

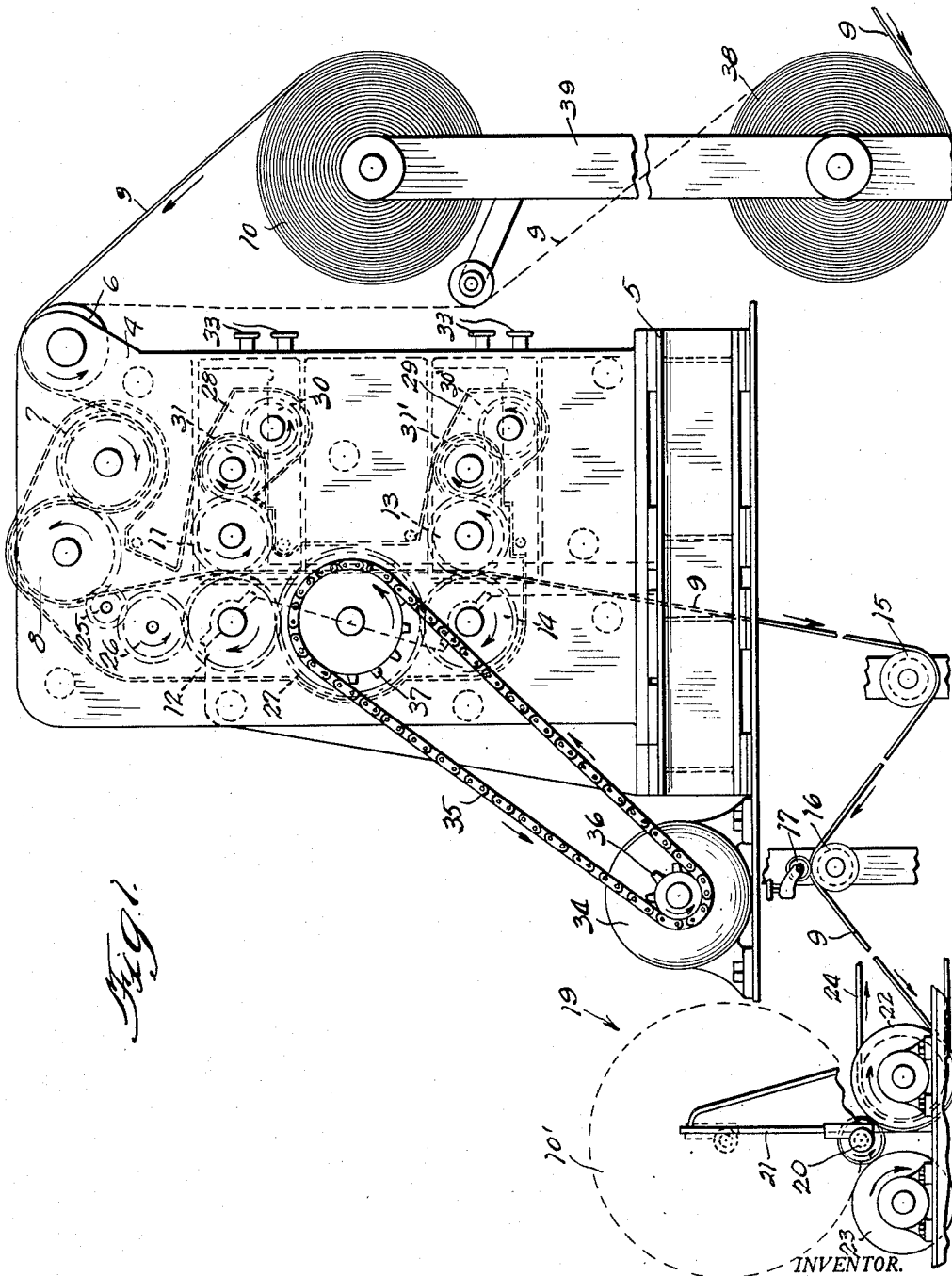
**Dec. 28, 1954**

**C. A. CARLSON**  
**APPARATUS FOR PRODUCING PLASTERBOARDS**  
**HAVING PRINTED EDGE INDICIA**

**2,697,982**

Filed March 11, 1949

3 Sheets-Sheet 1



