

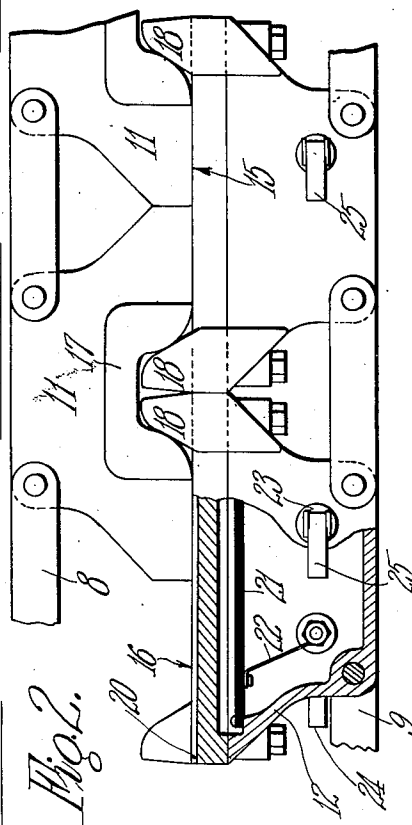
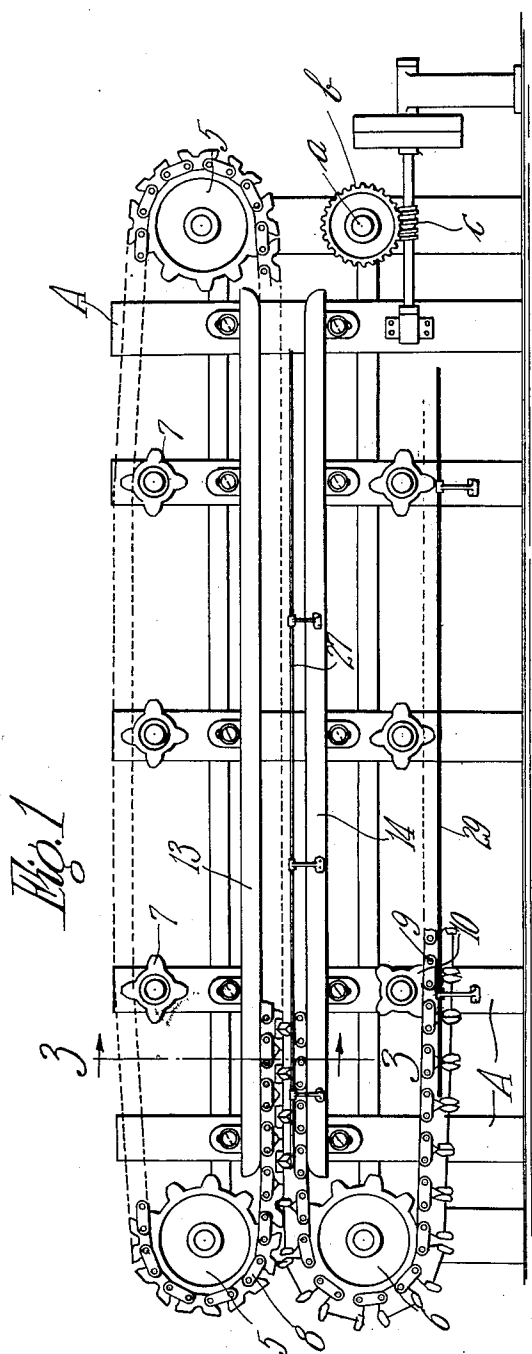
G. H. LEWIS.
VULCANIZER.

APPLICATION FILED MAY 27, 1918.

1,305,474.

Patented June 3, 1919.

2 SHEETS—SHEET 1.



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Fig. 3.

