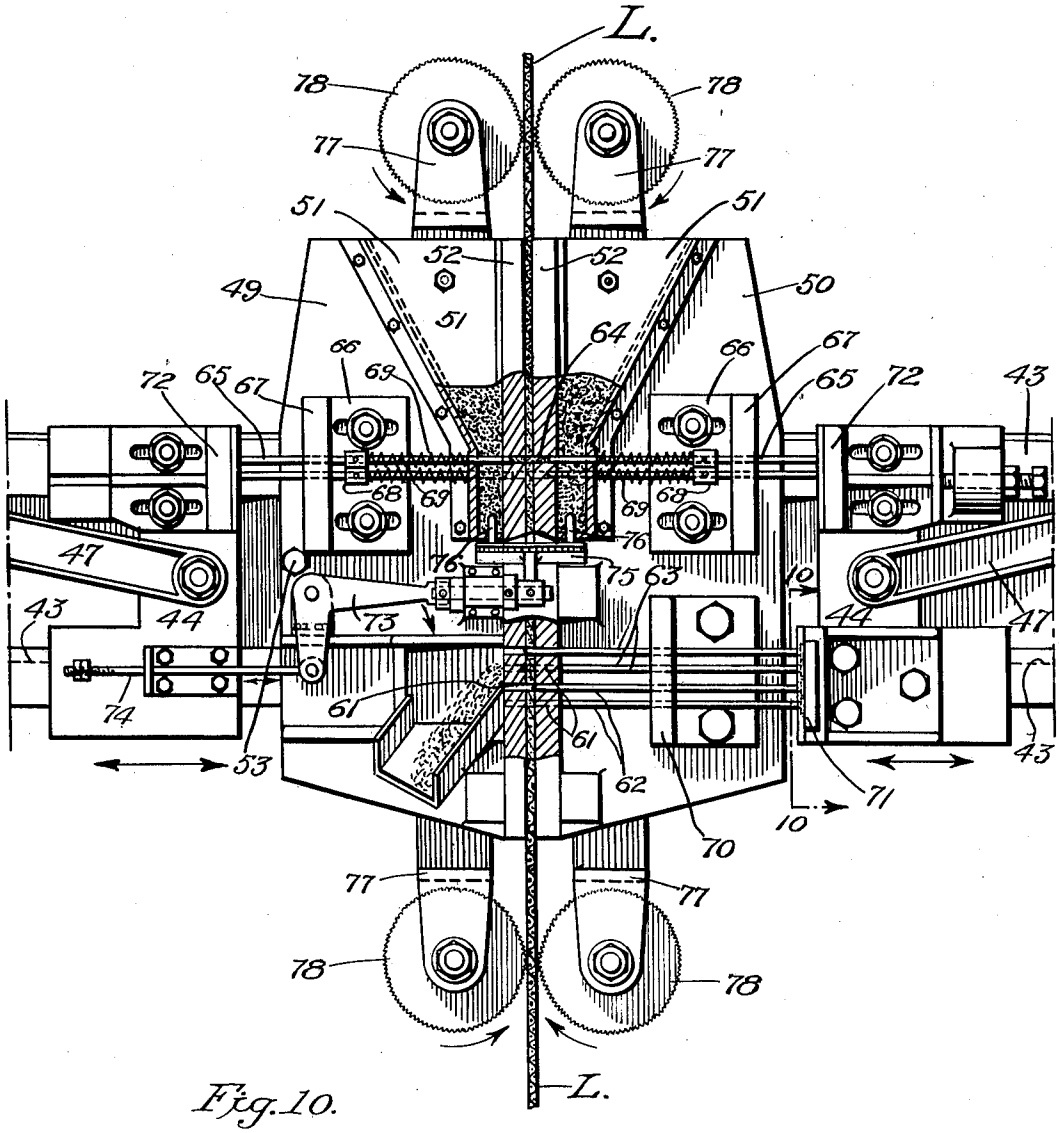
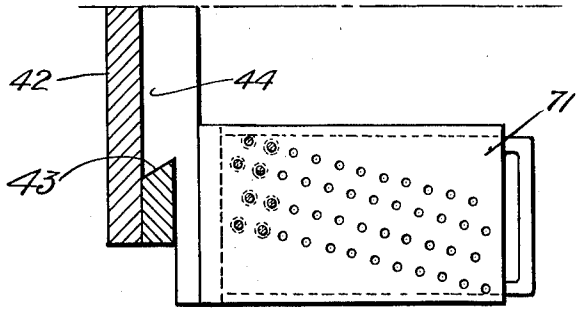


Fig. 10.



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LINING PLUGGING MACHINE

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Fig. 11.