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**BY**

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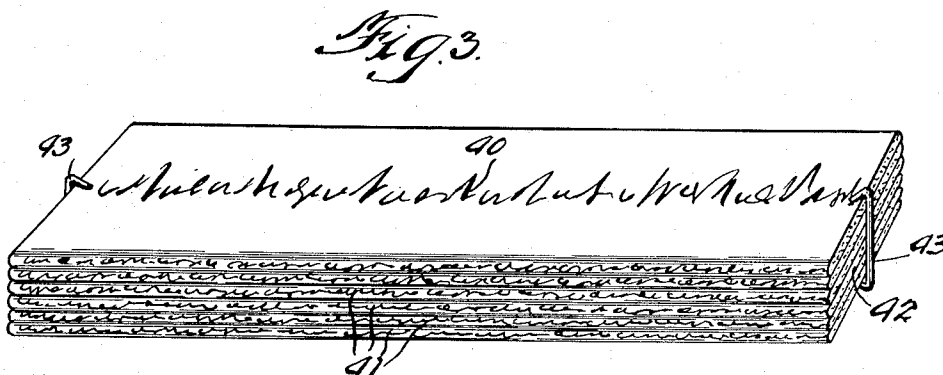
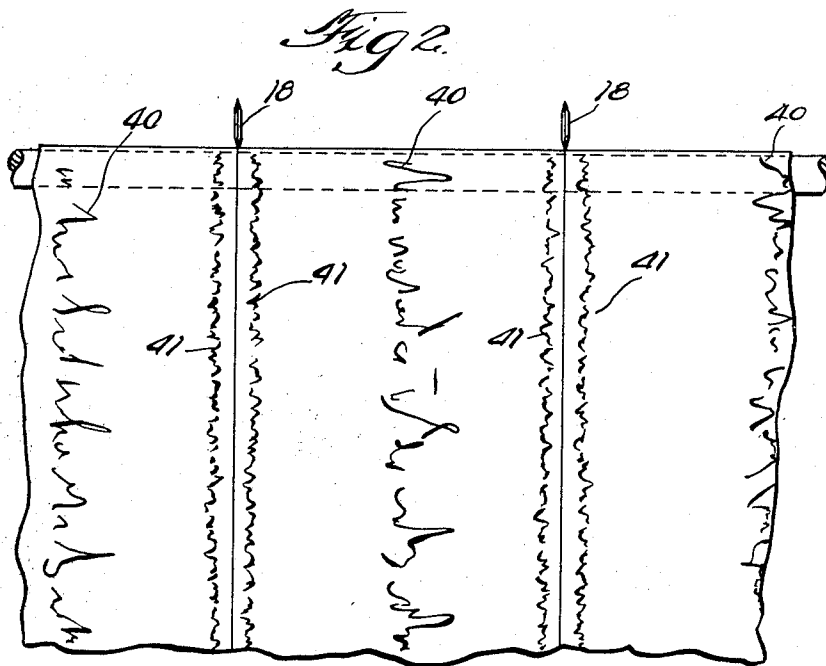
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3 Sheets-Sheet 2



