May 24, 1932. T. D. NUTTALL 1,859,838

PAPER MAKING MACHINE

Filed Oct. 3, 1930 3 Sheets-Sheet 1

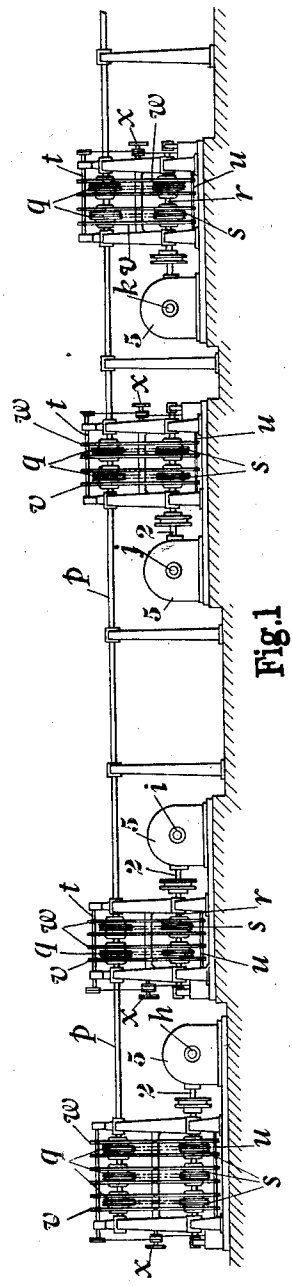


Fig.1

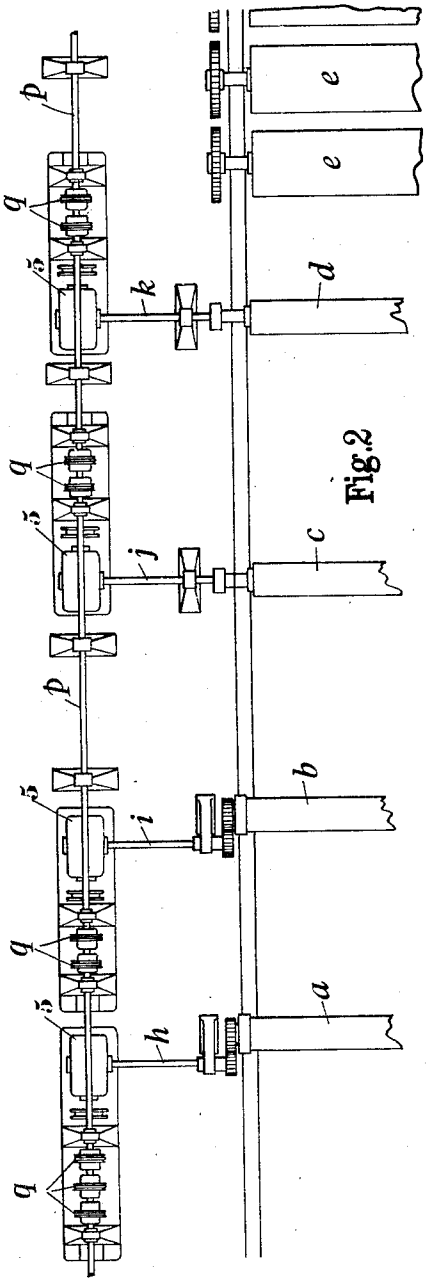


Fig.2

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PAPER MAKING MACHINE

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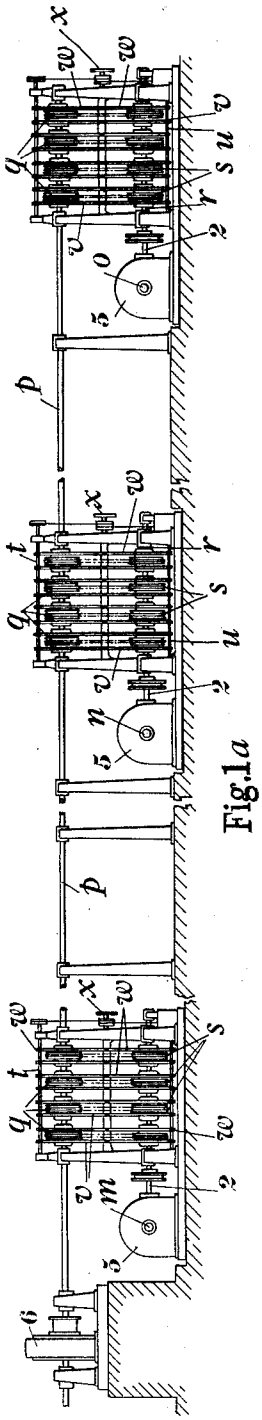


