3 Sheets—Sheet 1.

W. J. INGRAM.

ROTARY PRINTING MACHINES.

No. 194,152. Patented Aug. 14, 1877.

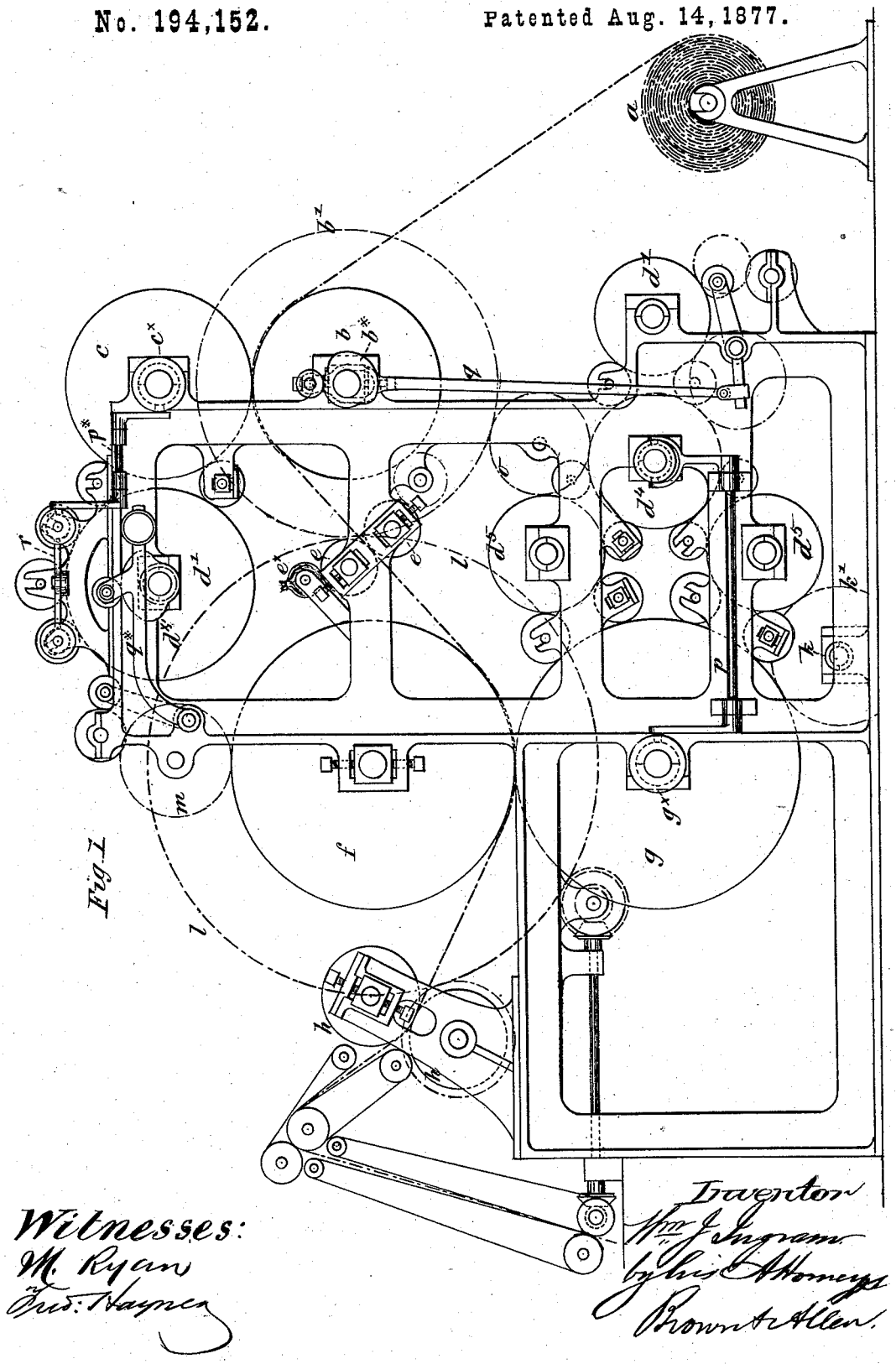

Fig 1

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3 Sheets—Sheet 2.

