H. L. BROWN.

POWER TRANSMITTING APPARATUS.

APPLICATION FILED NOV. 28, 1908.

957,650. Patented May 10, 1910.

2 SHEETS—SHEET 1.

Fig. 1

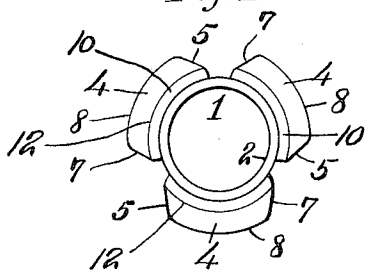


Fig. 7

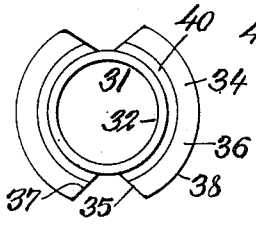


Fig. 10

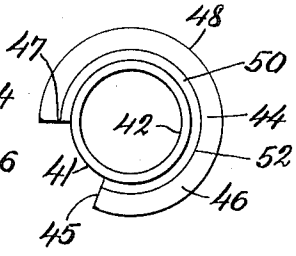


Fig. 2

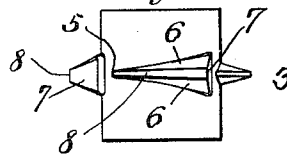


Fig. 8

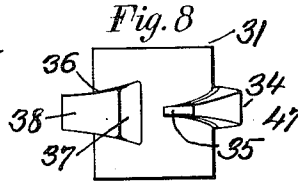


Fig. 11

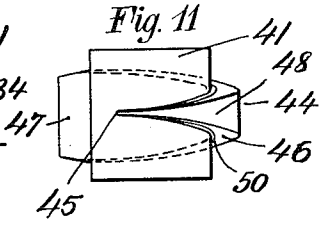


Fig. 3

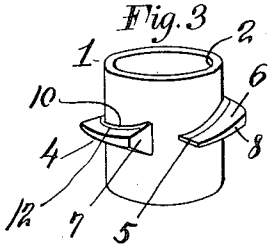


Fig. 9

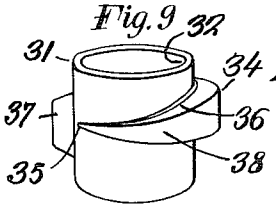


Fig. 12

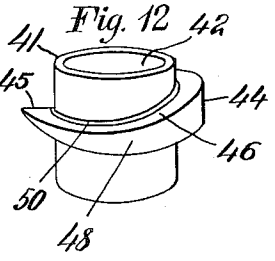
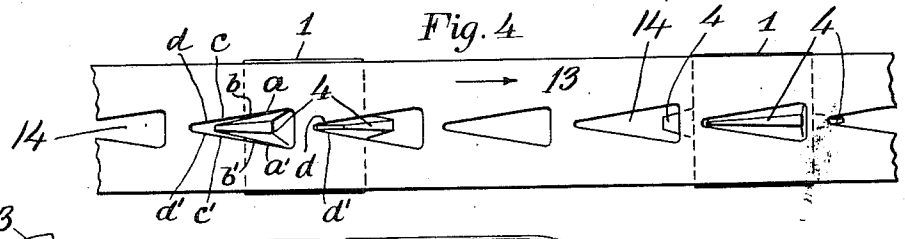


Fig. 4



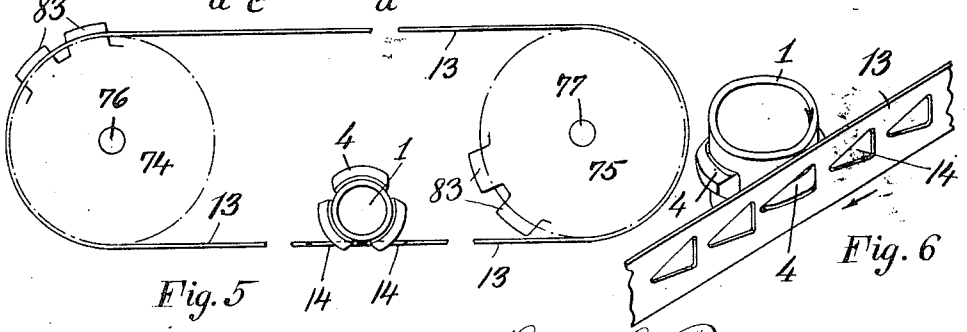


Fig. 5

Fig. 6

Witnesses

Henry L. Brown Inventor

By his Attorney

Alexander C. Brownfield

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2 SHEETS—SHEET 2.

