

No. 667,893.

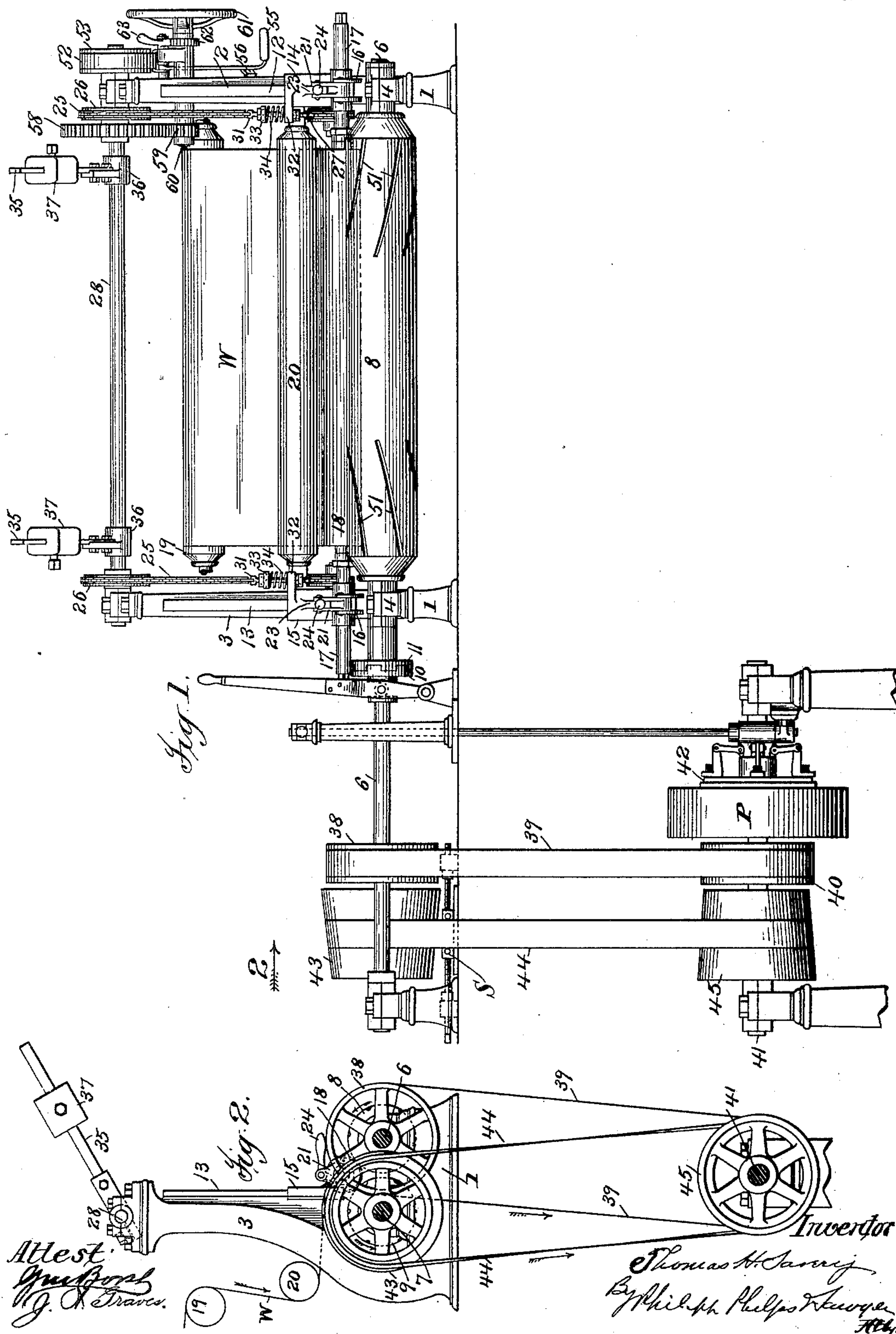
Patented Feb. 12, 1901.

T. H. SAVERY.  
WINDING MACHINE.

(Application filed Aug. 11, 1899.)

(No Model.)