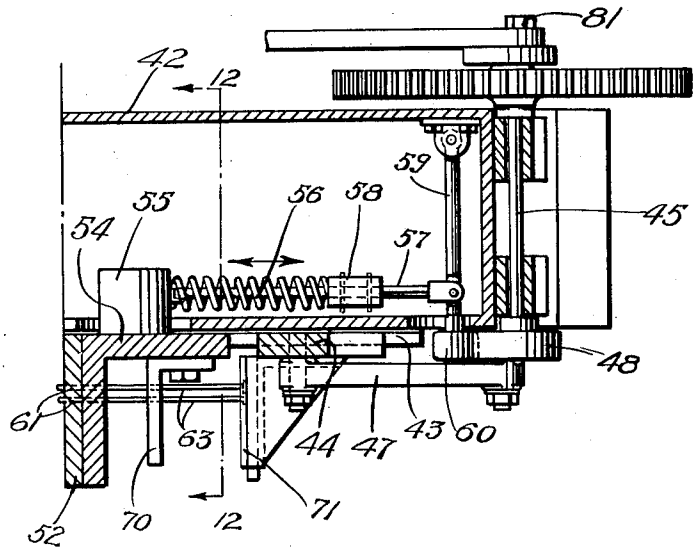
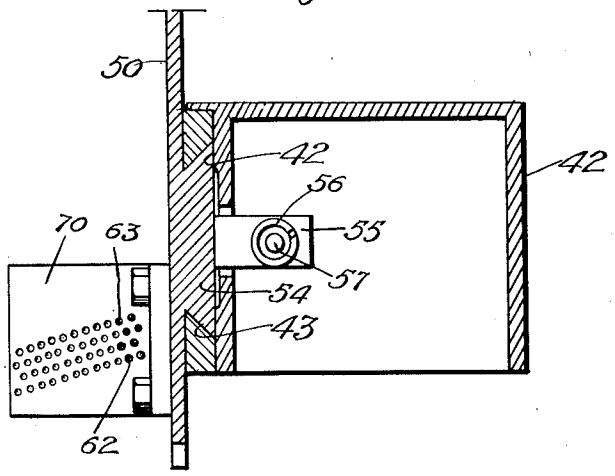


Fig. 12.



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Fig. 13.

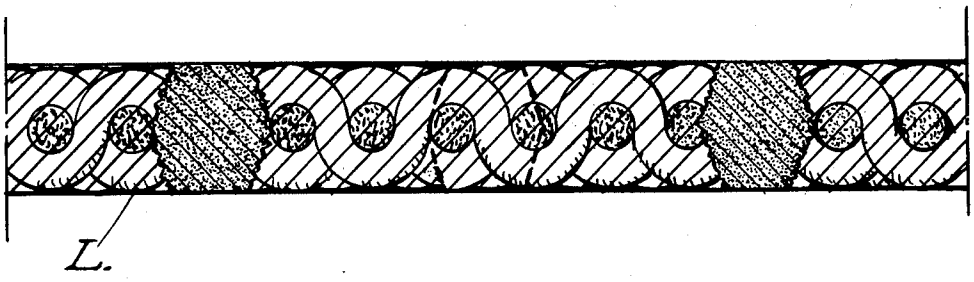
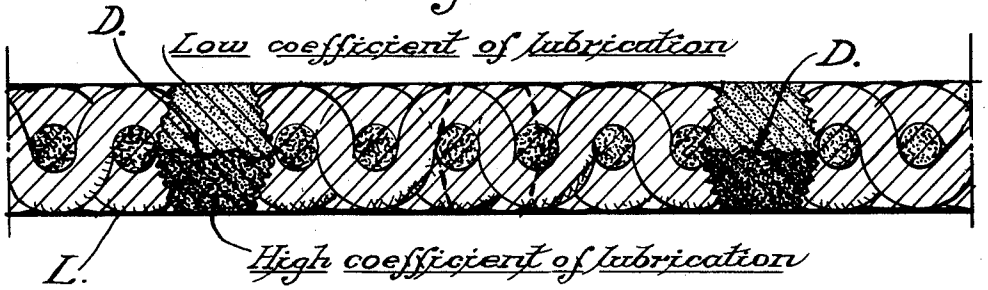


Fig. 14.



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Patented May 29, 1934

1,960,881

UNITED STATES PATENT OFFICE

1,960,881

LINING PLUGGING MACHINE

Herbert E. Sunbury, Wyncote, Pa., assignor to Allbestos Corporation, Philadelphia, Pa., a corporation of Pennsylvania

Application December 14, 1932, Serial No. 647,185

39 Claims. (Cl. 18—1)

This invention relates to tape plugging machines, and more particularly to a method of and machine for inserting in asbestos brake linings plugs of material containing both a lubricant and a material calculated to prevent glazing of the lining through the formation of vitreous deposits as a result of the heat developed during braking operations.

An important object of the invention is the provision of an apparatus of this character whereby plugged brake lining can be produced as a continuous process.

A further object of the invention is the provision of a structure of this character in which the inserted material is impacted in the lining to such an extent that the material, which is dry in nature, is thoroughly forced into the interstices of the walls of openings formed in the brake linings so that the formed plugs are securely anchored in the lining.

A further object of the invention is the provision of a structure of this character having a novel means for securing the brake lining in adjusted positions for the plugging operation.

A further and more specific object of the invention is the provision in a device of this character of a pair of plates between which the brake lining is passed during the perforating and plugging operations together with a means for relieving pressure on one of the plates periodically to permit the brake lining to be shifted to a new position and to apply pressure to said plate during the plugging operation to prevent shifting of the brake lining.