Fig. 13

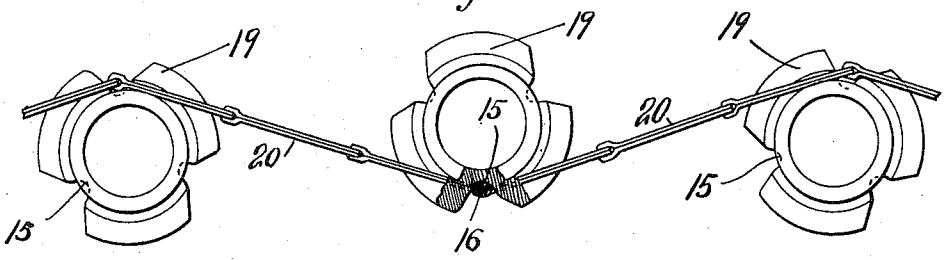
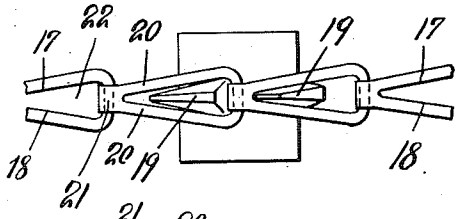


Fig. 14



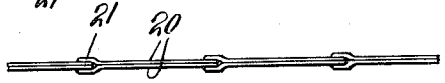
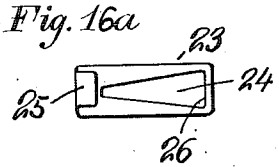


Fig. 15

Fig. 16a



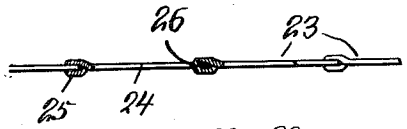
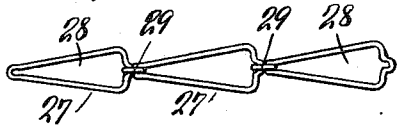


Fig. 16

Fig. 17



Witnesses

Henry L. Brown Inventor

By his Attorney

Alexander C. Fraser Jr.

UNITED STATES PATENT OFFICE.

HENRY L. BROWN, OF PATERSON, NEW JERSEY, ASSIGNOR TO BROWN SPIN-WRIGHT COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

POWER-TRANSMITTING APPARATUS.

957,650. Specification of Letters Patent. Patented May 10, 1910.

Application filed November 28, 1908. Serial No. 465,466.

To all whom it may concern:

Be it known that I, HENRY L. BROWN, of Paterson, New Jersey, have invented certain Improvements in Power-Transmitting Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings designating like parts.

This invention relates to power-transmitting apparatus, and is of special utility when embodied in mechanism for driving a rotating member by means of a member, such as a band or chain, movable in the direction of its length and preferably substantially continuous; and also for driving such a continuous member by means of the cooperating rotating member, although my improvements may be utilized in any field of power-transmission for which they are adapted by their nature.

An important object of my invention is to provide for more prolonged positive and progressive driving engagement of the driving and driven members at each driving period or contact than has been possible heretofore in chain drives; my invention making it possible also to utilize for the first time the walls of apertures in a continuous metallic band as the positively and progressively acting drive surfaces of the driven or driving member in such apparatus. To this end, in carrying my invention into effect, I prefer to provide a flat metallic band with a series of body apertures whose walls constitute drive surfaces inclined laterally relatively to the line of movement of said member, and to provide the co-acting member with a coöperating inclined surface to be engaged progressively at a plurality of consecutive points with said first mentioned inclined surfaces, to permit positive progressive actuation of one of said members by the one selected as the driving member. Where the co-acting member is rotatable, the number of such inclined surfaces upon the rotating member may vary according to their size and the diameter of the member, and the consequent extent of its periphery, and preferably I provide as large a number of such inclined surfaces as can be formed conveniently upon the circumference of the rotating member, although a single inclined surface extending preferably, but not necessarily, around a considerable portion of the rotating member, falls within the scope of my invention.