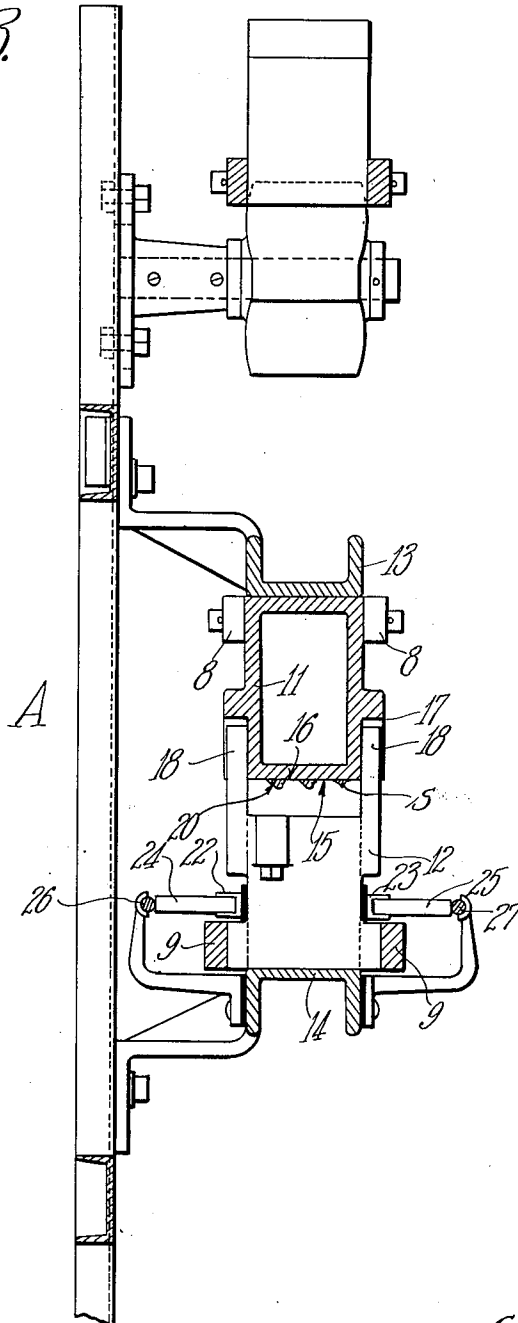
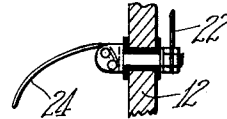


Fig. 4.



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VULCANIZER.

1,305,474.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, GEORGE H. LEWIS, a citizen of the United States, and a resident of Chicopee Falls, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Vulcanizers, of which the following is a specification.

This invention relates generally to vulcanizers and more particularly to improvements in vulcanizers to the end that they may be operated more efficiently and expeditiously.

According to the general practice in operating vulcanizers heretofore, considerable time, in addition to that necessary for the vulcanizing function, has been required in order to take vulcanized material out of the mold and put into the latter other material to be vulcanized. It is also necessary to reassemble the mold parts before another vulcanizing operation can take place. By reason of the necessity of the three steps outlined, it will be obvious that for a substantial part of the time, the vulcanizer is non-productive. This invention is concerned, among other things, with improvements in vulcanizers to the useful end that the non-productive interval, heretofore thought necessary, may be at least substantially reduced, if not entirely eliminated.

The broad object of this invention is to provide in combination with a vulcanizer means to automatically feed material to be vulcanized to the vulcanizer and to discharge vulcanized material therefrom, the vulcanizer being operable during or independently of the operation of such means, whereby the vulcanizer may be operated more nearly, if not in fact, continuously.

Another object of the invention is to provide in a vulcanizer, means to move a length of material to be vulcanized and means to apply pressure to the material while it is thus moved, together with means to heat the material while held under pressure, such heating means being operable during the movement of the material or not, as the case may require.

Another object of the invention is to provide in combination with suitable heating means, sets of movable vulcanizing mold sections in endless chain form, the sections of each set arranged to cooperate with those of another set during a portion of

their travel to receive, confine and convey a strip to be vulcanized.

A further object of the invention is to provide, in combination with sets of movable mold sections of the type described, interengaging means on the sections of each set for the purpose of preventing relative lateral or longitudinal displacement between the cooperating sections of the sets.

Another object of the invention is to provide, in combination with an endless chain series of vulcanizing mold sections, a heating means carried by each section and means connecting the several movable heating means to a stationary source of supply.

A further object of the invention is to provide in a vulcanizer of the type described generally improved mechanical structure.