A still further, and more specific object of the invention is the provision in an arrangement of this character of a construction whereby the inserted material is caused to expand to the greatest extent under the applied pressure at a point approximating the center of the brake lining to thereby increase the anchoring effect.

A further object of the invention is the provision of an improved method for placing plugs of lubricating or other material in tapes whereby the plug is formed as it is introduced to the tape and the formation takes place in such manner that the plug is securely anchored in the tape.

A further object of the invention is the provision of a method whereby a plugged tape may be produced in which the plug is formed at the time of introduction to the tape and has different characteristics at opposite ends thereof.

A further object of the invention is the provision of a novel and improved brake lining having inserted plugs of material which will modify the friction coefficient of the tape forming the body of the lining.

These and other objects I attain by the construction shown in the accompanying drawings wherein, for the purpose of illustration, I have shown a preferred embodiment of my invention and wherein:

Fig. 1 is a front elevation partially in section;

Fig. 2 is a side elevation, the lining strip advancing mechanism being omitted;

Fig. 3 is a section on line 3—3 of Fig. 1;

Fig. 4 is a vertical sectional view on line 4—4 of Fig. 3 illustrating the machine in a position preparatory to a stroke and with powdered material arranged for compression in an opening of the brake lining.

Fig. 5 is a similar view showing the machine at the completion of the stroke;

Fig. 6 is a front elevation partially in section showing a production machine for use in producing the lining in large quantities.

Fig. 7 is a side elevation thereof;

Fig. 8 is a rear elevation thereof;

Fig. 9 is an enlarged detail view partially in section showing the vital elements of the machine in a position wherein the plug-forming stroke is substantially completed;

Fig. 10 is a section on line 10—10 of Fig. 9;

Fig. 11 is a section on line 11—11 of Fig. 6;

Fig. 12 is a section on line 12—12 of Fig. 11;

Fig. 13 is an enlarged sectional view through a tape which has been plugged in accordance with my method; and

Fig. 14 is a similar section showing a tape in which the plug is modified to have different characteristics at opposite faces thereof.

In accordance with my method, the tape or brake lining L is first perforated in any suitable manner. This perforation is preferably by displacement of the strands without cutting the same, either in the process of manufacture of the lining, as described in the prior application of Edward J. Evans and William G. Kitchen, for Brake lining, filed April 10, 1931, Serial No. 529,208, or by passing through the lining a bluntly pointed punch as more clearly shown in Figs. 4 and 5 of the drawings. A predetermined amount of finely divided granular modifying material, of the character desired in the plug, is then placed in alignment with the opening. The material employed must be of such character that it will flow fairly freely in granular form and will consolidate and form a unitary plug under pressure. For the purpose of providing lubricant plugs in brake linings, which is the primary ob-

ject of the present invention, the material employed may be a finely divided mixture of graphite and lead. The material is formed in a plug in the opening by subjecting the same to high pressure. The pressure, in addition to integrating the previously granulated material as a unitary plug, forces the material into the interstices of the walls of the opening and, as a matter of fact, expands these walls. Since the resistance to spreading varies in different portions of the walls of the opening, the completed plug is firmly interlocked with the material of the tape as shown in Fig. 13 and cannot escape therefrom. To insure this spreading of the plug, the quantity of material employed is in excess of that necessary to the formation of a unitary plug of the same diameter and length as the tape opening. Such a plug will remain in position in a brake lining as the lining wears without crumpling or dislodging from the lining.

In some instances, it is desirable that the plug inserted in the lining have different characteristics through its depth. This end may be readily accomplished by feeding the granular material into the opening from opposite sides thereof while varying the characteristics of the material fed from one side of the tape from those fed from the other side thereof. With the application of pressure, a unitary plug is provided which has a central line of demarcation between areas of different characteristics while integrally connecting these areas. Obviously, by varying the amount of material introduced from opposite sides of the lining, this line of demarcation indicated D in Fig. 14 may be brought in desired position with relation to either face of the lining.

The material employed in formation of the pins preferably consists of the following ingredients in approximately the proportions given:

	Percent
A material combining with asbestos under heat to prevent formation of vitreous compounds, such as lead	30
A dry lubricant, such as graphite	25
A wear-resisting material, such as carbon black	5
A fibrous binder, such as asbestos fibres	25
A binding filler, preferably of an adhesive nature and tending to harden under pressure, such as linseed oil, asphalt, stearin pitch, oil varnish, glucose, synthetic resin, or synthetic resin varnish	5

Of the fillers mentioned above, any may be employed alone or they may be employed in mixture. I have found, for example, that a mixture of asphalt, stearin pitch, and synthetic resin varnish in the proportion of 50 parts of asphalt to 30 parts of stearin pitch and 20 parts of synthetic resin varnish, forms an excellent binder.