Heretofore, in the construction of power-transmitting apparatus involving the use of a chain and a sprocket wheel, or analogous devices in which the driving teeth have projected in a radial, or substantially radial, direction from the circumference of the sprocket wheel, the links of the chain have been engaged with the forward or rear faces of the tooth, or its equivalent, in a line contact, or limited area of contact, but in contradistinction to such an arrangement, my invention provides in its preferred form, a wedge-shaped tooth or recess upon the rotating member, and a coöperating wedge-shaped recess or projection upon the band or chain; the apex of the wedge being preferably directed forward in all instances where the projection is formed upon the driving member, and rearward in all cases where the recess is formed in the driving member, so that as the continuous member, whether driving or driven, moves in the direction of its length past the rotating member, successive portions of its inclined wedge surface come into engagement with the corresponding region of the coöperating wedge surface upon the rotating member, and as soon as the wedge upon the rotating member passes in its rotation out of the plane of engagement with the wedge upon the member moving in the direction of its length, the forward end of this wedge comes, after a slight interval, into position for similar engagement with the same or another cooperating wedge upon the other member, so that continuous driving engagement is preferably maintained. Where there is but a single wedge extending around a substantial part of the periphery of the rotating member, and also in cases where there is a plurality of wedge projections or recesses upon the rotating member, the forward edges of the several wedges are preferably presented, with but slight intervals, for successive engagement respectively with the successive wedge portions, projecting or recessed, of the member which moves in the direction of its length.

The various features of my invention will be illustrated and described fully in the accompanying drawings and specification and pointed out in the claims.

In the drawings, Figures 1, 2 and 3 illus-

trate respectively in plan, side elevation and perspective a rotating member for power transmitting apparatus, in the construction of which my invention has been embodied, these figures showing a member having three projecting wedges, and Figs. 4, 5 and 6 are views in side elevation, plan and perspective respectively of the same member, showing also a coöperating continuous band or endwise movable member in driving position; Figs. 7, 8 and 9 are similar views of a modified form of rotating member in which only two wedge projections are provided; while Figs. 10, 11 and 12 show in similar fashion still another modification in which the rotating member has but a single wedge projection extending around the greater part of its periphery; Figs. 13 and 14 show a chain and a whirl, or rotating member, in the construction of which my invention has been embodied, and this chain may serve as a driving or driven member, being provided with inclined power-transmitting surfaces to be described more fully hereafter; Fig. 15 is a plan view of the same chain, taken separately; and Figs. 16, 16[a] and 17, show respectively modified forms of chains for the same purpose.

In the embodiment of my invention selected for illustration and description to enable a ready and complete understanding of my improvements, the part designated by the reference numeral 1 is a rotating member, which may be of any convenient material, size and general contour, being shown in the instance illustrated as a whirl, sleeve or hub, having a longitudinal bore 2. The rotating member may be conveniently cast of "Sampson" metal, and in Figs. 1, 2 and 3 this member is shown as provided, in accordance with my invention, with three equi-distant wedge shaped projections 4, whose apices 5 preferably lie in the same transverse plane which may be termed "the plane of operative movement," and in a peripheral circle, at the side of which the inclined surface 6 of the wedge (see Fig. 2) broadens gradually to the butt 7 of each wedge, which may be separated by a suitable space from the apex of the next wedge projection, the circumferential face 8 of the projection being preferably concentric and lying in the same cylindrical surface, while the apices and corners of the wedges respectively are preferably slightly rounded as indicated, so as to avoid sharp corners likely to catch and tear articles brought in accidental contact therewith, and also to avoid unnecessary friction upon the coöperating band. These projections may vary in contour according to the requirements of the particular situation in which they are used, without departing from the spirit of my invention, and I have selected the double wedge form shown merely as one convenient embodiment, one of the valuable features of this form being found in the contour of the inclined edges 6 which preferably are not normal to the periphery of the sleeve throughout, but may be normal thereto for a short distance from the hub proper, as at 10, (see Fig. 1) and then the crown of the wedge or tooth preferably tapers outwardly at 6, decreasing in breadth toward its outer surface 8, the line 12 of demarcation between the normal portion of the wedge, and the tapered portion thereof, being shown clearly in Figs. 1 and 3.

In accordance with my invention, I provide a coöperating power-transmitting member 13 (see Figs. 4–6) movable in the direction of its length, and preferably substantially continuous, and as a convenient embodiment of this member I have shown in the instance illustrated an endless band of suitable material, such as steel, preferably very flexible and provided at intervals (preferably equi-distant) with openings 14 of any suitable size and shape to receive successively the wedge projections 4 upon the rotating member and coöperate therewith to transmit power from one member to the other. The arrows in the respective figures indicate the direction of movement of the coöperating members in the instance selected for illustration. In Figs. 4 and 5, the band may be considered as the driving member. In Fig. 6, the rotating member may be considered as the driving member, but in each instance either member may serve as the driving member upon the application of power thereto. Considering the band as the driving member, and referring particularly to Figs. 1, 4 and 5, the operation of my improved power-transmitting mechanism, constructed according to the novel principle already described, may be understood best perhaps by considering the walls of the apertures 14 to be divided into a plurality of driving regions *a*, *b*, *c* and *d*, (see Fig. 4) although as a matter of fact each wall is continuous and operates continuously upon the wedge projections 4, along the region of contact denoted by the line 12, what is said about the upper wall *a*, *b*, *c* and *d*, applying with equal truth to the lower wall *a'*, *b'*, *c'*, *d*,' when the wedge is symmetrical, having inclined surfaces on each side of the plane of rotation. When the band is carried in the direction of the arrow Fig. 4, the walls of the aperture 14 grip the wedge member 4 with their portions *a*, *a'*, just as one would grip the wedge with the finger and thumb and pull it around in the direction of the arrow, and as it is thus pulled the wall portions *b b'*, take hold in turn and then the portions *c c'*, and *d d'*, the operation being continuous as already indicated, the contact being preferably in a series of infinitely small regions or points along the shoulder