3 Sheets—Sheet 1.





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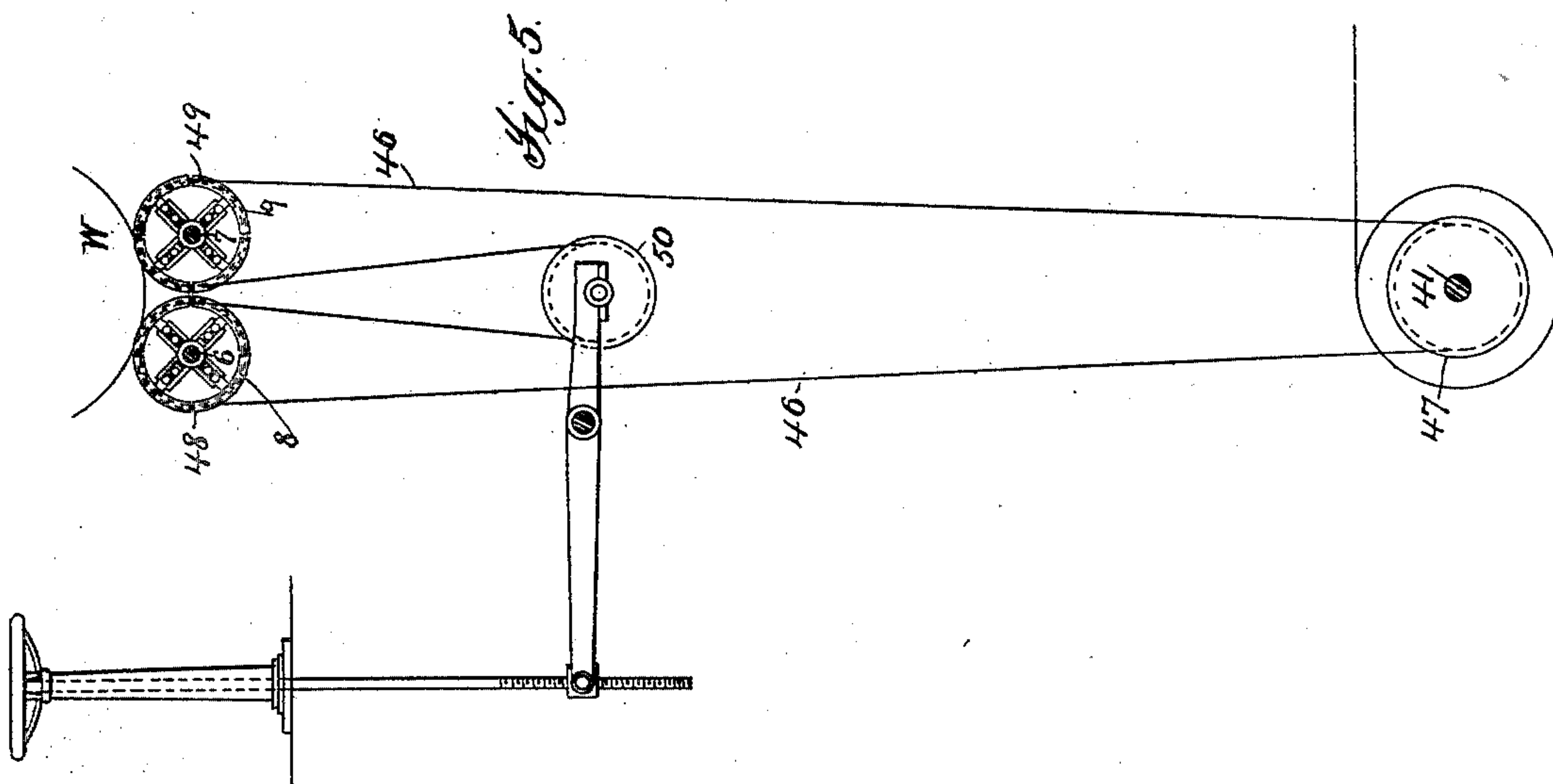
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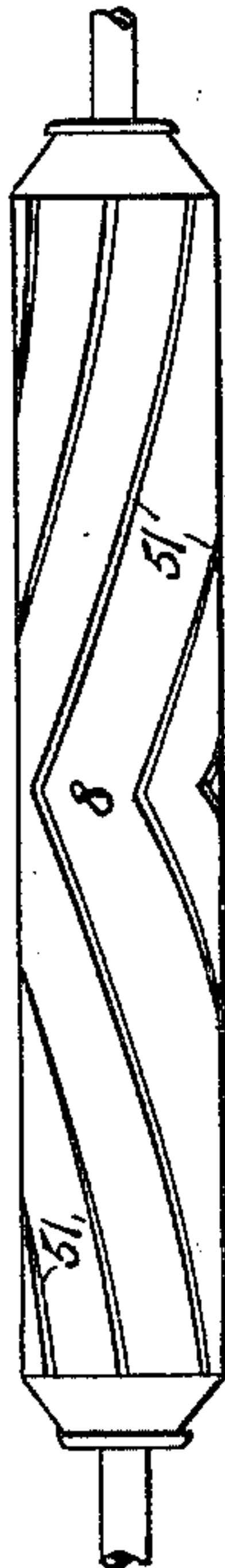
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3 Sheets—Sheet 3.