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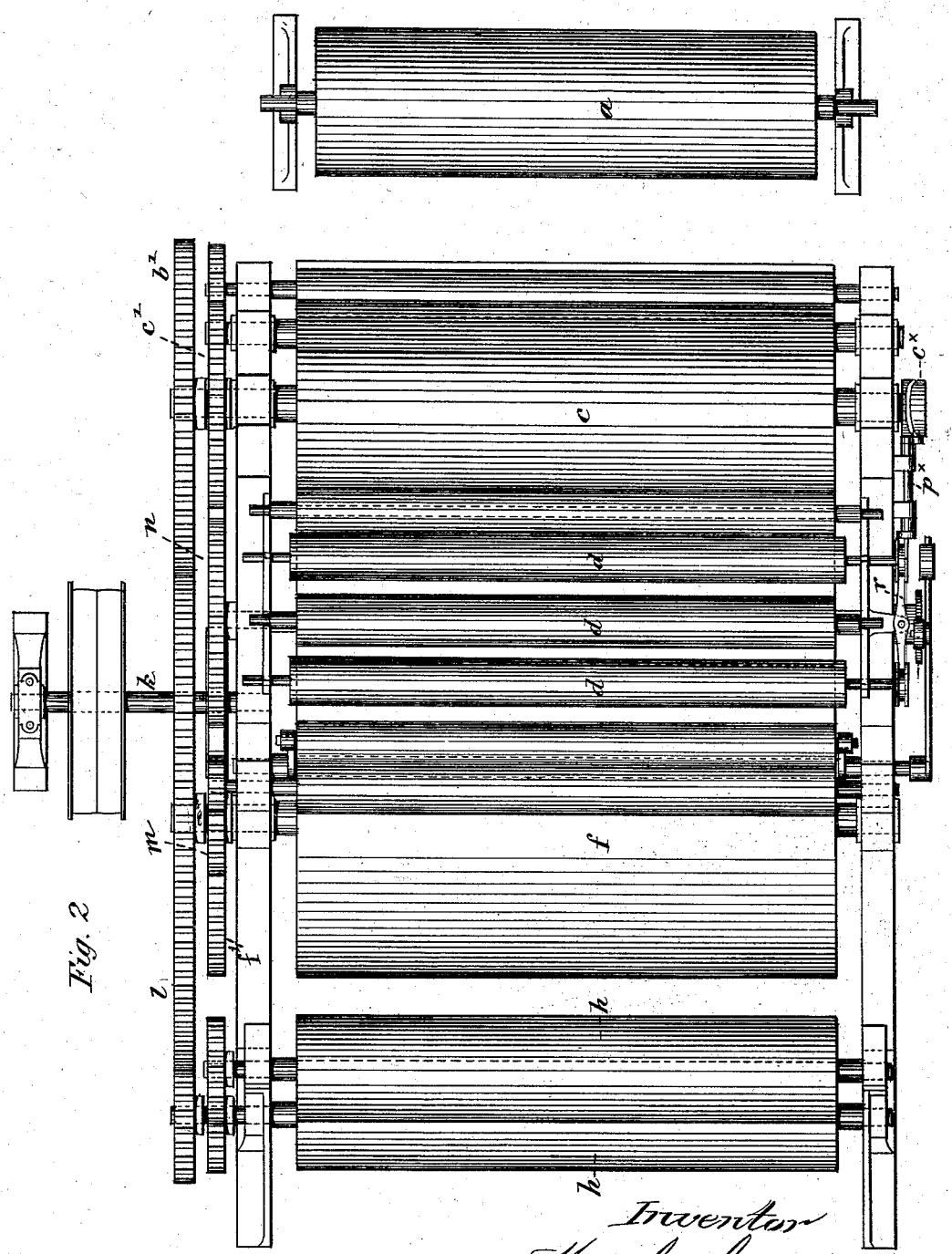

Fig. 2

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3 Sheets—Sheet 3.