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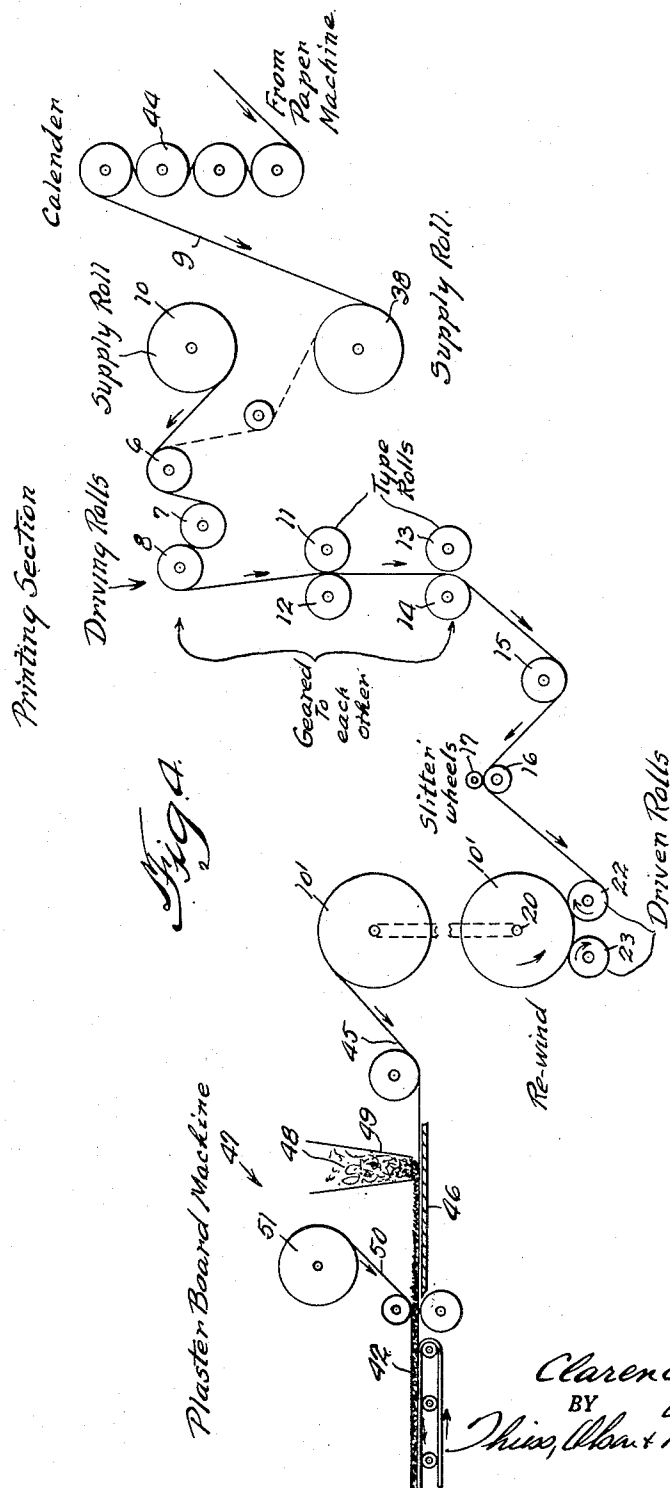
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3 Sheets-Sheet 3



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2,697,982

## APPARATUS FOR PRODUCING PLASTERBOARDS HAVING PRINTED EDGE INDICIA

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Application March 11, 1949, Serial No. 81,006

9 Claims. (Cl. 101—227)

The present invention relates to improvements in that type of printing machine in which a continuous web of material is printed upon while very rapidly traversing the printing press, and to plasterboard made from the web so printed.

The present invention is particularly concerned with a very special problem which is encountered in the manufacture of paper covered gypsum core plasterboard, and finds its chief application in that particular field.

In making such board, a continuous web of suitable heavy paper, which is practically thin cardboard, is unwound from a roll and is fed into a plasterboard machine in which a liquid slurry of calcined gypsum and water is placed upon the constantly moving web of paper.

This web is wider than the deposited mass of gypsum slurry, so that the paper can be folded upwardly and then across the mass of gypsum core material so as to form an edge therefor.

At the same time, also unwound from a continuous roll, is another sheet which is applied to what at that time is the top of the moving mass of calcined gypsum slurry so as to completely seal this core material between the two sheets of paper. The edges of the lowermost sheet are folded in such a manner that they underlie the top sheet. After the board thus formed has set, which it does after traveling about three hundred to about six hundred feet, the boards are then cut and passed through a drier. The sheet which was the bottom on the board machine is intended to be the outer or top sheet of the finished board. This is an important point to be remembered in the further discussion herein.

It has been found very desirable by the manufacturer of such plasterboards that the thin narrow edges of the board bear certain indicia which carry the trade-mark and other identifying marks whereby the product is shown to be the product of a certain manufacturer. The outside of the board, that is the one which was the bottom on the board machine, also usually carries the trade-mark, and other information such as patent markings and possibly even directions for use. As hitherto practiced, the indicia upon the face of the board were usually printed upon the finished boards after they had left the drier which therefore required a separate and rather cumbersome and expensive operation. The edge markings were applied by pasting suitably imprinted narrow strips of paper onto the edges of the boards.