12, this form of contact being desirable on account of the low friction factor, although I do not limit myself to the specific contour of the wedges illustrated in the figures under consideration. It will be noted, on close observation of Fig. 4, that the wall region *a*, *a'* is ready to grip the broad end of the rearward wedge 4, practically at the instant at which gripping engagement ceases between the gripping portion *d d'*, and the thin edge of the forward wedge 4, so that the rotative impulse imparted to the rotating member 1 is substantially continuous, the degree of separation between the wedges respectively and between the coöperating apertures, as well as the contour of these respective parts, being regulated preferably to accomplish such continuous, actuative engagement in most instances, although I do not limit myself to uninterrupted engagement.

As indicated in Figs. 4 and 5, the aperture 14 will preferably be slightly longer than the base of the tooth, to afford slight clearance at each end, and thus permit the band to sit snugly in against the periphery of the hub 2 of the rotating member, and thereby gain the maximum power-transmitting efficiency, which may be enhanced in some instances by forming a slight recess in the periphery of the sleeve as shown at 15, in Fig. 13, to receive a corresponding swell 16 formed in the material of the lengthwise moving member, such a swell or swells being constituted, in the form of device or modification illustrated in Figs. 13 to 17 inclusive by the overlapping portions of the chain links, of which the continuous member is made up in those figures. The links of the chains thus illustrated have respectively inclined walls 17 and 18 adapted to engage coöperatively the wedge teeth 19 of the rotating member, either to drive or be driven thereby in the manner already described, in accordance with the novel principle embodied in my invention, and such a chain may be found of service in various situations where greater flexibility is desirable, more particularly for the purpose of making short turns in a sinuous course around rotatable members such as those indicated in Fig. 13, and in this instance it will be noted that a plurality of the links are in engagement at the same time with their respective wedge members.

Various forms of link may be adopted for the purpose of my invention, and in the instance of those illustrated in Figs. 13 and 17 inclusive, the link shown in Figs. 13 to 15 follows, in general arrangement of its connection with adjoining links, a well known form of chain, each link being formed of two wings 20, with a medial ligament 21 which is passed through the apertures 22 of the adjoining link after the wings have been bent around into superimposed relation, the bending of each link serving to retain in closed position the wings of the adjoining link throughout the chain, as will be understood readily from Figs. 14 and 15.

In Figs. 16 and 16[a], a link 23 is shown with an aperture 24 similar in shape and function to those already described, the connection with adjoining links being formed by bending a connecting tongue 25 at one end of each link around the front bar 26 of the adjoining link.

In Fig. 17, still another form of chain is shown comprising wire links 27, bent to form apertures 28, the bars on each side of the link having the inclination necessary for power-transmitting purposes in accordance with my invention, these links being joined in any suitable manner, as for example, by the relatively short subsidiary or connecting links 29.

As already indicated briefly, there may be considerable variation in the shape and number of the wedges, teeth or projections with which the rotating member is provided, in accordance with my invention, and in Figs. 7, 8 and 9 I have shown one such modification in which the numbers 31 to 38 inclusive designate parts similar in construction and operation to parts numbered similarly, from 1 to 8 inclusive in Fig. 1, with this difference however, that there are only two wedges 34 in place of the three wedges 4 of the construction shown in Fig. 1. The three-wedge-form I find to possess desirable features of equilibrium, owing to the balanced relation of the wedges. So also in the modification shown in Figs. 10, 11 and 12, the parts designated by the reference numerals 41 to 48 inclusive are similar in construction and operation to the parts numbered 1 to 8 inclusive in Fig. 1, but in this modification there is but a single wedge extending around the greater part of the circumference of the rotating member.