*Fig. 6.*



Attest:  
*J. M. Boring*  
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*Fig. 7.*



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# UNITED STATES PATENT OFFICE.

THOMAS H. SAVERY, OF WILMINGTON, DELAWARE.

## WINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 667,893, dated February 12, 1901.

Application filed August 11, 1899. Serial No. 726,918. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS H. SAVERY, a citizen of the United States, residing at Wilmington, county of New Castle, and State of Delaware, have invented certain new and useful Improvements in Winding-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

10 This invention relates to improvements in machines for winding continuous lengths of material—such, for example, as paper—into rolls.

15 The improvements of the present invention have reference particularly to winding-machines of that class known as “drum-winders,” in which there are employed in the winding operation a winding mechanism and a laterally-displaceable receiving-core rotated 20 thereby to which the material is secured and upon which it is wound as it is thus rotated, the core and its roll of material in such machines being supported yieldingly in engagement with the winding mechanism by suitable means and displaced laterally accordingly as the roll of material enlarges.

25 One branch of the present invention relates to machines of this class in which the winding mechanism consists of a plurality of winding-rolls. In such machines in order to secure tight winding of the roll of material it is necessary that the second roll of a pair or that which is second in order of contact with the material should move at a surface speed 30 exceeding that of the other roll, as otherwise the material has a tendency to sag between the rolls. It is the primary object of the present invention in this connection to provide driving connections for this purpose. 40 It is desirable, moreover, that the difference in the relative surface speeds of the two rolls should be capable of variation or adjustment in accordance with different materials to be wound or for the purpose of securing different degrees of compactness in the winding of material. It is also the object of the present invention to provide for this, and for that reason the driving connections for these rolls are provided with adjustable means whereby 50 the surface speed of one roll may be adjusted relatively to the other, the range of adjustment being preferably such as to provide for

the driving of the roll which is second in order of contact with the material at a surface speed even less than that of the other roll 55 when it is desired to wind material, such as tissue-paper, very loosely. In carrying out these features of the invention the driving means employed are preferably such—for example, belts and pulleys—as will drive the 60 winding-rolls frictionally instead of positively, as by means of gears, as with such frictional driving connections the winding-rolls are permitted to slip relatively to the driving means, and vice versa, and thereby 65 adapt themselves to changes in the condition of the roll of material being wound as the size and weight thereof increase.

Another branch of the present invention relates generally to the construction of winding rolls or drums, the invention in this connection consisting of a roll or drum, portions of the surface whereof are omitted or depressed so as to provide inwardly-extending pressure-relieving recesses, the purpose of which 75 is to relieve the excess of pressure upon portions of the roll of material due to sagging of the latter as it enlarges or to other causes, and to thereby prevent the formation of irregularities at such portions of the roll of material or to correct such irregularities should they occur. 80

The invention also consists of other features and combinations of parts which will be pointed out in the claims. 85

The present invention, broadly considered, is capable of application to machines for winding materials of different kinds; but as it has been designed with especial reference to machines for winding paper, and particularly 90 paper as it leaves a paper-making machine, and as in such machines it has peculiar advantages it will for convenience be described in that connection.