Fig.1a

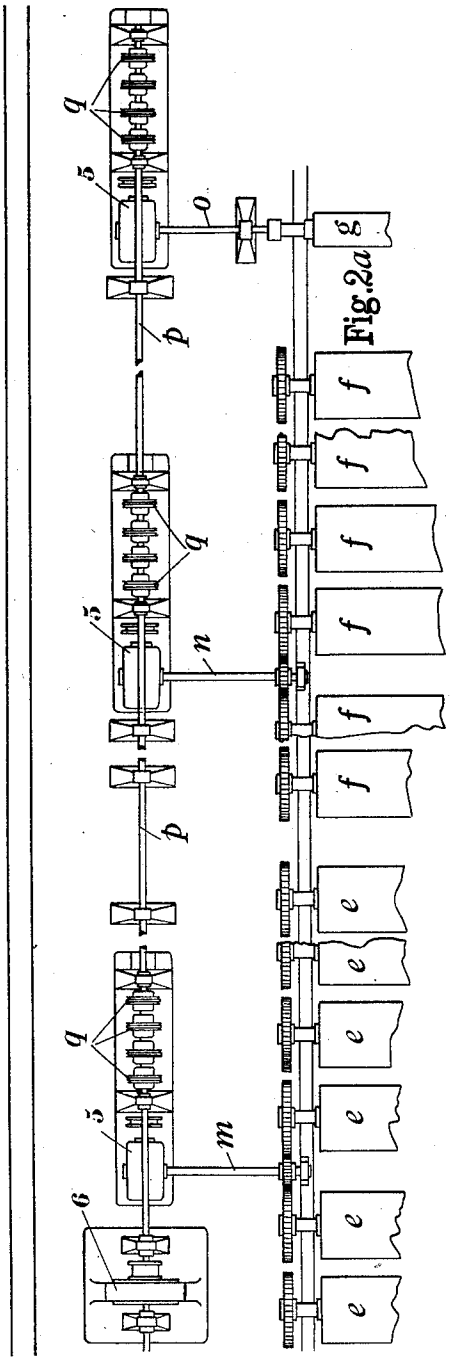


Fig.2a

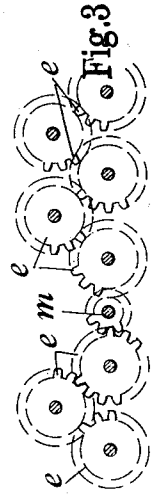


Fig.3

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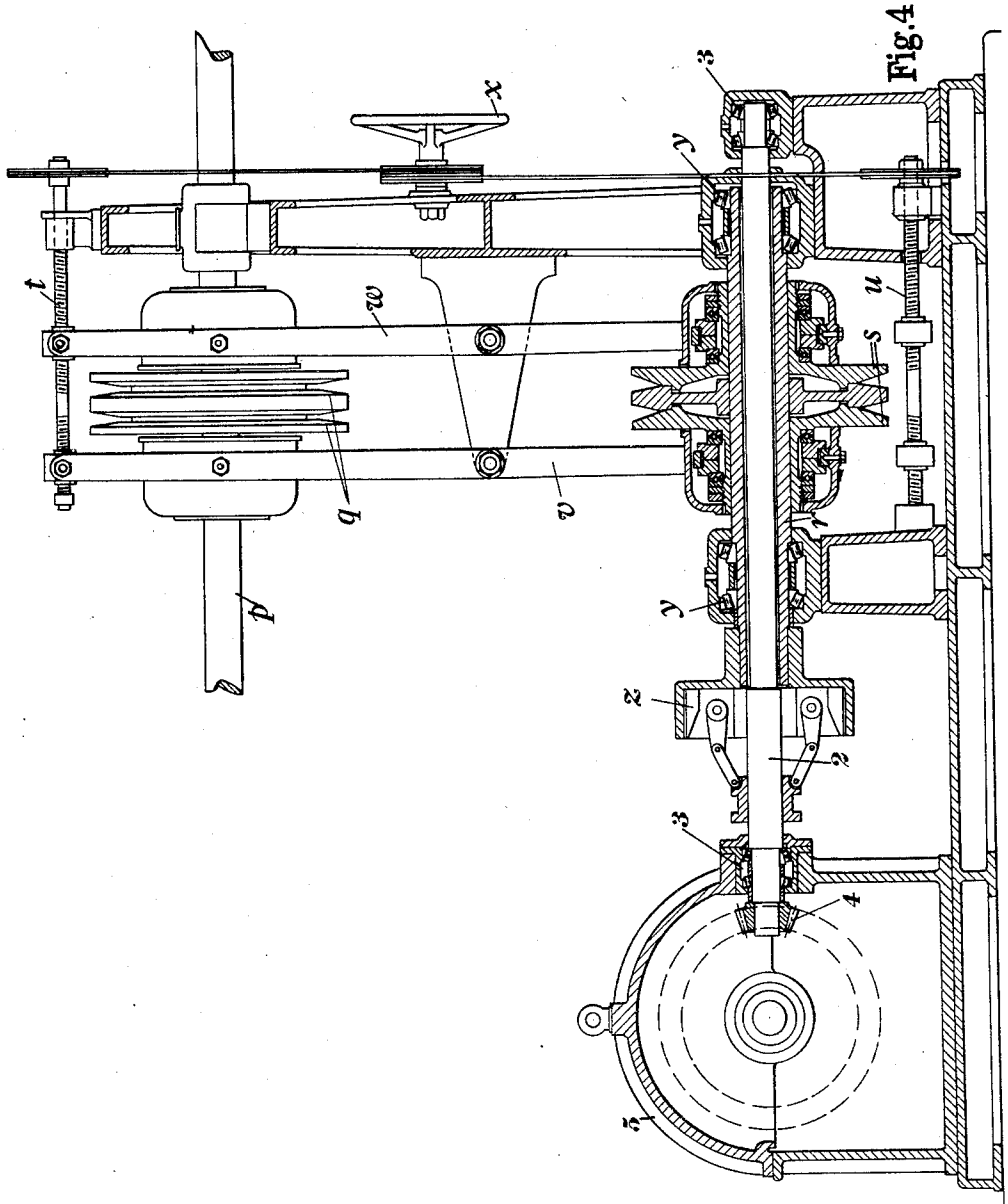
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PAPER MAKING MACHINE