The present invention obviates these difficulties by imprinting the paper which eventually forms the face and edges of the board prior to the utilization of such paper in the making of the board on the board machine. It will be appreciated that, in order to have the indicia readably visible, the printing has to be done with a high degree of accuracy as otherwise, when the paper is folded over the edge and back onto the back of the board, it would not be readably visible, because part of it might be on the back of the board, or part of it on the front of the board. In other words, accurate registry is highly important.

Another consideration which forms the proper background for the understanding and appreciation of the novelty and utility of the present invention lies in the fact that the paper cover sheets must be printed in enormous quantities, and in order to make the operation commercially economical, it has to be accomplished at extremely high speeds, for example as high as 1700 feet per minute or higher. Moreover, these cover sheets, when being printed, are about 160 inches wide, being subse-

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quently slit to the proper width to form the front and sides or edges of the plasterboard. To accomplish this printing it also must be done with inks which dry substantially instantaneously. Inks comprising oil-soluble dyes dissolved in an organic solvent, such as hydrocarbon, are suitable.

It will now be appreciated that the printing of this kind of material is surrounded by many difficulties, which it is the main object of the present invention to overcome.

Therefore, one of the primary objects of the present invention is to provide a machine for extremely rapidly printing suitable indicia on wide webs of material under conditions allowing rapid drying and immediate slitting of the webs into narrower webs, followed by the continuous rewinding thereof so that the resulting imprinted rolls can be transferred to the plasterboard making machines, and used thereon.

A further object of the present invention is to provide means for assuring accurate synchronization of the translational speed of the paper with the peripheral speed of a rotary printing cylinder so that the printed indicia will appear clear and sharp.

A further object of the present invention is to provide a machine for the simultaneous unwinding, printing, slitting, and rewinding of continuous webs of paper or the like at speeds approaching 1700 feet per minute or more.

A further object of the present invention is to provide bundles of plasterboard having clearly readable indicia on their side edges.

A further object is to provide plasterboard having readable indicia both on its face as well as its edge.

Further objects of the present invention will appear from the more complete description hereinbelow when considered in connection with the drawings filed concurrently herewith.

In the drawings:

Fig. 1 is a vertical section through the printing machine showing only such parts as are necessary for a proper understanding of its principles, all commonly used parts such as supports, gear-teeth, etc., being omitted for sake of clarity;

Fig. 2 is a plan view of a part of the printed sheets in the condition at which they arrive at the slitting mechanism which latter is diagrammatically illustrated;

Fig. 3 is a perspective side view of a bundle of plasterboards made in accordance with the present invention, and

Fig. 4 is a diagrammatical drawing showing, in side elevation, a complete system for producing the plasterboards of the present invention.

The printing machine, broadly considered, comprises means for supporting a roll of the paper to be printed, rotary printing cylinders, together with suitable ink fountains, slitting means, and a rewinding mechanism, or take-up roll, which also serves as a means for pulling the paper through the machine. The machine is also provided with actuating rolls which are driven by frictional contact with the web of paper that traverses the machine.

The machine is moreover also provided with temporary driving means which serve to feed the paper through the machine so as to initiate its operation, but which means are inactivated when the machine is actually in full operation.

Thus the machine consists of a suitable frame work 4 which supports various operating parts, this frame work being supported upon a base 5. At the upper part of the frame work 4 there are three rolls 6, 7 and 8, through which the web of paper 9, which is being unrolled from the supply roll 10, passes to form what may properly be termed an S-roll system, the paper passing first over half of roll 7 and then over half of roll 8, and thence traveling in a downward direction so as to pass between the first set of type rolls 11, and the opposed platen roll 12.

There is also provided a second set of type rolls 13 and platen rolls 14, the purpose being that two different colors can be imprinted upon the paper, for instance blue or black, for the indicia on the face, and for example red or green for the indicia that are to appear on the edge of the board.

The type consists of a rubbery material, and the construction is such that the type merely touches the paper without exerting any substantial pressure thereon, the ink, which is applied as a very fluid material, being transferred to the paper into which it sinks and thus dries almost instantly. This drying is accelerated by the fact that the paper is still warm, having been wound up into the roll 10 directly from the calender stack of the paper machine, on which it had been subjected to a temperature of about 290° F. The paper at the point of contact with the type is at least about 150° F. to 160° F.