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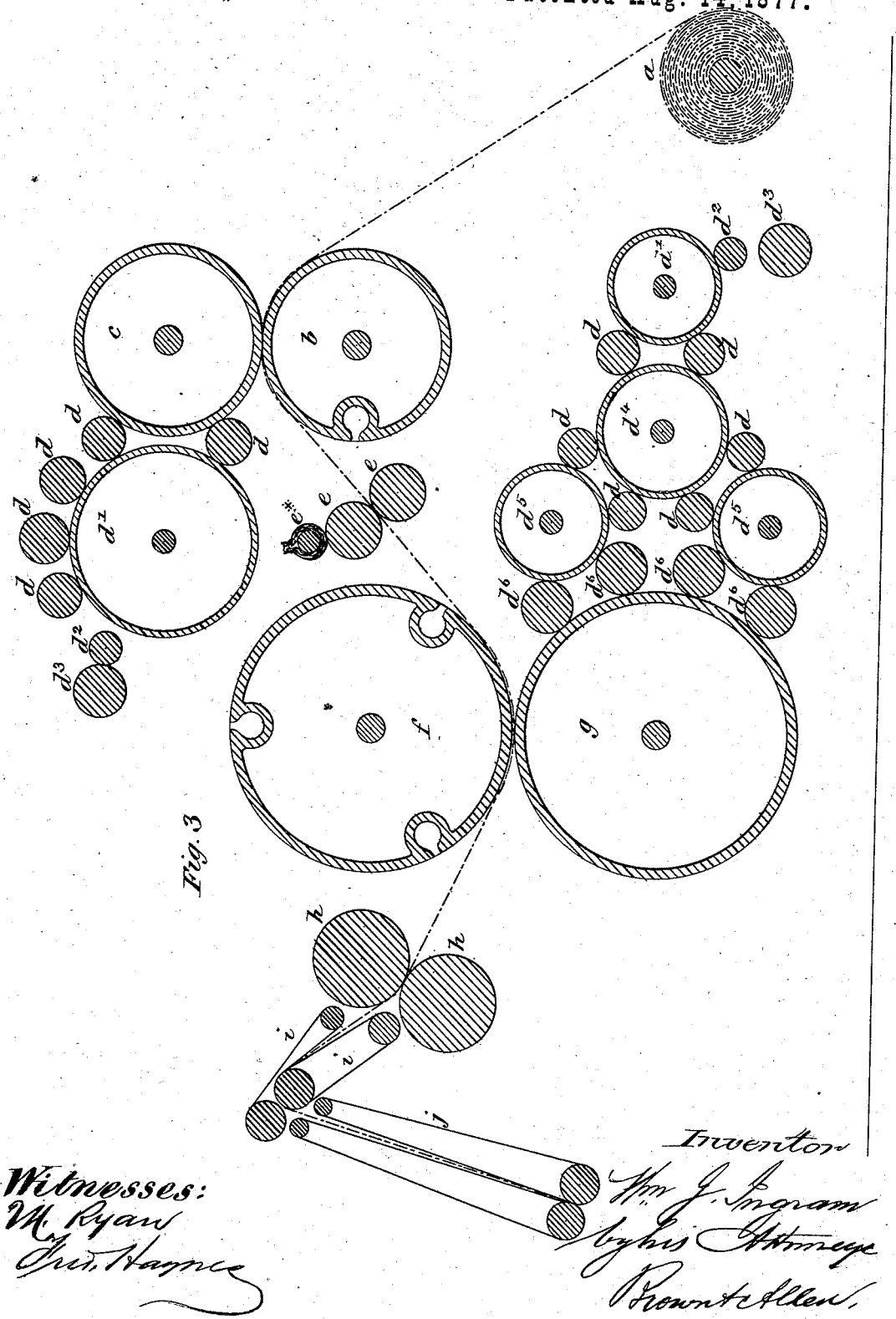

Fig. 3

Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM JAMES INGRAM, OF WESTMINSTER, ENGLAND.