Having illustrated and described my invention thus fully, and a suitable structure in which the same may be embodied, I wish it understood that I do not limit myself to the specific construction and materials selected for illustration and description, nor in general do I limit myself otherwise than as set forth in the claims, read in connection with this specification.

What I claim and desire to secure by Letters Patent is:—

1. Power transmitting apparatus; comprising a driving member and a driven member, one of said members being an endless metal band having apertures the walls of which constitute drive-surfaces and said other member being rotatable and having projections to enter said band apertures, with co-acting opposed drive surfaces inclined laterally fore-and-aft in transverse relation to the plane of actuative movement,

said surfaces being constructed and arranged to cause progressive, positive, actuative contact of said driving member surfaces with said driven member surfaces respectively.

2. Power transmitting apparatus; comprising an apertured, endless, metal band, flat throughout its length, constituting a lengthwise-acting member; and a rotating member having a projecting part with operating surfaces inclined divergently in a lateral direction relatively to the path of rotation of said part and arranged to turn recurrently into the path of said lengthwise-acting band, the aperture-walls of said band presenting opposed co-acting inclined surfaces to be engaged with said inclined operating surfaces positively and progressively throughout each period of projection of said part into the path of movement of said lengthwise-acting band; substantially as described.

3. Power-transmitting mechanism; comprising an endless metallic band having at regular intervals V-shaped openings with their angles rounded and arranged with their apices in the same direction lengthwise of said band; a rotatable sprocket-wheel-member consisting of a hub provided with a peripheral tooth V-shaped in transverse-section and having its apex arranged in the mid plane of the rotative path of said tooth; and means to support said sprocket-wheel-member rotatably adjacent said band, in position to permit recurrent entry of said tooth into a plurality of said apertures successively; said tooth having its walls normal to the periphery of said hub near the base of said tooth, and tapered toward the crown, to permit ready entrance of said tooth into said opening, and exit therefrom, respectively, said tooth being somewhat shorter than said opening, and of suitable width to cause progressive engagement of its walls with the inclined walls of said openings respectively, for positive actuation of one of said members by the one selected to serve as the driving member; and means to actuate said driving member; substantially as described.

4. The combination with a rotating member having a driving surface wedge-shaped in plan when viewed radially; of a band having coöperating wedge driving surfaces respectively inclined laterally fore-and-aft relatively to the direction of coöperative movement; substantially as described.

5. A power-transmitting device; comprising an endwise movable member provided at intervals with V-shaped openings having their apices arranged lengthwise of said member; substantially as described.

6. A power-transmitting device, comprising a metallic band having apertures, the walls of said apertures constituting driving-surfaces inclined laterally fore-and-aft relatively to the length of said band to engage progressively and actuate positively a coöperating power-transmitting member; substantially as described.

7. A power-transmitting device; comprising a metallic band having at regular intervals V-shaped openings all with their angles rounded and arranged with their apices in the same direction lengthwise of said band; substantially as described.

8. A power-transmitting device; comprising a metallic band having apertures the walls whereof constitute drive-surfaces to engage progressively and actuate positively a rotatable member; substantially as described.

9. A power-transmitting device; comprising a sprocket-wheel-member having an annular hub provided with a peripheral tooth, substantially V-shaped in plan, said tooth having its walls normal to the periphery of said hub near the base of said tooth, and tapering toward the crown with its outward surface substantially concentric with said hub; substantially as described.

10. A power-transmitting device; comprising a sprocket-wheel-member provided with a tooth, V-shaped in plan, to engage actuatively another member having inclined surfaces opposed to, and to coöperate with the side walls of said tooth, said side walls being perpendicular to the base near said base and approaching each other toward the crown to permit ready entrance of said tooth between said coöperating inclined surfaces, and exit therefrom respectively, said tooth being of suitable width to cause progressive engagement of its walls with the inclined walls of said coöperating inclined surfaces for positive actuation of one of said members by the one selected to serve as the driving member; substantially as described.

11. Power-transmitting apparatus; comprising a lengthwise-movable member having a series of V-shaped apertures arranged with their apices presented in the same direction along the line of movement of said member; and a rotatable member having V-shaped projections arranged to enter said V-shaped apertures; and means to actuate one of said members, and through it to move said other member positively by a progressive engagement of the inclined portions of each V-shaped surface with the successive inclined portions of the coöperating V-shaped surface; the apex of said V being directed rearwardly when the projection is formed on the driven member; substantially as described.

Signed at New York, in the county and State of New York, this 26th day of October, 1908.

HENRY L. BROWN.

Witnesses:

ALEXANDER C. PROUDFIT,

JOHN B. WENTWORTH.