

No. 845,725.

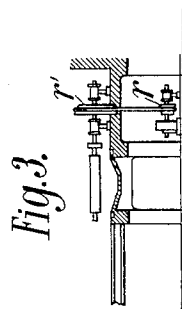
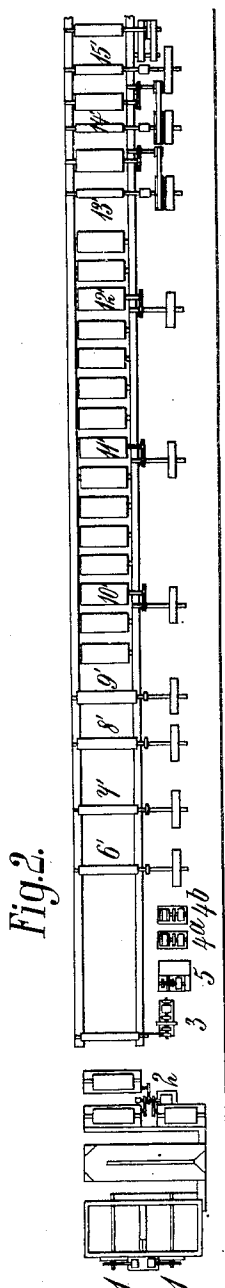
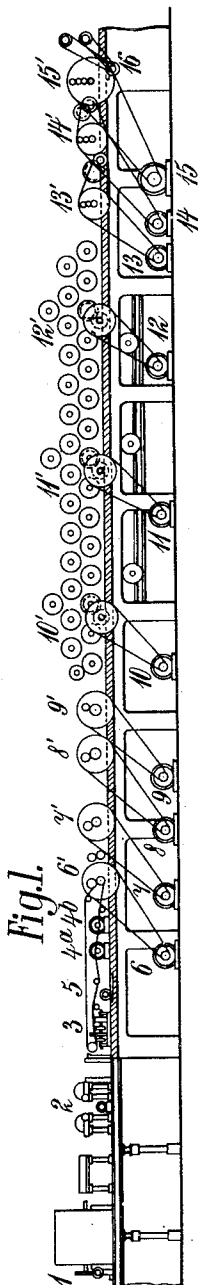
PATENTED FEB. 26, 1907.

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MEANS OF DRIVING PAPER MAKING MACHINES ELECTRICALLY.

APPLICATION FILED JULY 12, 1906.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 4.

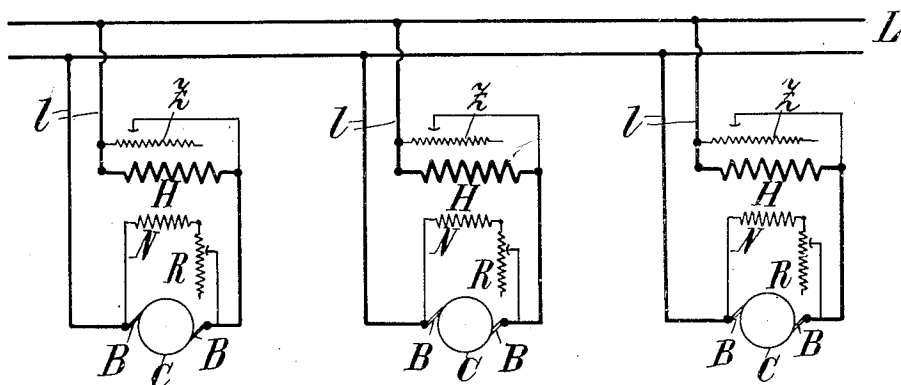
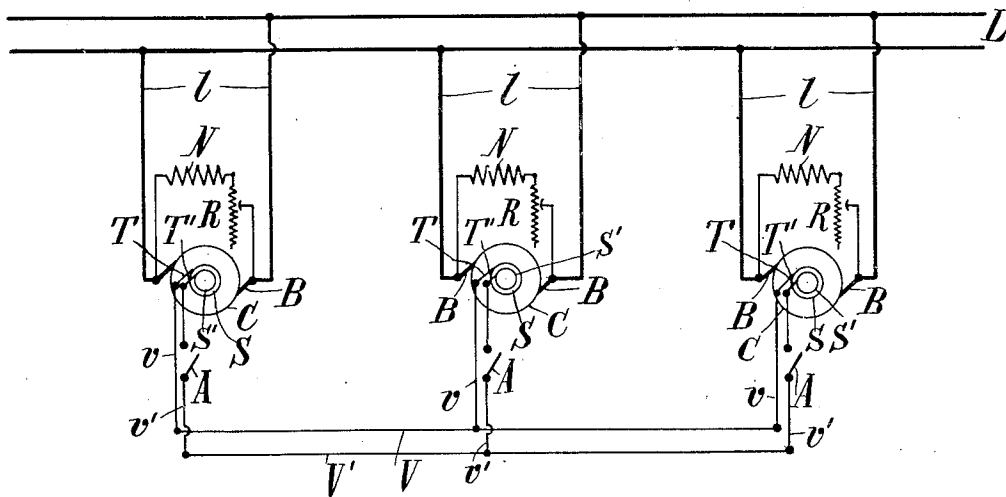


Fig. 5.