To the composition above set forth, I may add, if desired, an inert organic material for the purpose of performing some additional function in the use of the brake lining; for example, fullers earth may be added, and when added will tend to polish the brake drums and assist in preventing formation of deposits thereon. Powdered zinc, zinc oxide, litharge and, as a matter of fact, a great many powdered metals or metal oxides are available and will perform additional functions in connection with the brake lining. The lead employed in the composition is preferably in the form of lead oxide fume and, accordingly, in a very finely divided state. This may be substituted for, either in whole or in part, by powdered zinc or zinc oxide. The ingredients are assembled and mixed in a disintegrating mixer which leaves them in a finely divided granular state suitable for introduction to the lining by the apparatus hereinafter described.

Referring now more particularly to Figs. 1 to 5 of the drawings, the numeral 10 generally designates an arbor press comprising a stationary bed 11 and an overhanging head 12 through which a vertically-reciprocable arbor 13 is slidably directed. Movements of the arbor 13 toward and away from the bed are controlled by an oscillatable lever 14 through any suitable and well known mechanism, such mechanism preferably including a stroke-limiting device generally designated at 15. Upon the bed 11 I mount a plate 16 over which a strip of brake lining, indicated at L, is fed in steps of predetermined length by any suitable mechanism. In the present instance, I have disclosed gripping rollers 17 between which the lining L passes, one of these rolls being actuated through a pedal-controlled ratchet mechanism 18. The stroke of the operating pedal 19 associated with the ratchet mechanism is preferably adjustably limited, as for example, by a shiftable arm 20 supported from the bracket 21 mounting the ratchet mechanism and rolls 17, such arm having a finger 22 engaging in a slot 23 formed in a link 24 connecting the pedal 19 and the oscillatory lever 25 of the ratchet mechanism and engaging the upper end of the slot 23 after a predetermined stroke of the pedal and, accordingly, a predetermined advance of the lining L.

Secured to the arbor 13 is a plunger head 26 bearing a pin plate 27. The pin plate 27 bears 3 distinct groups of pins designated at 28, 29 and 30, these groups comprising respectively punches, guide pins, and rams. Plate 16 is provided with openings 31 aligning with the punches and guide pins, but is solid in alignment with the rams. Supported from plate 16 for vertical movement upon headed dowels 32, is a plate 33, this plate being normally separated from the plate 16 to the greatest extent possible in view of the heads of the dowels 32 by springs 34. The extent of separation of plates 16 and 33 may be regulated by adjustment of the dowels 32 which are threaded in plate 16. Plate 33 has openings aligning with all of the pins carried by plate 27. Associated with the plate at those openings aligning with the rams 30 is a gauge plate 35, this plate being detachable for interchangement with similar plates and having a series of openings equaling in number the number of ram pins carried by plate 27. It will be noted from an inspection of Fig. 3 of the drawings that the plate 33 has, in the present illustration, a great many more openings than are occupied or opposed by the pins of plate 27, so that it may be employed with linings of different widths, and plate 35 serves to cover all of those openings for the passage of ram pins not opposed by pins, for a purpose presently to appear. Between the plate 33 and plate 16 are arranged adjustable guides 36 which may be shifted to provide a desired opening 37 between adjacent faces thereof so that different widths of brake lining may be accommodated.

In use of this apparatus, the dowels are first adjusted so that a piece of brake lining of the proper thickness will slide between the plates 16 and 33 and the guides 36 are adjusted to provide a proper opening for the passage of the lining. The proper plate 35 having been placed on the upper surface of plate 33, the head is reciprocated with alternate progressions of the lining through

the feed mechanism until a series of openings formed by punches 28 aligns with the ram pin openings of plate 33. At this time, the anti-friction compound, or the like, which is to be inserted in the openings of the tape is placed in the ram pin openings of plate 33 aligned with openings of gauge plate 35, plate 35 serving as a means for determining the quantity of material aligned with each ram.

A convenient method for inserting the material in such openings is to provide a shallow hopper as indicated at 38, this hopper being bottomless and slidable along plate 35 so as to pass under the ram pins and supply the openings of plate 33 through the openings of plate 35, it being understood that with the exception of properly grouped series of openings, plate 35 is free from perforations. Such a hopper may be guided by a rib 39 upon the upper surface of the plate 33, which rib serves to prevent accidental passage of the anti-friction material to that portion of the surface of the plate 33 at which the punches and guide pins co-act with the plate.

As head 26 approaches plate 16, springs 40 interposed between the head and plate 33, and preferably housed as indicated, will act to force plate 33 into clamping engagement with the brake lining so that the lining is stationary at the time the pins 28, 29 and 30 are co-acting therewith. It will be obvious that by alternate progressions of the lining and depressions of head 26, the tape or fabric strip will be formed with a series of openings containing the anti-friction material.

In the form of the apparatus disclosed in Figs. 6 to 12 inclusive, the machine illustrated in Figs. 1 to 5 has been modified for power operation and for rapid production of the modified lining. In these figures the numeral 41 generally designates spaced standards connected at their upper ends by a transverse supporting frame 42 formed on one face with a cross head guide 43 having cross heads 44 operating in opposite ends thereof. Mounted in suitable bearings at each end of the member 42 is a shaft 45 having a crank pin 46 at one end which is connected to the associated cross head by a link 47. The crank pins 46 are mounted upon cams 48, the purpose of which will presently appear.