In the accompanying drawings, Figure 1 is 95 an end elevation of a paper-winding machine equipped with the present invention, including the preferred form of driving connections for the winding rolls or drums. Fig. 2 is a side elevation thereof looking toward the right 100 of Fig. 1. Fig. 3 is a side elevation, on an enlarged scale and partly in section, of the winding mechanism looking toward the left of Fig. 1. Fig. 4 is a section on the line 4 of



Fig. 3. Fig. 5 illustrates a modification in the driving connections for the winding rolls or drums, and Figs. 6 and 7 illustrate modifications in the winding rolls or drums.

Referring to said drawings, the frame of the machine consists of supports 1, provided with uprights 2 3. Mounted in journal-boxes 4 5 on the supports 1 is a pair of shafts 6 7, bearing winding rolls or drums 8 9, respectively, said shafts being connected with a driving-pulley P by connections which will be hereinafter described and in such way as to be both driven in the same direction, as indicated by the arrows in Fig. 2. Upon the shafts 6 7 are splined or otherwise suitably secured sliding clutch members 10, adapted to engage corresponding clutch members 11, (one of which is shown,) borne by the winding rolls or drums, and when so engaged to operatively connect said rolls or drums with the shafts 6 7, respectively. The uprights 2 3 are provided with vertical guides 12 13, respectively, upon which are mounted sliding carriages 14 15, respectively, each of said carriages being provided with a bracket 16 at its lower end forming a journal-bearing for the reception of a shaft 17, bearing the sleeve or shell 18, constituting the receiving-core to which the web of paper is secured and upon which it is wound into a roll, such core and its roll of material during the winding operation resting upon and being rotated by the winding-rolls 8 9. The shaft 17 is squared at its ends in the usual way for the reception of a wrench, so that after the end of the web of material is secured to the core 18 said shaft and core may be rotated by hand to wind a portion of the web on the core, and thus start the formation of the roll. The web W of paper is led into the winding-machine from a paper-making machine and on its way to the core 18 passes over and under guide-rolls 19 20, respectively. The journal-bearing 16 in each of the sliding carriages 14 15 is split, so as to provide a hinged upper portion 21, which may be swung open whenever it is desired to insert or remove a shaft 17 and core 18, such upper member being provided with a latch 22, adapted to engage a projection 23 on the sliding carriage, and thus lock said member in its closed position. The latch 22 is pivoted to the member 21 and is provided with a handle 24, by which it may be readily disengaged from the sliding carriage to permit said upper member to be swung open.

Each of the sliding carriages 14 15 has connected to it a sprocket-chain 25, passing over a sprocket-wheel 26 and under a sprocket-wheel 27. The sprocket-wheels 26 are secured to a shaft 28, journaled in the upper ends of the uprights 2 3, while the sprocket-wheels 27 are journaled upon studs 29, secured in the lower ends of said uprights, studs being employed at this point in order that there may be no interference with the winding of the roll. Each of the sprocket-chains 25 is made in two sections connected by a turnbuckle 30,

by which the length of the chain may be adjusted, and also by a hook 31 on the end of one section engaging a loop on the end of the other section. Each sprocket-chain is yieldingly connected to its carriage by means of a lug 32 on the carriage, through which the shank of the hook 31 passes, said shank being screw-threaded above the lug 32 to receive an adjustable collar 33, between which and said lug is interposed a coiled spring 34.

It will be understood that as the winding rolls or drums 8 9 are rotated by their shafts 6 7 in the direction of the arrows in Fig. 2 they will by frictional engagement with the core 18 and the material previously wound thereon rotate said core and wind the web of material W thereon, said core and roll of material as the latter increases in diameter being laterally displaced relatively to the winding rolls or drums and the sliding carriages 14 15, in which the core 18 is supported, moved upwardly thereby and through the sprocket-chains 25 26 in turn rotating the shaft 28.

Projecting radially, or substantially so, from the shaft 28 is a pair of arms 35, which move with the shaft 28 in the arc of a circle and during the first part of the winding operation resist rotation of said shaft, and consequently lateral displacement of the core 18, with gradually-decreasing pressure tending to force said core toward the winding rolls or drums 8 9, and during the latter part of the winding operation assist rotation of said shaft 28, and consequently furnish a gradually-increasing support for the core 18 and its roll of material, and thus relieve the winding-rolls of the increase in weight of said roll of material. The arms 35 are secured to collars 36, rigidly secured to shaft 28, and are weighted by means of weights 37, adjustable longitudinally of the arms, whereby the resisting and supporting power of said arms may be regulated to suit different kinds of paper or different sizes of rolls. This resisting and assisting mechanism constitutes no part of the present invention.