Filed Oct. 3, 1930 3 Sheets-Sheet 3

Fig. 4



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1,859,838

UNITED STATES PATENT OFFICE

THOMAS DOWNHAM NUTTALL, OF BURY, ENGLAND, ASSIGNOR TO BENTLEY & JACKSON LIMITED, OF BURY, ENGLAND, A BRITISH COMPANY

PAPER MAKING MACHINE

Application filed October 3, 1930, Serial No. 486,222, and in Great Britain November 6, 1929.

This invention relates to paper making machines and more particularly to the driving arrangements thereof. In order to accommodate the drives to the individual sections of the machine to suit the extension or contraction of the paper web in the course of manufacture, the speed of the said drives between the couch rolls and the driving roll of the final calender must be varied. The drive to the latter may be from 10 to 15 per cent faster than the drive to the bottom couch roll, but the drives to all the sections are preferably derived from a single line shaft. It is found in practice a complicated matter to obtain satisfactory variable speed driving means for the individual sections which can give the desired speed variations.

The object of my present invention is to provide an improved simple and compact driving arrangement for a paper making machine, such arrangement also adapting itself to economical manufacture.

In accordance with my invention, the in-driving shafts of the different sections of the machine are adapted to rotate at an approximately uniform speed, and the rolls driven thereby are varied in diameter or suitably geared as to give the required surface speed at each section of the machine to the paper web passing through. Such diameters and surface speeds are determined by the known characteristics of the class of paper to be produced on the machine. As the in-driving shafts are rotated at uniform speeds from a common line shaft, the driving means to the various sections can be similar in character and in most sections can be duplicates one of the other, so that the drives are interchangeable. In some sections, however, such as the drying cylinder section, the drive may require to be stronger than in the other sections.

Owing to various causes, such as temperature variations, changes in the stock, condition of the wet felts, and the like, well known in the art, it is necessary to provide for small differences of speeds between the in-driving shafts of the machine sections. This is preferably effected by means of a V belt drive on and adjustable V-grooved pulley or pulleys for each section, but can be done by flat belts on conical pulleys, or flat belts or ordinary ropes on expanding pulleys.

Referring to the three accompanying sheets of explanatory drawings:—

Figure 1 (Sheet 1) and Figure 1*a* (Sheet 2) taken together constitute an elevation of a paper making machine making newsprint constructed in accordance with my invention.

Figure 2 (Sheet 1) and Figure 2*a* (Sheet 2) taken together constitute a plan view of the driving side of the machine shown in Figures 1 and 1*a*.

Figure 3 shows the drive to the drying cylinders.

Figure 4 is a detail view, partly in section, of one of the similar driving units for a section of the complete machine.

The same reference letters in the different views indicate the same parts.