Other objects and advantages will appear in the following description and in the appended claims.

The invention, in an embodiment at present preferred, is shown for illustrative purposes in the accompanying drawings, in which:

Figure 1 is an elevational view of an apparatus embodying the invention;

Fig. 2 is an enlarged view, with parts in section, of a portion of the structure shown in Fig. 1;

Fig. 3 is a partial cross-sectional view taken on the line 3—3 of Fig. 1; and

Fig. 4 is a fragmentary cross-sectional view of one of the movable mold sections.

Referring to these drawings: A represents a suitable supporting frame for the apparatus. Upon frame A are rotatably mounted upper and lower pairs of spaced sprockets 5 and 6 respectively. The sprockets 5, together with other smaller sprockets 7, support a sprocket chain 8 and a like chain 9 is supported by the sprockets 6, and other smaller sprockets 10. The right hand sprocket 6 has been broken away in Fig. 1 to show that upon its shaft *a* a worm gear *b* is fixed which gear may be driven by means of the worm *c* from a suitable source of power. The chain 9 may thus be driven and means are provided whereby the chain 8 may be driven from, and at the same speed as, chain 9 as will appear. The chains 8 and 9 may also be driven in any other suitable manner as the particular requirements of each case may require, and the invention is therefore

independent of the specific driving means, the means shown being given merely by way of illustrative example.

The detailed construction of the chains 8 and 9 is best shown in Fig. 2. Each chain carries a series of shoes and preferably, although not necessarily, these shoes also function as links of the chain. Thus, the upper chain 8 is made up of alternate ordinary chain links and specially formed shoes 11 and the lower chain 9 is made up in a like manner with other specially formed shoes 12 interposed between the ordinary chain links. The outer portions of shoes 11 and 12 are of such length that they abut end to end with the adjacent shoes of their respective chains, during the straight line travel of the latter. The chains 8 and 9 are also so supported that the lower run of the former and the upper run of the latter move in adjacent and spaced parallel relation. The shoes 11 and 12 thus extend toward one another, during that portion of the travel of their respective chains just described, and the shoes are preferably made of such height that their adjacent outer surfaces abut as shown.

A guide bar 13 is mounted on frame A for vertical adjustment and is arranged to engage the inner surfaces of the shoes 11 during the lower straight line travel of chain 8 and a like guide bar 14 is similarly mounted to engage the inner surfaces of the shoes 12 during the upper straight line travel of chain 9. These guide bars 13 and 14 thus insure an accurate straight line travel of chains 8 and 9 during their adjacent runs and preferably are so adjusted and constructed with a converging entrance as to cause the faces 15 and 16 of shoes 11 and 12 respectively to closely abut in contiguous relation. The guide bars 13 and 14 also insure that the surfaces 15 and 16 are held in close contact with the requisite pressure. Thus, it will be seen that the shoes 11 and 12, while moving in engagement with the guide bars 13 and 14 respectively, provide two smooth unbroken surfaces which are movable in unison in a straight line while held together under pressure.

To insure that there will be no relative movement between the surfaces 15 and 16 while they are held in contact, a recessed and laterally extending lug 17 is provided centrally on each shoe 11 and on both sides thereof, as shown in Figs. 2 and 3. Each shoe 12 has at the four corners of its outer surface 16 upwardly extending lugs 18 which project laterally from the sides of the shoe. The arrangement is such that the lug 18 on one end of one shoe 12 and the lug 18 on the adjacent end of the next succeeding shoe 12 pair together to form a tooth which is adapted to enter the central recess 17 in the shoe 11. Thus, not only are the two se-

ries of shoes caused to move at exactly the same speed but also the engagement of the lugs 17 and 18 afford means for propelling the chain 8 from the chain 9 which is driven as already described. The lugs 18, being arranged in pairs on shoes 12 also form a succession of upstanding forks, between the prongs of which the lower portions of shoes 11 fit to prevent relative lateral movement between the engaging surfaces 15 and 16. It is also to be noted that the joints in the continuous surface afforded by the surfaces 16 of the abutting shoes 12 are staggered with relation to the joints in the continuous surface afforded by the surfaces 15 of the abutting shoes 11.