The connections for driving the rolls 8 9 at different relative surface speeds with the surface speed of roll 9 exceeding that of roll 8 and whereby also the relative surface speeds of these rolls may be varied within wide limits to accommodate different kinds of material or secure different degrees of compactness in winding will now be described. Before entering upon a detailed description of the connections shown it may be stated that with connections for frictionally driving these rolls consisting, preferably, of belts and pulleys, particularly for the roll 9, the most satisfactory results are obtained, as such connections, unlike gears for positively driving the rolls or drums, permit the winding rolls or drums to accommodate themselves to the varying conditions of the roll of material as the latter enlarges and increases in weight and in the pressure thereof upon the rolls, and thus prevent breakage of the web. Such



belt and pulley connections may be arranged in a variety of ways; but the arrangement which I prefer is that illustrated in Figs. 1 and 2, which will now be described in detail.

5 Referring to these figures, the shaft 6 is provided with a plain pulley 38 and with a belt 39, passing around a pulley 40, fast to a shaft 41, on which the driving-pulley P is journaled, a friction-clutch 42 being provided for  
10 connecting said shaft and pulley. Shaft 7 is provided with a cone-pulley 43 and with a belt 44, passing around a cone-pulley 45, fast to the shaft 41, cone-pulleys being employed so that on shifting the belt 44 by means of a  
15 belt-shifting mechanism S the surface speed of the winding-roll 9 may be readily increased over that of roll 8 or its speed adjusted within wide limits, even to a point where it is less than that of roll 8, to suit different materials  
20 or to secure different degrees in compactness of winding. A further advantage of adjustable driving connections, and particularly belt and pulley driving connections, is that the relative surface speeds of the two rolls  
25 may be adjusted with great nicety for tight winding, and thus breakage of the web of material due to undue strain or tension thereon avoided.

The driving connections for the two rolls  
30 or drums 8 9 are, as will be observed, independent of each other, so that adjustments may be made in the driving connections of roll or drum 9 without in any way affecting roll or drum 8.

35 Although the driving connections illustrated in Figs. 1 and 2 are preferred, connections such as illustrated in Fig. 5 may be employed without departing from the present invention, broadly considered. In this case  
40 the driving connections for the rolls 8 9 consist of a belt 46, passing around a pulley 47 on shaft 41 and around expanding-pulleys 48 49 on the shafts 6 7, respectively, and engaged by a belt-tightener 50. The surface speed of  
45 the roll or drum 9 in this case may be varied by adjusting either pulley 48 49 so as to effect an increase in the surface speed of roll 9 over that of roll 8, or vice versa.

The winding-rolls 8 9 are of peculiar construction, being each provided on its periphery with pressure-relieving recesses 51, extending inwardly from the ends thereof. These recesses may be parallel with the axis of the roll, as shown in Fig. 7, or they may  
55 extend obliquely in the direction of rotation of the roll or drum, as shown in Figs. 1 and 6, and may meet, as shown in Fig. 6, their purpose being to prevent the formation of irregularities in the material being wound  
60 due to excess of pressure at one part of the winding-rolls over that at other parts and to correct such irregularities should they for any reason occur. Some of the irregularities which these recesses are designed to prevent the  
65 formation of or to correct if formed are those which occur in the winding of large or heavy rolls of material, which after they pass a cer-

tain point sag at their middle portions, and thus cause the winding roll or drum against which they rest to also sag. As a roll of material sags in this way there is a corresponding increase in the pressure exerted upon the end portions of the roll of material, due to the fact that the corresponding portions of the winding roll or drum are unyielding. This  
70 undue pressure produces an objectionable wave-like appearance, creases, and other irregularities in the ends of the material. By the provision of these pressure-relieving recesses the formation of these irregularities is  
75 entirely prevented, as when such recesses arrive in position for engagement with the roll of material the material at the point of contact with the winding roll or drum is forced into these recesses and the excess of pressure  
80 at these points entirely relieved. These pressure-relieving recesses may be employed for preventing irregularities arising in other ways or for the purpose of correcting such irregularities should they occur.  
90