In the drawings, *a* indicates the lower couch roll, *b* the lower of the first press rolls, *c* the lower of the second press rolls, *d* the lower of the third press rolls, *e* the cylinders of the first drying section, *f* the cylinders of the second drying section, and *g* the lower calender roll or bowl. A separate drive is provided to each of the sections *a*, *b*, *c*, *d*, *e*, *f* and *g* of the machine and the respective in-driving shafts *h*, *i*, *j*, *k*, *m*, *n* and *o* of such sections are adapted to be rotated at a substantially uniform rate. This is effected by making the driven rolls, such as *c*, *d* and *g* of a diameter to give a predetermined surface speed for any particular speed of the in-driving shaft to which it is directly connected or by interposing a gear drive between the in-driving shaft and the roll or cylinder it drives. It will be seen that the couch roll *a*, the first press roll *b* and the drying sections *e* and *f* are driven through gearing, but I may drive the rolls *a* and *b* directly by their shafts *h* and *i* and obtain the desired surface speed of the rolls by a variation in their diameter.

As all the shafts *g* to *o* are to be rotated at a substantially uniform speed, the driving units can be substantially similar. The main driving shaft *p* from which all the sections are driven is placed overhead and has

thereon at positions opposite to each section of the machine to be driven from such shaft, one or more V-grooved pulleys q of the type in which the V can be made wider or narrower to alter the ratio of the drive. The driven shaft r of each section has a similar arrangement of V-grooved pulleys s thereon and the means comprising the inter-connected screws t, u and the levers v, w operated by such screws for adjusting the axially displaceable parts of the pulleys on the two shafts p and r, are operated by the hand wheel x so that as the V grooves in the driving pulleys q are increased in width the V-grooves in the driven pulleys s are correspondingly reduced. Preferably each V-belt drive consists of a central fixed part co-operating with two longitudinally movable parts one at each side, the adjacent faces of the fixed and moving parts being tapered to form the V-grooves. The shaft r carrying the driven pulleys is hollow and mounted in suitable bearings y. At one end it carries a part of a clutch z, the other part of which is carried by a shaft 2 passing through the hollow shaft and supported in suitable bearings 3, 3 independent of the hollow shaft r. One end of the shaft 2 carries a wheel or pinion 4 driving a suitable speed reduction unit 5 from which the in-driving shaft of the section is rotated. The speed reduction gear 5 and the hollow driven shaft r with the clutch driven central shaft 2, form separate units which can be duplicated for the drives to most of the sections of the machine. Also the V pulleys q and s on the driving and driven shafts are equal in diameter and similar in construction. By this means, I am enabled to reduce the cost of manufacture, for the individual parts and also the units or assemblies in the various drives can for the most part be duplicated and made interchangeable.

According to the power requirements of the various sections of the machine, I increase or decrease the number of V belts in the drive to the sections. Thus the couch roll a has three double V-belt drives thereto; the 1st, 2nd and 3rd press roll s have two double V belt drives and the drying sections and the calender bowl have four double V-belt drives.

It will be understood that the main driving shaft p can be rotated by its motor 6 at varying speeds in order to increase or decrease the speed of the entire machine, but the speeds of the in-driving shafts g to o whilst they are thereby varied, nevertheless retain their various speed relations one to another.

It will be seen that in accordance with my invention, all the in-driving shafts g to e to the respective sections of the paper making machine rotate at a practically uniform speed and that the substantial variations required in each section of the machine to deal with the elongation or contraction of the paper web are provided for by suitably proportioning the driving roll or rolls of such sections, where such are directly driven, or the gear to the roll or cylinder, where the drive is indirect.

If desired, the main driving shaft p may be placed below or on the floor level of the machine instead of overhead as before indicated.

By increasing the number of ropes and pulleys in any one drive as before referred to, sectional drives of any required power may be obtained and a standard diameter of V belt pulley adopted for all sizes of paper making machines driven in this manner, the varying factors being the strength of the driving shaft p and clutches z and the strength and ratio of the reduction gearing 5.

My improved arrangement provides for easy access to the working parts at the back of the machine whilst occupying less space than the driving arrangements at present usual. Economy in building costs is thus ensured.

What I claim is:—

1. In a paper making machine, a main driving shaft, a plurality of indriving shafts driven by said driving shaft, rotary elements driven by said indriving shafts and having their respective peripheral speeds determined by appropriate selection of their diameter or by gearing between them and their respective indriving shafts, and independently variable V-belt or like speed varying means for transmitting the drive from said main shaft to said indriving shafts.

2. In a paper making machine, a plurality of sections having rotary cylindrical members the peripheral speeds of which are approximately determined by selection of their diameters or by provision of suitable gearing, indriving shafts for separately driving said sections, a main shaft, and independently adjustable speed varying means for transmitting power from said main shaft to said indriving shafts.

3. In a paper machine, a main shaft, a plurality of indriving shafts, independently controllable speed varying means and speed reduction gear for transmitting motion from said main shaft to said indriving shafts, and rotary paper-making elements driven from said indriving shafts, each of said elements being of such a diameter, or so geared to the respective indriving shaft, as to cause the element to rotate at approximately the desired peripheral speed.

In testimony whereof I have signed my name to this specification.

THOMAS DOWNHAM NUTTALL.