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MEANS OF DRIVING PAPER-MAKING MACHINES ELECTRICALLY.

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Specification of Letters Patent.

Patented Feb. 26, 1907.

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To all whom it may concern:

Be it known that I, ALBERT AICHELE, a citizen of Switzerland, and a resident in Baden, Hasselstrasse, Canton Argau, Switzerland, have invented certain new and useful Improvements in Improved Means of Driving Paper-Making Machines Electrically, of which the following is a specification.

This invention relates to improvements in the electrical driving of paper-making machines, and more especially to the electrical driving of the individual parts or sections of a paper-making machine by means of separate electric motors provided with means so as to impart a desired number of rotations to the entire machine and with means for maintaining the same speed independently of the load in all the motors in such a way, however, that the speed of the separate motors can be varied within certain small limits.

The working speed of a paper-making machine—that is to say, the peripheral speed of all the rollers and drying-cylinders—has to be adjustable within wide limits, according as a strong paper or a better quality of paper is made at its lowest speed, while, on the contrary, thin papers and the ordinary paper for newspapers have to be made at the highest practicable speed.

Heretofore the driving devices for paper-making machines were change-wheels, step-pulleys, large belt-cones with displaceable belts, or steam-engines and electric motors with variable speeds. The motion of the separate parts or sections—such as the coucher, wet-presses, drying-cylinders, smoothing apparatus, and rolling apparatus—is derived from the driving-motor by a longitudinal shaft with cone-wheels or by rope and belt gearing, while the other parts of the paper-making machine—for example, the stirring-vats, pumps, pulp-strainers, and shaking-frame—are driven by special intermediate gearing. The last-mentioned parts of the paper-making machine must be able to run independently of the working speed of the paper-making machine at a constant number of rotations, with the exception of the shaking-frame, which has cone-belt drums or belt-pulleys for adjusting the number of rotations of its crank-shaft in order to be able to adjust the number of shakes or strokes of the screen independently of the working speed of the paper-making machine.

Besides the adjustability within wide limits

of the working speed of the paper-making machine the tension of the paper has to be regulated in every part or section of the machine—that is to say, at a definite working speed the peripheral speeds of the individually-driven rollers and drying-cylinders have to be adjusted relatively to one another within narrow limits, (about five per cent.) This adjustability is necessary for the reason that the different kinds of paper stretch or contract differently between the separate presses, drying-cylinders, and smoothing-mills and without an accurate adjustability of the tension of the paper between the individual parts or sections the paper would be easily torn or run loosely into folds.

The regulation of the paper tension has heretofore been accomplished by driving the individual parts or sections of the paper-making machine by means of cone-belt pulleys of about one-half yard in length, on which belts 0.1–0.2 two yards wide run, said belts being shiftable by means of spindles and hand-wheels.

From the foregoing it is evident that the driving of a paper-making machine has to meet any conditions and causes considerable expense for shafts, bearings, and belts, though the modern construction of paper-making machines has to some extent simplified the motion-transmitting means by arranging steam-engines and electric motors with variable speed. Electric driving, however, has hitherto generally been arranged in groups in such a manner that a variable-speed motor drives the parts of the machine which run at a variable speed by means of intermediate shafts, while the apparatus which runs at a constant speed, like vats, pumps, &c., has been most frequently driven in one or two groups.

According to the present invention individually electrical driving, with all of its advantages, is employed for driving paper-making machines. The primary condition is that all those motors which drive the individual parts or sections of a paper-making machine proper run at the same speed, but that collectively a change in the number of rotations—that is to say, of the working speed within wide limits—is permitted, while at the same time the individual motors may be run at a constant speed or at a separately-adjusted speed.

In the accompanying drawing is shown an

example of an electric individually-driven paper-making machine constructed according to my invention, and in which—

Figures 1, 2, and 3 show, respectively, a side elevation, a plan view, and a cross-section of a paper-making machine and its motors; and Figs. 4 and 5 are diagrams of the electric connections of the different motors.

Similar reference characters indicate corresponding parts throughout the several figures.