The oblique recesses 51 of Figs. 1 and 6 are preferred, because they gradually relieve the ends of the roll of material of the undue pressure exerted thereon, the pressure being first  
95 relieved at the inner ends of such recesses and then gradually relieved toward the outer ends thereof or the extreme ends of the winding roll or rolls. They are also preferred because in addition to relieving the roll of material of undue pressure they have a tendency  
100 to spread the ends of the material outwardly toward the ends of the roll and to thus prevent the formation of wrinkles and to correct such wrinkles if previously formed.

In addition to the weighted arms 35 the machine is provided with a friction-brake consisting of a strap 52, passing around a pulley 53, secured to shaft 28, one end thereof being secured to a fixed part of upright 2 and the other end to the weighted arm 54 of a bell-  
105 crank lever pivoted in said upright, the other arm 55 of which is adapted to be moved by hand out of and into engagement with a spring-catch 56 when it is desired to apply the brake to or release it from the shaft 28.  
110 The arm 54 is preferably weighted by means of a weight 57, adjustable longitudinally thereof, whereby the resistance of this brake mechanism to rotation of shaft 28 may be regulated. The shaft 28 is also provided with a  
120 gear 58, engaged by a pinion 59, the shaft 60 of which is provided with a hand-wheel 61, by which it may be rotated when after the completion of a winding operation it is desired to return shaft 28, arms 35, and sliding carriages  
125 14 15 to initial position. The shaft 60 is also provided with a ratchet 62, adapted to be engaged by a pawl 63 when it is desired to lock the pinion 59 and shaft 28 against rotation and to retain the sliding carriages in any de-  
130 sired position—as, for example, when introducing a new core 18 into the machine.

What is claimed is—

1. The combination with a pair of winding-



rolls adapted to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, of driving connections including an adjustable member, whereby said winding-rolls may be driven at varying relative surface speeds, substantially as described.

2. The combination with a pair of winding-rolls adapted to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, of driving connections, including an adjustable member, whereby said winding-rolls may be driven at varying relative surface speeds with the surface speed of the winding-roll second in order of contact with the material exceeding that of the other roll, substantially as described.

3. The combination with a pair of winding-rolls adapted to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, of driving connections for said winding-rolls, the connections for the roll second in order of contact with the material including an adjustable member whereby it may be driven at varying surface speeds in excess of that of the other roll, substantially as described.

4. The combination with a pair of winding-rolls adapted to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, of belt-and-pulley connections, including an adjustable member, whereby said winding-rolls may be driven at varying relative surface speeds, substantially as described.

5. The combination with a pair of winding-rolls adapted to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, of belt-and-pulley connections, including an adjustable member, whereby said winding-rolls may be driven at varying relative surface speeds with the surface speed of the winding-roll second in order of contact with the material exceeding that of the other roll, substantially as described.

6. The combination with a pair of winding-rolls adapted to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, of belt-and-pulley connections for said winding-rolls, the connections for the roll second in order of contact with the material including an adjustable member whereby it may be driven at varying speeds in excess of that of the other roll, substantially as described.

7. The combination with a pair of winding-rolls adapted to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, of adjustable belt-and-pulley connections for one of said winding-rolls whereby it may be driven at varying surface speeds, substantially as described.

8. The combination with a pair of winding-rolls adapted to wind material into a later-

ally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, of adjustable belt-and-pulley connections for the winding-roll second in order of contact with the material whereby it may be driven at varying speeds in excess of that of the other roll, substantially as described.

9. The combination of a winding-roll, belt-and-pulley driving connections therefor, another suitably-driven winding-roll adapted to coact therewith to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, substantially as described.

10. The combination with a pair of winding-rolls adapted to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, of belt-and-pulley driving connections for said winding-rolls, substantially as described.

11. The combination with a pair of winding-rolls adapted to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, of connections for driving the winding-roll which is second in order of contact with the material at a surface speed exceeding that of the other roll, substantially as described.