The endless surfaces afforded by the shoes 11 and 12 are adapted, when such shoes are in abutment, to convey therebetween a strip of vulcanizable material and hold it under the requisite pressure during its vulcanization. To this end one, or both, series of shoes, as the case may require, are provided with grooves to receive the material. Thus, assuming for example, that strips, such as are used for beads of tire shoes, or solid tire or other vulcanizable material are to be vulcanized, each shoe 12 may have one or more longitudinal grooves 20 (Fig. 3) in the surface 16 thereof, the cross-sectional shape of such grooves being varied as desired to suit the requirements of the particular work in hand. Generally, on account of the shape of tire beads which are used as an example in the illustration it is not necessary to groove the surfaces 15 of the shoes 11 although this may obviously be done if necessary or desirable. The grooves 20 of successive shoes 12 are held in alinement by the lateral guiding means described so that a continuous channel is afforded to receive the strip to be vulcanized, as *s* in Fig. 3. In the practical use of the illustrated structure, the strip *s* is made somewhat larger in cross-section than the groove so that the strip when fed between the shoes 11 and 12 and into grooves 20, may be firmly pressed by the surfaces 15 of shoes 11 into the interstices of grooves 20.

Any suitable means may be provided to heat the surfaces 15 and 16 and thus vulcanize the strips *s* therebetween. As an illustration of one means which may be used for this purpose, there has been shown (see Fig. 2) electrical heating coils 21 in each of the hollow shoes 12, and it is to be understood that a like arrangement may be made for shoes 11 if desired. The terminals 22 and 23 of each coil 21, extend outwardly through opposite side walls of its shoe and terminate in flexible brushes 24 and 25 respectively, one of which is clearly shown in detail in Fig. 4. Arranged along both sides of the path of shoes 12 are stationary bus bars 26 and 27 which are sup-

plied from an appropriate source of electricity and which are engaged by the several brushes 24 and 25 respectively, whereby electricity may be supplied to coils 21 to heat the surfaces 16 of shoes 12. The bus bars 26 and 27 have been shown as arranged to energize the coils 21 of shoes 12 only during their upper straight line travel. If necessary or desirable the coils 21 may be continuously energized by extending the bars 26 and 27 throughout the entire path of travel of the shoes or a second pair of bus bars, one of which appears at 29 in Fig. 1, may be employed to energize the coils 21 of shoes 12 during their lower-straight line travel. The surfaces 16 are heated by radiation from coils 21 and shoes 12 and by conduction from the surfaces 15. Obviously the surfaces 16 may be heated in any other suitable manner.

In operation strips of vulcanizable material, preferably somewhat larger in cross-section than the grooves or recesses 20, are fed between the shoes 11 and 12, as their respective surfaces 15 and 16 come into abutment, and into grooves 20. The shoes 11 and 12, being held against relative displacement vertically, press the strips into the grooves 20 and hold the strips confined and under pressure, as in a mold. Meanwhile the strips are conveyed by frictional engagement with the shoes 11 and 12. The manner in which the strips are conveyed is particularly important here, since the strips of rubber compound are not capable of withstanding tensional strains to any great extent without undesirable elongation. As the strips are thus moved while held under pressure in the confines of grooves 20, heat to the requisite degree may be applied by the coils 21 and the degree of heat and interval of travel of the strips in grooves 20 may readily be made such that the strips upon leaving the grooves 20 are vulcanized to the desired degree.

The invention is therefore directed toward and contemplates continuously operable vulcanizers although it is not to be inferred that other manners of operation are not contemplated. It is obvious that the vulcanizer may be operated in other ways, as intermittently or step by step, without reaching the desirable ultimate goal of strict continuity and still permit important and substantial advantages, due to the fact that the feeding and discharging of the material may take place more rapidly than heretofore, and also simultaneously, as well as to the fact that the mold parts automatically separate to discharge the vulcanized material and automatically come together to confine and apply pressure to the material to be vulcanized.

The invention has been disclosed in one embodiment for the purposes of illustra-

tion, but the scope of the invention is defined by the appended claims rather than by the foregoing description.