IMPROVEMENT IN ROTARY PRINTING-MACHINES.

Specification forming part of Letters Patent No. **194,152**, dated August 14, 1877; application filed November 14, 1876; patented in England, April 14, 1875, for fourteen years.

To all whom it may concern:

Be it known that I, WILLIAM JAMES INGRAM, of the Strand, in the city of Westminster, England, have invented certain Improvements in Rotary Printing-Machines, of which the following is a specification:

The main object of my invention is to print in a better and more rapid manner than heretofore from curved surfaces in which "cuts" or illustrations are combined with the letter-press.

It has feen found in practice that cuts or engravings require much more careful inking than the letter-press, and that the ordinary inking arrangements, which are found to answer very well for printing letter-press, will give but very imperfect work from engravings or cuts.

It has also been well-nigh impossible to obtain satisfactory impressions from cuts or engraved plates bent to the sharp curve required to correspond to printing-cylinders of the ordinary size.

In order to overcome these difficulties I considerably increase the diameter of the printing-cylinder to which the cuts or engraved plates are to be adapted, so that the curves to which these cuts or engraved plates are bent may be gentler and of longer radius than the curved surface of the other printing-cylinder.

By this means I am also enabled to place on the same printing-cylinder two, three, or more copies of the cuts or engravings, so that while the surface-speed of the large and small printing-cylinders is the same, the small cylinder, if it contains only one set of stereotype-plates for the letter-press, will rotate two, three, or more times for every revolution of the large cylinder. The impression-cylinder, which acts in conjunction with the large printing-cylinder, is also correspondingly increased in size, and rotates at the same surface-speed.

If desired, the type-cylinder may be increased in size, so as to be capable of receiving a duplicate set of stereotype-plates for the letter-press, while the large cylinder will have a triplicate or other suitable number of sets of cuts for the engravings. The large printing-cylinder will therefore perform two-thirds (or less) of a revolution while the smaller or type-cylinder is making one complete revolution.

My invention also consists in the combination, with the two printing-cylinders, of pressing-rollers for the purpose of pressing and smoothing the paper after it has received the impression from the letter-press printing-cylinder, and before it passes to the cut or engraved-plate cylinder.

My improvements are particularly adapted to the continuous web-press, in which the paper to be printed is drawn from a long roller, and, after being printed, is divided or cut up into sheets by means of a cutting apparatus, and the sheets are then folded ready for sale or distribution.

In the accompanying drawings, Figure 1, Sheet 1, is a side elevation of a printing-machine constructed according to my improvements for printing an illustrated paper or book from a continuous web of paper. Fig. 2, Sheet 2, is a plan of the same; and Fig. 3, Sheet 3, is a sectional view or diagram, showing the position of the printing and impression cylinders, the inking and distributing rollers and their appendages, the frame-work and driving-gear of the machine being removed in order to simplify the drawing and avoid confusion.

The continuous web of paper is wound on a roller, *a*, and is led from thence to the first impression-cylinder *b*, which is of the ordinary construction, and carries the paper forward to receive the first impression on one side of the paper from the type-cylinder *c*, which receives its ink from a set of inking-rollers, *d d d d*, arranged round a large distributing-cylinder, d^1, which is supplied with ink by the vibrating carrying-roller d^2 from the ductor or fountain-roller d^3. Some of these rollers have an endwise motion given to them for the purpose of more evenly distributing the ink on the cylinder d^1, as is well known.

All this is the ordinary arrangement or construction of parts connected with the inking apparatus in printing-machines of this class, except that in the drawing the type-cylinder *c* and the impression-cylinder *b* are represented as being made large enough in circumference to receive and act upon two sets or duplicates

of the stereotype-plates, so that, at every complete revolution of the cylinders *b* and *c*, two duplicate impressions will be produced on the continuous sheet.