After having passed between the two sets of printing rolls 11 and 12, and 13 and 14, the paper, after passing idle roll 15, which is seen near the bottom of the center of Fig. 1, thence passes over roll 16, and encounters rotary slitter 17.

The paper is then rewound on the take-off mechanism broadly designated as 19. This consists of a mandrel 20 the ends of which are vertically movable on supports 21, the paper 9 being wound about the mandrel 20 by means of the positively driven rolls 22 and 23, which are driven by suitable means not further illustrated, but indicated by the belt 24, although they can be directly motor driven.

The means for driving the printing machine are primarily the rolls 7 and 8, which are in the S-section, and which are geared to the printing and platen rolls by a train of gears which may comprise the gears 25 and 26 which drive suitable gears that are attached to the platen rolls 12, printing (type) rolls, etc.

Motion is also transmitted through a drivable gear 27 which transmits the motion to suitable gears attached to the other gears that form the gear-train. The platen rolls 12 and 14 are also geared to the type rolls 11 and 13 which latter two carry suitable resilient type or cuts, ink being applied to the type rolls 11 and 13 through the fountains 28 and 29 which are of the usual construction, each consisting of two rolls 30, 31, and 30', 31'. These rolls may be adjusted relative to each other and to the type rolls 11 and 13 by means of a number of control wheels, all of which bear the reference numeral 33, because they all have the same function.

In order to start up the machine when first feeding the web 9 therethrough, a motor 34 is provided which drives a chain belt 35, which engages suitable sprockets 36 on the motor shaft and sprockets 37 on the geared roll 27.

After the paper has been applied to the wind-up or take-up mechanism 19, and a few turns have been taken around the mandrel 20, the driving means for driving the rewind mechanism are brought into operation, whereafter the motor 34 is shut off and the motion of the web is effected entirely by the rewind mechanism as it gradually rewinds the now imprinted paper, eventually forming a roll of the same size as original roll 10 and indicated as 10' and shown in dotted outline at the left side of Fig. 1.

By reason of the fact that the paper, in passing over the S-section, that is to say, rolls 7 and 8, imparts motion thereto, which of course is peripherally the same as the translational speed of the paper, it will follow that, as the entire gear-train is brought into operation, the speed of the printing and platen rolls will peripherally correspond exactly with the translational speed of the paper, and therefore even though the speed of the paper should be subject to variation during the operation, the correspondence of the peripheral and translational speeds at the point of printing will always be identical, and therefore the printing will always be sharp and clear because there will be no slippage of the paper relative to the type or cuts on the type cylinders 11 and 13.

A separate roll of paper is shown as being wound upon a roll 38 at the lower right hand corner of Fig. 1, where the web 9 is shown coming from some other source, which in this case may be the paper machine upon which the paper is made.

As shown in dotted lines, the paper 9 may be unrolled from the roll 38 while a new roll 10 is being formed by being wound up from the paper machine, thus allowing rapid and almost continuous operation, the feed being taken from alternate rolls of the paper.

Referring now specifically to Fig. 2, this shows the web of paper at the point where it meets the slitters 18, at which time the paper will bear certain indicia 40 intermediate the slitters and which is intended to appear on the front surface of the finished plasterboard.

The paper 9 will also carry a plurality of closely adjacent lines of indicia 41 which are those which are in-

tended to appear upon the edges of the board. As the original web of paper 9 is slit, the slitting takes place intermediate the narrow space between indicia 41 and 41, so that the finished sheet will have one central indicia 40 and two lateral indicia 41.

When the plasterboard is finished the indicia 40 will appear on the face thereof, and the indicia 41 will appear at the narrow edges of the board. The core material is indicated in Fig. 3, which represents a finished bundle of plasterboards, by the reference numeral 42, but the exact nature of this is a matter of indifference, the main point being that the board carries readable indicia visible on the sides of the board, which is particularly important when the boards are stacked up into bundles, as is customary in the plasterboard art. It has become customary to provide bundles about 6 boards high, the boards being kept together by suitable clips 43 which engage the top and bottom boards at each end of the bundle, leaving the sides open to view. It is at these sides where the presence of the visible indicia is of course valuable because it serves as an identification of the goods of the manufacturer.