12. The combination with a pair of winding-rolls adapted to wind material into a laterally-displaceable roll and suitable means for guiding the roll of material as it is displaced, of adjustable frictional driving connections for one of said rolls whereby it may be driven at different surface speeds relatively to the other roll, substantially as described.

13. The combination with a pair of winding-rolls adapted to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, of independent belt-and-pulley connections for each winding-roll, the connections for one roll including an adjustable member whereby its surface speed may be varied relatively to the other roll, substantially as described.

14. The combination with a pair of winding-rolls adapted to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, of independent belt-and-pulley connections for each winding-roll, the connections for the roll which is second in order of contact with the material including an adjustable member whereby its surface speed may be varied relatively to the other roll, substantially as described.

15. The combination of a winding-roll and a member coacting therewith to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, portions of the surface of said winding-roll being omitted or depressed lengthwise of the roll to provide pressure-re-



lieving recesses or depressions, substantially as described.

16. The combination of a winding-roll and a member coacting therewith to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, portions of the surface of said winding-roll being omitted or depressed to provide oblique pressure-relieving recesses or depressions extending inwardly toward each other from opposite ends of the roll and in the direction of rotation of the roll, substantially as described.

17. The combination of a winding-roll and a member coacting therewith to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, portions of the surface of said winding-roll being omitted or depressed to provide oblique pressure-relieving recesses or depressions extending inwardly toward each other from opposite ends of the roll and in the direction of rotation of the roll and meeting at substantially the middle thereof, substantially as described.

18. The combination of a pair of winding-rolls adapted to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, portions of the surface of each of said winding-rolls being omitted or depressed lengthwise of the roll to provide pressure-relieving recesses or depressions, substantially as described.

19. The combination of a pair of winding-rolls adapted to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, portions of the surface of each of said winding-rolls being omitted or depressed to provide oblique pressure-relieving recesses or depressions extending inwardly toward each other from opposite ends of the roll and in the direction of rotation of the roll, substantially as described.

20. The combination of a pair of winding-rolls adapted to wind material into a laterally-displaceable roll, and suitable means for guiding the roll of material as it is displaced, portions of the surface of each of said winding-rolls being omitted or depressed to provide oblique pressure-relieving recesses or depressions extending inwardly toward each other from opposite ends of the roll and in the direction of rotation of the roll and meeting at substantially the middle thereof, substantially as described.

21. The combination of a pair of winding-rolls adapted to wind material into a later-

ally-displaceable roll, suitable means for guiding the roll of material as it is displaced, portions of the surface of each of said rolls being omitted or depressed lengthwise of the roll to provide inwardly-extending pressure-relieving recesses or depressions, and driving connections whereby the rolls may be driven at different relative surface speeds, substantially as described.

22. The combination of a pair of winding-rolls adapted to wind material into a laterally-displaceable roll, suitable means for guiding the roll of material as it is displaced, portions of the surface of each of said rolls being omitted or depressed lengthwise of the roll to provide inwardly-extending pressure-relieving recesses or depressions, and adjustable driving connections whereby the winding-roll which is second in order of contact with the material may be driven at a surface speed in excess of that of the other roll, substantially as described.

23. The combination of rolls 8, 9, adjustable connections for driving roll 9, independent driving connections for roll 8, guides 12, 13, and sliding carriages 14, 15, substantially as described.

24. The combination of rolls 8, 9, cone-pulleys 43, 45, and belt 44 for driving roll 9, and independent belt-and-pulley connections for driving roll 8, substantially as described.

25. The combination of rolls 8, 9, and driving connections therefor, the surface of each of said rolls being cut away at intervals at each end to provide inwardly-extending pressure-relieving recesses or depressions, substantially as described.

26. The combination of rolls 8, 9, and driving connections therefor, the surface of each of said rolls being cut away at intervals at its ends to provide oblique pressure-relieving recesses or depressions extending inwardly and in the direction of rotation of the roll, substantially as described.

27. The combination of rolls 8, 9, and driving connections therefor, the surface of each of said rolls being cut away at intervals at its ends so as to provide oblique pressure-relieving recesses or depressions extending inwardly and in the direction of rotation of the roll and meeting at substantially the middle thereof, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

THOMAS H. SAVERY.

Witnesses:

THOS. H. SAVERY, Jr.,  
VINCENT G. HAZARD.