Mounted on the cross head guide-bearing face of the frame 42 between the cross heads 44 are a pair of hopper plates 49 and 50, each of these plates having at its upper end a hopper 51, one wall of which is formed by an angular flange 52 formed on the associated hopper plate. These hopper plates may be conveniently mounted upon the frame 42 by means of portions engaging in the cross head guide and the plate 49 is secured at 53 to the frame so as to be held against movement with relation thereto while the plate 50 is free to partake of slight movement in the guide. As more clearly shown in Fig. 11, the cross head guide-engaging portion 54 of this plate has a rearwardly-extending lug 55 extending through the opening formed in the adjacent wall of frame 42. This lug 55 forms a seat for one end of a spring 56 which surrounds a rod 57 and has its opposite end arranged against a stop 58 on this rod. Rod 57 is connected to a lever 59 having a roller 60 bearing against the cam 48. Cam 48 is so shaped that as the cross head actuated thereby approaches the plate 50, spring 56 is compressed, exerting spring pressure to urge plate 50 toward plate 49 and thus to clamp and securely hold a strip of lining L arranged between the flanges of the plates.

The flanges 52 of the plates 49 and 50 are each provided with openings 61 for the passage of punches 62 and guide pins 63 and with further openings 64 for the passage of ram pins 65, the last-named openings being disposed in those portions of the flanges 52 which constitute walls of hoppers 51. Each hopper plate mounts a guide 66 for the associated ram pins 65, these guides including projecting flanges 67 through which the ram pins extend. Guides 66 are adjustable toward and away from the associated hopper, as indicated and the ram pins are provided with stops 68 to engage flange 67 when the pins have been withdrawn from flanges 52 to a predetermined extent and thus determine the amount of anti-friction material disposed between adjacent ends of the ram pins and the openings and, accordingly, the amount of material which is finally delivered to the tape L. Withdrawal of the ram pins is effected by means of spring 69 extending between the stops 68 and the adjacent wall of the hopper. Hopper plate 50 further includes a guide 70 for the punches and guide pins 62 and 63. These guide pins and punches are connected to the adjacent cross head 44 by a pin plate 71 similar to the pin plate 27 previously described. Both cross heads 44 embody contact elements 72 to engage the outer ends of the associated ram pins. The cross head associated with hopper plate 49 is further employed as a means for operating agitator mechanism for agitating the material within hoppers 51. This mechanism, as at present disclosed, includes a bell crank 73 having a lost motion link connection at 74 with the cross head and rocking a plate 75 bearing pins 76 loosely projecting into the lower ends of the hoppers.

As a means for feeding the lining L between the flanges 52 and into the sphere of action of the punches and rams, I mount from the frame 42 through brackets 77 pairs of friction rollers 78 between which the lining is passed, these rollers being preferably corrugated as illustrated. Each roller has a ratchet disc 79 and is rotated through ratchet mechanism 80 actuated by link and lever connections with a crank pin 81 provided on one or the other of shafts 45. Leaving the uppermost pair of rolls, the lining L is preferably roll-wound upon a reel 82 operatively connected to one of shafts 45 to be driven thereby through suitable relief mechanism compensating for the varying diameter of the reel as the material is rolled thereon. In the present instance a link 83 is shown as operatively connecting an oscillatable lever 84 oscillating about the pivot of the reel with an oscillating member 85 forming a portion of the link and lever connections operating an adjacent roll 78. The oscillating lever 84 has a pin and slot connection with the link 83, the pin being normally maintained at one end of the slot by a spring as shown. The reel is equipped with a ratchet 86 engaged by a holding pawl 87, and by the advancing pawl 88 on the oscillating lever. It will be obvious that when reel 82 offers too great resistance to oscillation of lever 84 during an advancing period of pawl 88, the spring maintaining the pin in normal position in the slot will yield and thus permit the link 83 to shift independently of lever 84. Obviously, any other yielding relief mechanism may be employed in lieu of that described.

Each hopper 51 includes an adjustable wall 89, the material stored within this hopper being stored between the stationary rear wall of the

hopper and said movable wall. The movable wall extends below the level of the lowermost ram pin openings and serves to prevent material from entering those openings with which ram pins are not aligned.

It will be obvious that with a structure of this character the material when once threaded through the machine, will be intermittently advanced. Between each advance of the material the cross heads 44 will be advanced and at each advance thereof the punches will form openings in the fabric, the guide pins will serve to align the fabric and the ram pins will be moved toward one another consolidating material therebetween and forcing it into the previously formed openings. Also, as hereinbefore described, the plate 50 will be spring-urged toward the plate 49 so that the material is clamped and may not be accidentally moved. With the completion of the working stroke, continued rotation of shafts 45 not only withdraws the several pins from engagement with the lining but, likewise, releases the tension on spring 56 so that plate 50 may shift to free the lining. Thereafter, shafts 45 will act to advance the lining by actuation of rolls 78.

The punches referred to and employed for forming openings in the lining need not be, and preferably are not, of such type that they form these openings by removal of portions of the lining, but are rather of a bluntly pointed type which will serve to spread the weave of the lining and thus form openings therein. It will be understood that woven asbestos brake lining fabric is, due to the character of asbestos, made from yarns which include not only asbestos, but likewise fine brass wires so that when the weave is spread by the punch it will remain open. This type of punch is preferred due to the fact that the normal strength of the lining is not impaired.