The method by which the boards are made is illustrated by Fig. 4, which shows a combination of the paper-machine, printing machine, and the plasterboard-making machine. Thus the paper 9 which is being wound up onto rolls 10 or 38 is seen as coming (from the right) from the calender stack 44 of a paper machine, which is not further shown, but which may consist of the well-known type of multicylinder machine such as is commonly used in making, say, a nine-ply cardboard web. After traversing the S-section (rolls 7 and 8) and type and platen rolls (11-12 and 13-14) of the printing machine, and having been properly slit into narrower widths of the required size by slitters 17, the paper forms the now printed roll 10'. This roll 10' becomes the source of supply for the bottom sheet 45 that is applied to the bed 46 of the plasterboard-making machine broadly designated by the reference character 47. A suitable amount of a calcined gypsum slurry 48 is applied to the paper 45 from a feeding device 49, and thereafter the upper sheet 50 is applied, this being derived from a roll 51 of paper. The plasterboard machine is shown in the merest outline, as its detailed construction is well known in the art, the essential feature of the present invention, so far as the plasterboard is concerned, being in the pre-printing of the sheet that is to form the front and sides (edges) of the final plasterboard, the printing being so definitely placed that it will appear readably on the narrow edges of the plasterboards, so as to be readable even when they are made up into a six-high bundle as illustrated in Fig. 3. The method of folding over the edges of bottom sheet 45 is exactly the same as in any standard plasterboard machine, and hence is not illustrated. (See for instance Utzman Patent 1,330,413.)

Having the paper printed substantially immediately after it has been made serves several useful purposes. Mainly, the temperature at which it arrives at the printing machine, which allows of ultra-rapid drying of the ink, and secondarily, the fact that it will not have had time to expand or undergo dimensional changes, which might interfere with the accurate register essential to the formation of a properly printed edge in the finished plasterboard.

Only sufficient parts have been shown in the figures to make an understanding of the principles of the invention possible, various details having been deliberately omitted as all these are well within the skill of the machinists art and it will be easy to construct the machine based upon the principles herein disclosed.

The exact location and orientation of the various parts is of course subject to considerable variation and the printing machine could just as well be constructed so that the various parts thereof would be at a 90° angle to that shown by the figure, but suffice it to say that a system incorporating the present invention has been constructed and is in successful use, and therefore the invention is primarily illustrated by a printing machine which resembles the actual machine as much as is possible and without more detail than is necessary for its proper understanding.

Accordingly, applicant claims:

1. A printing press for continuously printing indicia upon a taut moving web, comprising rotatably mounted cooperating type and platen rolls between which said

moving web passes, drive rolls drivingly connected to said type and platen rolls and over which said moving web passes with sufficient frictional contact to activate said drive rolls, and means for positively pulling the moving web over the drive rolls and between said type and platen rolls so as to actuate the said drive rolls; said type and platen rolls being actuated only by the frictional contact between said moving web and said drive rolls.

2. A printing press for continuously printing indicia upon a moving web, comprising cooperating type and platen rolls arranged in opposed relation and between which said moving web passes, a gear-train interconnecting said type and platen rolls, drive rolls operatively connected to said gear-train and over which said moving web passes with sufficient frictional contact to serve as the sole means for driving said drive rolls, a rotatably mounted web-rewinding mandrel, and power-actuated means cooperating with said mandrel for pulling said web through the press and effect winding of said web, subsequent to indicia being printed thereon, about said mandrel.

3. A printing press for continuously printing indicia upon a taut moving web, comprising rotatably mounted cooperating type and platen rolls between which said web passes, a gear-train interconnecting said type and platen rolls and provided with drive rolls engaged by said web and solely driven by the frictional contact of said web with said drive rolls, power-actuated means for pulling said web over said drive rolls and between said type and platen rolls, whereby the translational speed of the web and the peripheral speed of said type and platen rolls are substantially the same.