The paper having received its two impressions on one side from the type-cylinder *c*, is carried forward and passes between a pair of pressing-rollers, *e e*, to the second impression-cylinder *f*, which is so adjusted in position relatively to the other impression-cylinder *b* that the impression to be given by the impression-cylinder *f* and printing-cylinder *g* on the other side of the paper shall accurately register with that which has just been given from the printing-cylinders *b* and *c*.

The same surface-speed is given to the pressing-rollers *e e* as to the printing-rollers *b* and *c*, and consequently to the paper. The function of these rollers (the lower of which may be made of paper, and the upper one of iron or other metal) is to press the paper and flatten down the projecting marks produced by the type, so that there shall be a fair, smooth, and even surface on the other side of the paper to receive the impression of the cuts mounted on the large printing-cylinder *g*. The pressing-rollers *e e* not only smooth the paper by flattening down the indentations caused by the type or printing surface of the cylinder *c*, but the upper pressing-roller, as the printed paper passes in contact therewith, takes up the superfluous ink from the printed surface and prevents it from setting off on the blankets of the large impression-cylinder *f*. The ink thus taken up by the top pressing-roller *e* is removed from its surface by the cylindrical bar or pad *e**, the surface of which is covered with unwashed wool—that is, wool in the state in which it comes from the sheep's back, because in this state it contains just the right quantity of grease. This bar *e** is stationary, and therefore the surface of the roller *e*, as it rotates, rubs against it; but it is capable of being moved round on its axis from time to time, so as to present a fresh surface to the roller *e*. The circumference of the cylinders *b* and *c* is one-third smaller than that of the other two printing-cylinders *f* and *g*. The cylinder *g* is therefore calculated to receive a triplicate set of cuts, while the type-cylinder *c* would only receive a duplicate set of stereotype-plates for the letter-press.

It will be evident, therefore, that whereas every complete revolution of the printing-cylinders *b* and *c* will produce two impressions on one side of the paper, as already explained, every complete revolution of the larger printing-cylinders *f* and *g* will produce three impressions on the other side of the paper.

The arrangement just described, in which the engraved-plate or cut cylinder is made one-third larger than the type or letter press cylinder, has been found to work well in practice; but I do not intend to limit myself to these precise proportions, as in some cases it might be found convenient to make the cut-cylinder twice the circumference of the type-cylinder, or in some other proportion, such as five to three, the object in view and the effect obtained being in all cases precisely the same.

As, however, the cuts on the cylinder *g* will require a larger quantity of ink and more careful inking than ordinary type or the stereotype-plates on the cylinder *c*, I employ a special, peculiar, and novel arrangement of apparatus for inking the cuts or engraved plates on the cylinder *g*. This part of my invention will be best understood by referring to Fig. 3, in which d^3 is the ductor or fountain-roller, from which the ink is taken by the vibrating roller d^2 and is transferred intermittently to the large distributing-roller d^1. Two small rollers, *d d*, take the ink from d^1 and transfer it to a second large distributing-roller, d^4, to which a reciprocating endwise motion is communicated by means of suitable gearing, as shown at Fig. 1. The ink is thereby distributed evenly over the surface of the roller d^4, from which it is transferred by the four small rollers *d d d d* to two other large distributing-rollers, d^5 d^5, in contact with which four large inking-rollers, d^6 d^6 d^6 d^6, rotate, and take therefrom the ink which they transfer to the printing-surface of the large cylinder *g*. By this means I am enabled to provide the engraved surfaces on the cylinder *g* with a plentiful and uniform supply of ink, so that good impressions of the cuts may be obtained therefrom.