Since the structure set forth is obviously capable of considerable modification without in any manner departing from the spirit of the invention, I do not wish to be understood as limiting myself thereto except as hereinafter claimed.

I claim:

1. In apparatus for plugging brake linings, punches, rams, means to actuate said punches and rams, intermittent feeding means for advancing a strip of brake lining successively to said punches and rams, and means for supporting plugging material in alignment with the rams to be forced by the rams into the punch-formed openings of the strip.

2. In apparatus for plugging brake linings, a series of reciprocable pins including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip over the supporting means in steps of such length that openings formed by the punches subsequently align with the rams, and means to support plugging material in alignment with the rams to be forced into the openings of the strip.

3. In apparatus for plugging brake linings, punches, rams, means to actuate said punches and rams, intermittent feeding means for advancing a strip of brake lining successively to said punches and rams, means for supporting plugging material in alignment with the rams to be forced by the rams into the punch-formed openings of the strip, and means for clamping the strip intermediate advances thereof by said feeding means.

4. In apparatus for plugging brake linings, a series of reciprocable pins, including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip over the supporting means in steps of such length that openings formed by the punches subsequently align with the rams, means to support plugging material in alignment with the rams to be forced into the openings of the strip, and means for clamping the strip intermediate advances thereof by said feeding means.

5. In apparatus for plugging brake linings, punches, rams, means to actuate said punches and rams, intermittent feeding means for advancing a strip of brake lining successively to said punches and rams, and means for supporting plugging material in alignment with the rams to be forced by the rams into the punch-formed openings of the strip, said rams comprising two groups, each ram of each group opposing a ram of the other group, the operating means for the rams comprising means for oppositely moving said groups.

6. In apparatus for plugging brake linings, a series of reciprocable pins, including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip over the supporting means in steps of such length that openings formed by the punches subsequently align with the rams, and means to support plugging material in alignment with the rams to be forced into the openings of the strip, said rams comprising two groups, each ram of each group opposing a ram of the other group, the operating means for the rams comprising means for oppositely moving said groups.

7. In apparatus for plugging brake linings, punches, rams, means to actuate said punches and rams, intermittent feeding means for advancing a strip of brake lining successively to said punches and rams, means for supporting plugging material in alignment with the rams to be forced by the rams into the punch-formed openings of the strip, and means for clamping the strip intermediate advances thereof by said feeding means, said rams comprising two groups, each ram of each group opposing a ram of the other group, the operating means for the rams comprising means for oppositely moving said groups.

8. In apparatus for plugging brake linings, a series of reciprocable pins, including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip over the supporting means in steps of such length that openings formed by the punches subsequently align with the rams, means to support plugging material in alignment with the rams to be forced into the openings of the strip, and means for clamping the strip intermediate advances thereof by said feeding means, said rams comprising two groups, each ram of each group opposing a ram of the other group, the operating means for the rams comprising means for oppositely moving said groups.

9. In apparatus for plugging brake linings, punches, rams, means to actuate said punches and rams, intermittent feeding means for advancing a strip of brake lining successively to said punches and rams, means for supporting plugging material in alignment with the rams to be forced by the rams into the punch-formed openings of the strip, and means for clamping the strip intermediate advances thereof by said feed-

ing means rendered operable by advance of the rams toward the strip.

10. In apparatus for plugging brake linings, a series of reciprocable pins, including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip over the supporting means in steps of such length that openings formed by the punches subsequently align with the rams, means to support plugging material in alignment with the rams to be forced into the openings of the strip, and means for clamping the strip intermediate advances thereof by said feeding means rendered operable by advance of the rams toward the strip.

11. In apparatus for plugging brake linings, a series of reciprocable pins, including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip from the supporting means in steps of such length that openings formed by the punches subsequently align with the rams, means to support plugging material in alignment with the rams to be forced into the openings of the strip, and means including said supporting means for clamping the strip intermediate advances thereof by said feeding means.

12. In apparatus for plugging brake linings, a series of reciprocable pins, including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip over the supporting means in steps of such length that openings formed by the punches subsequently align with the rams, means to support plugging material in alignment with the rams to be forced into the openings of the strip, a plate in opposition to said supporting means in alignment with the rams, and means for yieldably urging said plate into engagement with the strip to thereby clamp the strip between the plate and supporting means as the rams approach the strip.

13. In apparatus for plugging brake linings, spaced stationary and movable plates, punches extendable through openings in the movable plate, rams movable toward and away from said plates and aligning with other openings in the movable plate, means to reciprocate said punches and rams, means for feeding a strip of brake lining between the plates in steps of such length that openings formed by such punches subsequently align with said rams, and means associated with the movable plate for supporting plugging material in alignment with the openings of the plate associated with the rams.