What I claim is,—

1. In a vulcanizer, two movable and endless series of mold sections arranged for a portion of their travel to move in contiguous relation, means to drive each of said series, the molds of one series presenting molding grooves, into which grooves a strip to be vulcanized may be fed and confined, and means additional to said driving means to hold the coacting sections of each series against relative longitudinal displacement.

2. In a vulcanizer, two movable and endless series of mold sections arranged for a portion of their travel to move in contiguous relation, means to drive said series, the molds of one series presenting molding grooves, into which grooves a strip to be vulcanized may be fed and confined, means additional to said driving means to hold the coacting sections of each series against relative longitudinal displacement both forward and backward with respect to the sections of the other series, and means to heat the strip while it is held in said grooves.

3. In a strip vulcanizer, two movable and endless series of mold sections, each of the sections of one of said series having a strip-engaging portion, and said two series being arranged for a portion of their travel to move in adjacent relation and to grip and confine therebetween a strip of material to be vulcanized, and interengaging means on the sections of each series to prevent relative lateral displacement of the coating mold sections both to one side and to the other.

4. In a strip vulcanizer, two movable and endless series of mold sections, each of the sections of one of said series having a strip-engaging portion, and said two series being arranged for a portion of their travel to move in adjacent relation and to grip and confine therebetween a strip of material to be vulcanized, and interengaging means on the sections of each series to prevent relative lateral displacement or longitudinal displacement both backward and forward of the coating mold sections.

5. In a strip vulcanizer, two movable and endless series of mold sections, each of the sections of one of said series having a strip-engaging portion, and said two series being arranged for a portion of their travel to move in adjacent relation and to grip and confine therebetween a strip of material to be vulcanized, interengaging means on the sections of each series to prevent relative lateral displacement both to one side and to the other, and also to prevent relative longitudinal displacement both forward and backward, of the coacting mold sections, and means to heat the material while confined between the latter.

6. In a vulcanizer, two movable and endless series of mold sections arranged for a portion of their travel to move in contiguous and coacting relation, and means to hold the coacting sections of each series against relative displacement; such means comprising a device in the character of a recessed upstanding lug upon a section of one of said series with its recess located to open toward the hereafter-mentioned mated section when said sections are mated, and a device in the character of an upstanding lug upon the mating section of the other series, and located to face the first-named section when said sections are mated, thereby to mesh in the recess of the lug of the first named section; substantially as described.

7. In a continuous vulcanizer for vulcanizing strip material, an endless movable series of individual mold sections each presenting a mold recess extending from one end to the other thereof; certain of said sections being each of heat conducting material having a groove in the body thereof of relatively small size in comparison to the body and constituting the mold recess, the body having a relatively large portion of its surface at the sides of the groove contoured to intimately contact a substantial portion of the surface of a cooperating section of the hereafter-named second series of sections, in heat conducting relation thereto; a second endless movable series of sections, to engage the sections of the first series during a portion of the travel and close the mold recesses, certain of the sections of such second series being contoured to engage the said

certain sections of the first series in intimate and heat conducting contact with a substantial portion of the surfaces thereof; and means for heating certain of the sections.

8. In a continuous vulcanizer for vulcanizing strip material, an endless movable series of individual mold sections each presenting a mold recess extending from one end to the other thereof; certain of said sections being each of heat conducting material having a groove in the body thereof of relatively small size in comparison to the body and constituting the mold recess, the body having a relatively large portion of its surface at the sides of the groove contoured to intimately contact a substantial portion of the surface of a cooperating section of the hereafter-named second series of sections, in heat conducting relation thereto; a second endless movable series of sections, to engage the sections of the first series during a portion of the travel and close the mold recesses, certain of the sections of such second series being contoured to engage the said certain sections of the first series in intimate and heat conducting contact with a substantial portion of the surfaces thereof; and means secured in sections of one of said series for heating the bodies thereof, and for heating by conduction the bodies of the sections of the other series, whereby the strip to be vulcanized is heated all about by direct contact by heated bodies relatively large in comparison to the size of the strip; substantially as described.

GEORGE H. LEWIS.