The paper having thus been printed on both sides, the continuous sheet is carried forward to the cutting-cylinders or rollers *h h*, which are of the ordinary construction, one being provided with a serrated cutting-edge, and the other with an elastic cushion or other equivalent device to cut against. By this means the paper will be partially divided, and in this state is conducted by the carrying tapes and rollers *i i* to the tapes and rollers *j j*, as indicated in Fig. 3. A slightly-accelerated or quicker motion is given to the rollers *j j* than to the rollers *i i*; therefore, when the paper enters between the nip of the rollers *j j*, it will be drawn forward quicker than it is delivered by the rollers *i i* above, and consequently will be completely severed in the form of separate sheets from the continuous web as it travels forward. These separate printed sheets will be delivered by the severing-rollers *j j* either to a folding apparatus, where the sheets will be properly folded ready for sale or distribution, or they will be deposited by a fly-frame on a receiving-table provided for the purpose.

The several working parts are driven by the gearing indicated by dotted lines in Fig. 1, in which *k* is the main driving-shaft, on which is mounted a toothed wheel, *k'*, which gears into another toothed wheel on the axle of, and of the same diameter as, the engraved plate-cylinder *g*. This wheel gears into another toothed wheel, *f'*, Fig. 2, (of the same size and number of teeth,) mounted on the axle of the impression-cylinder *f*.

Another toothed wheel, *l*, Figs. 1 and 2, (but of larger diameter,) on the axle of the impression-cylinder *f*, gears into and drives a wheel, *b'*, on the axle of the smaller impression-cylinder *b*. The axle of this cylinder also carries another toothed wheel, (of the same diameter as the cylinder,) which gears into a similar wheel, *c'*, of the same diameter and number of teeth on the axle of the type-cylinder *c*.

The inking mechanism for the type-cylinder *c* is driven by the wheel *m*, which is actuated by the smaller toothed wheel on the axle of the cylinder *f*, and gears into and drives a toothed wheel, *n*, on the axle of the distributing-roller d^1.

The inking apparatus for the larger or engraved-plate cylinder *g* is driven by the intermediate wheel *o*, Fig. 1, which drives a train of wheels, as indicated by dotted lines in the figure. The lower distributing-roller of the pair d^5 is, however, driven direct by the toothed wheel *k'* of the main driving-shaft *k*. The cutting-rollers *h h* and the delivery tapes and rollers *i i* and *j j* are driven by the large toothed wheel *l* on the axle of the impression-cylinder *f*, as shown in Fig. 1.

An endwise motion is imparted to the large distributing-roller d^4 of the lower inking apparatus by means of a rocking shaft, *p*, Fig. 1, which is rocked by a cam, *g**, on the end of the axle of the cylinder *g*. The vibrating motion of the carrying-roller d^2 is effected by means of a cam or eccentric, *b**, on the axle of the type-roller *b*, the motion being transmitted by the vertical rod *q* to the vibrating roller below. A similar motion is given to the vibrating roller d^2 of the upper inking apparatus by means of a cam, *d**, on the axle of the large distributing-roller d^1, which, as it rotates, lifts the weighted lever *q**, Fig. 1, and causes the roller d^2 to vibrate between the fountain-roller d^3 and the large distributing-roller d^1. An endwise reciprocating motion is imparted to the two small rollers *d d*, Figs. 1 and 2, by means of the vibrating lever *r* and the rocking shaft *p**, actuated by the cam *c**, on the end of the axle of the smaller type-cylinder *c*.

Having now described my invention of improvements in printing machinery, and having explained the manner of carrying the same into effect, I wish it to be understood that I claim—

1. The large cylinder *g*, for receiving the cuts, in combination with the smaller cylinder *c*, for receiving the type, the said cylinders being, respectively, provided with blanket-cylinders *f* and *b*, and so geared as to be driven a different number of rotations per minute, according to their respective diameters, as and for the purpose herein set forth.

2. The combination of the pressing-rollers *e e* with the printing-cylinders *c* and *g*, for the purpose of pressing and smoothing the paper after it has received the impression from the letter-press printing-cylinder, and before it passes to the cut or engraved-plate cylinder, as herein set forth.

Dated the 6th day of October, 1876.

WILLIAM JAMES INGRAM.

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