14. In apparatus for plugging brake linings, spaced stationary and movable plates, punches extendable through openings in the movable plate, rams movable toward and away from said plates and aligning with other openings in the movable plate, means to reciprocate said punches and rams, means for feeding a strip of brake lining between the plates in steps of such length that openings formed by such punches subsequently align with said rams, means associated with the movable plate for supporting plugging material in alignment with the openings of the plate associated with the rams, and means operated by approach of the rams to the strip for shifting said movable plate toward said stationary plate to thereby clamp the strip against movement.

15. In apparatus for plugging brake linings, punches, rams, means to actuate said punches and rams, intermittent feeding means for advancing a strip of brake lining successively to said punches and rams, said rams comprising two groups, each ram of each group opposing a ram of the other group, the operating means for the rams comprising means for simultaneously oppositely moving said groups, and means to interpose plugging material between said ram groups.

16. In apparatus for plugging brake linings, punches, rams, means to actuate said punches and rams, intermittent feeding means for advancing a strip of brake lining successively to said punches and rams, said rams comprising two groups, each ram of each group opposing a ram of the other group, the operating means for the rams comprising means for simultaneously oppositely moving said groups, means to interpose plugging material between said ram groups, and a hopper for plugging material associated with each group of rams and through which the groups operate.

17. In apparatus for plugging brake linings, punches, rams, means to actuate said punches and rams, intermittent feeding means for advancing a strip of brake lining successively to said punches and rams, said rams comprising two groups, each ram of each group opposing a ram of the other group, the operating means for the rams comprising means for simultaneously oppositely moving said groups, means to interpose plugging material between said ram groups, and means to adjustably determine the amount of plugging material interposed between the rams.

18. In apparatus for plugging brake linings, a series of reciprocable pins, including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip over the supporting means in steps of such length that openings formed by the punches subsequently align with the rams, means to support plugging material in alignment with the rams to be forced into the openings of the strip, said rams comprising two groups, each ram of each group opposing a ram of the other group, the operating means for the rams comprising means for oppositely moving said groups, and means to adjustably determine the amount of plugging material interposed between the rams.

19. In apparatus for plugging brake linings, punches, rams, means to actuate said punches and rams, intermittent feeding means for advancing a strip of brake lining successively to said punches and rams, means for supporting plugging material in alignment with the rams to be forced by the rams into the punch-formed openings of the strip, means for clamping the strip intermediate advances thereof by said feeding means, said rams comprising two groups, each ram of each group opposing a ram of the other group, the operating means for the rams comprising means for oppositely moving said groups, and means to adjustably determine the amount of plugging material interposed between the rams.

20. In apparatus for plugging brake linings, a series of reciprocable pins, including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip over the supporting means in steps of such length that openings formed by the punches subsequently align with the rams, means to support plugging material in alignment with the rams to be forced into the openings of the strip, means for clamping the

strip intermediate advances thereof by said feeding means, said rams comprising two groups, each ram of each group opposing a ram of the other group, the operating means for the rams comprising means for oppositely moving said groups, and means to adjustably determine the amount of plugging material interposed between the rams.

21. In apparatus for plugging brake linings, punches, rams, means to actuate said punches and rams, intermittent feeding means for advancing a strip of brake lining successively to said punches and rams, means for supporting plugging material in alignment with the rams to be forced by the rams into the punch-formed openings of the strip, and means to adjustably determine the amount of plugging material supported in alignment with the rams.

22. In apparatus for plugging brake linings, a series of reciprocable pins including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip over the supporting means in steps of such length that openings formed by the punches subsequently align with the rams, means to support plugging material in alignment with the rams to be forced into the openings of the strip, and means to adjustably determine the amount of plugging material supported in alignment with the rams.

23. In apparatus for plugging brake linings, punches, rams, means to actuate said punches and rams, intermittent feeding means for advancing a strip of brake lining successively to said punches and rams, means for supporting plugging material in alignment with the rams to be forced by the rams into the punch-formed openings of the strip, means for clamping the strip intermediate advances thereof by said feeding means, and means to adjustably determine the amount of plugging material supported in alignment with the rams.

24. In apparatus for plugging brake linings, a series of reciprocable pins, including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip over the supporting means in steps of such length that openings formed by the punches subsequently align with the rams, means to support plugging material in alignment with the rams to be forced into the openings of the strip, means for clamping the strip intermediate advances thereof by said feeding means, and means to adjustably determine the amount of plugging material supported in alignment with the rams.

25. In apparatus for plugging brake linings, punches, rams, means to actuate said punches and rams, intermittent feeding means for advancing a strip of brake lining successively to said punches and rams, means for supporting plugging material in alignment with the rams to be forced by the rams into the punch-formed openings of the strip, means for clamping the strip intermediate advances thereof by said feeding means rendered operable by advance of the rams toward the strip, and means to adjustably determine the amount of plugging material supported in alignment with the rams.

26. In apparatus for plugging brake linings, a series of reciprocable pins, including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip over the supporting means in steps of such length that openings formed by the punches subsequently align with the rams, means to support plugging material in alignment with the rams to be forced into the openings of the strip, means for clamping the strip intermediate advances thereof by said feeding means rendered operable by advance of the rams toward the strip, and means to adjustably determine the amount of plugging material supported in alignment with the rams.