The individual parts of the paper-making machine are driven by sixteen separate electric motors, 1-16, Fig. 1. The transmission of the motion from the motors 6-15 to the parts driven by them—viz., the couch-press 6', the wet-presses 7' 8' 9', the groups of cylinders 10' 11' 12', the damp smoothing-mills 13' 14', and the calender 15'—takes place by means of cone-pulleys r r' , (shown in Fig. 3,) which are also used in shaft-driving and by means of which the regulation of the paper tension takes place and by which the use of high-speed motors is permitted.

By preference compound-wound continuous-current motors, with auxiliary poles, if desired, are used. These motors are so compounded that every motor individually maintains its number of rotations at a constant speed, even with variations of load. The compounding is so arranged that it admits of regulation—that is to say, the possibility is afforded of choosing a speed for all the rollers corresponding to the kind of paper by altering the tension; but the regulation of the tension—that is to say, of the separate motors relatively to one another—takes place by altering the shunt excitation of the separate motors. By driving the paper-making machine according to this arrangement it affords the advantage that the intermediate gearing, as well as the driving by cone-pulleys from the separate motors, is rendered unnecessary. The motors are then either directly coupled with the rollers to be driven or the transmission of motion—in the case of high-speed motors—takes place by means of the ordinary belts and cone-pulleys or chains and sprocket-wheels or worm-wheels.

Fig. 4 shows diagrammatically three motors of one mode of construction, with their electrical connections. L are the line-wires by which the current is supplied to all the motors and to which the commutators C of the motors are connected by conductors l and brushes B . The brushes B are connected by a shunt-circuit N , in which is placed a resistance R . This serves for regulating the strength of the current. In the conducting-wires l is inserted a series coil H , with which a resistance Z is placed parallel. By regulating the resistance R the strength of the shunt-current in the shunt-circuit and the shunt excitation can be changed within cer-

tain limits, whereby the velocity of the motor may be varied so as to regulate the tension of the paper. The regulation of the series coil H is necessary for the reason that in a change in the tension of the line-current passing through the line-wires L for the purpose of changing the speed of the entire machine the complete compounding of the motor can only be maintained by a corresponding regulation of the current which passes through the series coil. All the motors for the different parts of the paper-making machine which have to be run with variable speed are connected in the same manner as described.

A second form of the application is shown in Fig. 5. In this case also three motors, together with their connections, are shown diagrammatically. L are the line-wires which supply the current to the brushes B , that are in contact with the commutators C of the motors, and l the branch conducting-wires. With the brushes B is connected a shunt-circuit N , and the strength of the current passing through the same is regulated by the resistance K . Besides the commutators C the motors are provided with contact-rings S and S' , which are connected in the usual manner with the armature of the motor. Brushes T T' are in contact with the contact-rings S S' . All the brushes T and all the brushes T' of the different motors are connected by conducting-wires V v , respectively, V' v' , with each other. In the conductors v' are arranged switches A . By closing the switches A the motors are connected in parallel, and thereby synchronized, so that they rotate at the same speed. For regulating the tension of the paper—that is to say, for regulating within small limits the number of rotations of the rollers which are driven by the different motors—it is necessary with the last arrangement to interpose a transmission of the motion from the motors to the individual rollers by means of any known mechanism—such as, for instance, cone-pulleys, as shown in Fig. 3.

Further forms of individual electrical driving of paper-making machines may be readily obtained by optional combinations of the arrangements described above without departing from the spirit and scope of this invention.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, with a paper-making machine, of separate electric motors for driving the individual parts thereof, means for maintaining a constant working speed for the entire machine as desired, and means for varying the working speed of the individual parts of the machine within small limits.

2. The combination, with a paper-making machine, of separate electric motors for driv-

ing the individual parts or sections thereof, means on said motors for maintaining them at a constant working speed as desired, and means for varying the working speed of the separate motors within small limits.

3. The combination, with a paper-making machine, of separate continuous-current shunt-wound motors for driving the individual parts or sections thereof, means on said electric motors for maintaining them at the same speed independently of the load, and means for varying the speed of the separate motors within small limits.

4. The combination, with a paper-making machine, of separate electric motors for driving the individual parts or sections of the machine, means on said electric motors for maintaining them at the same working speed independently of the load, and shunt-windings connected with said motors for varying the

speed of the separate motors within small limits.

5. The combination, with a paper-making machine, of separate electric motors for driving the different parts or sections thereof, adjustable compound windings for said motors for permitting the same working speed to be maintained for all the motors independently of the load, and adjustable shunt-windings for said motors for enabling the speed of the individual motors to be varied within small limits by regulating the shunt excitation.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

ALBERT AICHELE.

Witnesses:

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E. A. STADLER.