4. A machine for producing printed paper cover sheets for gypsum-core plasterboard comprising means for unwindably supporting a relatively wide roll of suitable cover-sheet paper, peripherally touching drive rolls over and between which the unrolled paper frictionally passes thereby causing them to rotate and acting as the sole source of power to do so, a set of cooperating rotatably mounted type and platen rolls between which said unrolled paper passes, a gear-train interconnecting said drive rolls and said type and platen rolls and imparting to the latter a peripheral speed substantially identical with the translational speed of the unrolled paper passing therethrough, and means for pulling the paper through the machine; said means comprising a power-actuated paper rewinding mechanism and slitting means disposed between said type and platen rolls and said rewind mechanism for slitting the relatively wide roll of paper into a plurality of relatively narrow rolls.

5. A machine for continuously printing indicia on a moving web of paper, comprising cooperating rotatably mounted type and platen rolls between which the web passes, rotatably mounted drive rolls drivingly connected to said type and platen rolls, each of said drive rolls being partially embraced and frictionally engaged by said moving web and solely actuated thereby, and power-actuated means engaging said web for positively pulling the latter past said drive rolls and between said type and platen rolls for effecting rotation of the latter as the result of the frictional contact of the web with said drive rolls.

6. A printing press for continuously printing indicia upon a moving web, comprising rotatably mounted printing rolls between which said moving web passes, rotatably mounted drive rolls drivingly connected to said

printing rolls and frictionally engaged by and actuated solely by frictional contact with said moving web, a rotatably mounted mandrel about which said moving web is wound subsequent to printing thereof, and power-actuated web-pulling means frictionally engaging said web as the latter winds about said mandrel.

7. A printing press for continuously printing indicia upon a moving web, comprising cooperating rotatably mounted type and platen rolls between which said moving web passes, rotatably mounted drive rolls drivingly connected to said type and platen rolls and frictionally engaged by and actuated solely by frictional contact with said moving web, a rotatably mounted mandrel about which said moving web is wound subsequent to passing between said type and platen rolls, and power-actuated rotatably mounted means frictionally engaging said web as the latter winds about said mandrel and effecting positive pulling of said web through the press.

8. A printing press for continuously printing indicia upon a moving web, comprising a pair of cooperating rotatably mounted type and platen rolls between which said moving web passes, rotatably mounted drive rolls drivingly connected to said type and platen rolls and frictionally engaged and partially embraced by said moving web which thus serves as the sole source of power for said drive rolls, a rotatably mounted mandrel, adjacent said type and platen rolls, and about which said moving web is wound subsequent to printing thereof, and power-actuated means frictionally engaging the periphery of said mandrel for effecting pulling of said web through said press and actuating said drive rolls at a peripheral speed substantially the same as the translational speed of said web.

9. A printing press for continuously printing indicia upon a moving web which comprises a set of rotatably mounted cooperating type and platen rolls between which said web passes to effect the transfer thereto of imprints from the type on the type roll, drive rolls drivingly connected with said type and platen rolls and driven solely by frictional contact of the web as it passes over and between said drive rolls, and means beyond said type and platen rolls for pulling said web through the press.

#### References Cited in the file of this patent

##### UNITED STATES PATENTS

| Number    | Name       | Date           |
|-----------|------------|----------------|
| 609,007   | Butler     | Aug. 16, 1898  |
| 994,590   | Jackson    | June 6, 1911   |
| 1,369,450 | Manss      | Feb. 22, 1921  |
| 1,466,000 | Sevigne    | Aug. 28, 1923  |
| 1,518,954 | Assheton   | Dec. 9, 1924   |
| 1,553,955 | Parsons    | Sept. 15, 1925 |
| 1,719,199 | Schumacher | July 2, 1929   |
| 1,744,292 | Young      | Jan. 21, 1930  |
| 1,942,168 | Hawley     | Jan. 2, 1934   |
| 1,966,191 | Strohofer  | July 10, 1934  |
| 2,021,037 | Walper     | Nov. 12, 1935  |
| 2,132,340 | Grupe      | Oct. 4, 1938   |
| 2,239,860 | Roos       | Apr. 29, 1941  |
| 2,268,594 | Huber      | Jan. 6, 1942   |
| 2,321,057 | Weiss      | June 8, 1943   |
| 2,332,296 | Brunk      | Oct. 19, 1943  |
| 2,393,514 | Bicknell   | Jan. 22, 1946  |
| 2,435,369 | Simmonds   | Feb. 3, 1948   |
| 2,528,184 | Schwayder  | Oct. 31, 1950  |