27. In apparatus for plugging brake linings, a series of reciprocable pins, including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip from the supporting means in steps of such length that openings formed by the punches subsequently align with the rams, means to support plugging material in alignment with the rams to be forced into the openings of the strip, means including said supporting means for clamping the strip intermediate advances thereof by said feeding means, and means to adjustably determine the amount of plugging material supported in alignment with the rams.

28. In apparatus for plugging brake linings, a series of reciprocable pins, including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip over the supporting means in steps of such length that openings formed by the punches subsequently align with the rams, means to support plugging material in alignment with the rams to be forced into the openings of the strip, a plate in opposition to said supporting means in alignment with the rams, means for yieldably urging said plate into engagement with the strip to thereby clamp the strip between the plate and supporting means as the rams approach the strip, and means to adjustably determine the amount of plugging material supported in alignment with the rams.

29. In apparatus for plugging brake linings, spaced stationary and movable plates, punches extendable through openings in the movable plate, rams movable toward and away from said plates and aligning with other openings in the movable plate, means to reciprocate said punches and rams, means for feeding a strip of brake lining between the plates in steps of such length that openings formed by such punches subsequently align with said rams, means associated with the movable plate for supporting plugging material in alignment with the openings of the plate associated with the rams, and means to adjustably determine the amount of plugging material supported in alignment with the rams.

30. In apparatus for plugging brake linings, spaced stationary and movable plates, punches extendable through openings in the movable plate, rams movable toward and away from said plates and aligning with other openings in the movable plate, means to reciprocate said punches and rams, means for feeding a strip of brake lining between the plates in steps of such length that openings formed by such punches subsequently align with said rams, means associated with the movable plate for supporting plugging material in alignment with the openings of the plate associated with the rams, means operated by approach of the rams to the strip for shifting said movable plate toward said stationary plate to thereby clamp the strip against movement, and means to adjustably determine the amount of plugging material supported in alignment with the rams.

31. In apparatus for plugging brake linings, punches, rams, means to actuate said punches and rams, intermittent feeding means for advancing a strip of brake lining successively to said punches and rams, means for supporting plugging material in alignment with the rams to be forced by the rams into the punch-formed openings of the strip, said rams comprising two groups, each ram of each group opposing a ram of the other group, the operating means for the rams comprising means for oppositely moving said groups, and means to adjustably determine the amount of plugging material interposed between the rams.

32. The method of producing a brake lining, consisting in providing a tape having openings therein, aligning a granular mixture containing lead and graphite with each tape opening while regulating the amount of material aligned with each opening to provide sufficient material to produce a solid unitary plug of greater cubical content than the opening, and finally pressing the material into the opening to solidify the material as a unitary plug.

33. The method as set forth in claim 32, wherein the material aligned with each opening is divided in two lots, introduced to the opening from opposite sides of the tape, and the proportions of lead to graphite in the lots introduced to each opening differ from one another.

34. The method of producing a brake lining consisting in providing a woven friction tape having openings therein, aligning a granular mixture of friction-modifying material with each tape opening while regulating the amount of material aligned with each opening to provide sufficient material to produce a solid unitary plug of greater cubical content than the opening and finally pressing the material into the opening to solidify the material as a unitary plug.

35. The method set forth in claim 34 wherein the material aligned with each opening is divided in two lots introduced to the opening from opposite sides of the tape, the friction-modifying characteristics of the lots introduced from opposite sides of each opening differing from one another.

36. In apparatus for plugging brake linings, a series of rams, means to feed a strip of perforated brake lining by the rams in a manner aligning the perforations of the strip with said rams, means to actuate said rams, and means for supporting plugging material in alignment with the rams to be forced between the rams into the openings of the strip.

37. In apparatus for plugging brake linings, a series of reciprocable pins including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip over the supporting means in such manner that openings formed by the punches subsequently align with the rams, and means to support plugging material in alignment with the rams to be forced into the openings of the strip.

38. In apparatus for plugging brake linings, a series of rams, means to feed a strip of perforated brake lining by the rams in a manner aligning the perforations of the strip with said rams, means to actuate said rams, and means for supporting plugging material in alignment with the rams to be forced between the rams into the openings of the strip, said rams comprising two groups, each ram of each group opposing a ram of the other group, the operating means for the rams comprising means for oppositely moving said groups.

39. In apparatus for plugging brake linings, a series of reciprocable pins including punches and rams, means to support a strip of brake lining for operations by said punches and rams, means to advance the strip over the supporting means in such manner that openings formed by the punches subsequently align with the rams, and means to support plugging material in alignment with the rams to be forced into the openings of the strip, said rams comprising two groups, each ram of each group opposing a ram of the other group, the operating means for the rams comprising means for oppositely moving said groups.

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DISCLAIMER

1,960,881.—*Herbert E. Sunbury*, Wyncote, Pa. LINING PLUGGING MACHINE. Patent dated May 29, 1934. Disclaimer filed June 1, 1937, by the assignee, *Allbestos Corporation*.

Hereby disclaims the following claims of said patent, 5, 6, 7, 8, 15, 16, 38, and 39.

[*Official Gazette, June 22, 1937.*]