D. E. ROBERTS.

METHOD OF AND APPARATUS FOR PRODUCING PLASTER BOARDS.

APPLICATION FILED FEB. 8, 1909.

1,008,991.

Patented Nov. 14, 1911.

6 SHEETS—SHEET 1.

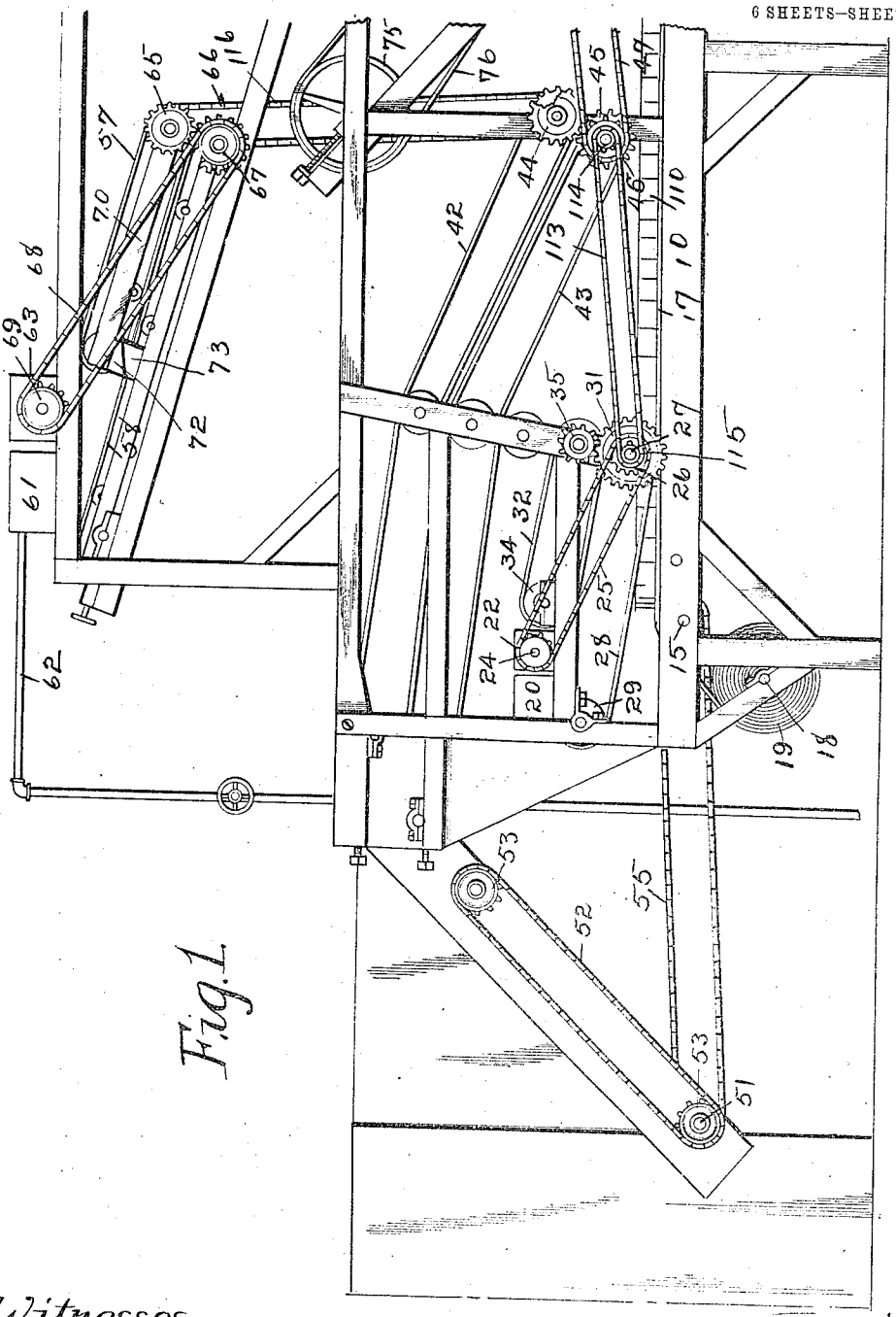

Fig. 1.

Witnesses
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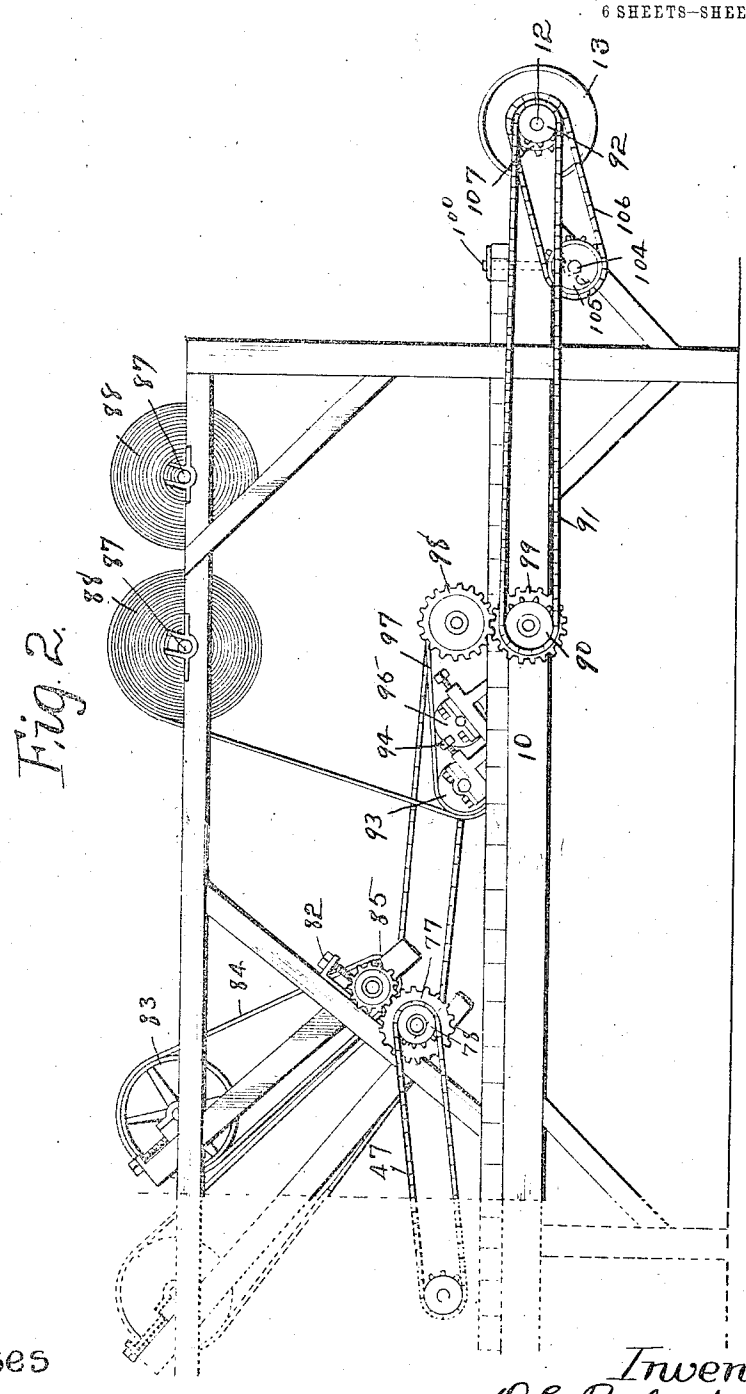

Fig. 2.

Witnesses
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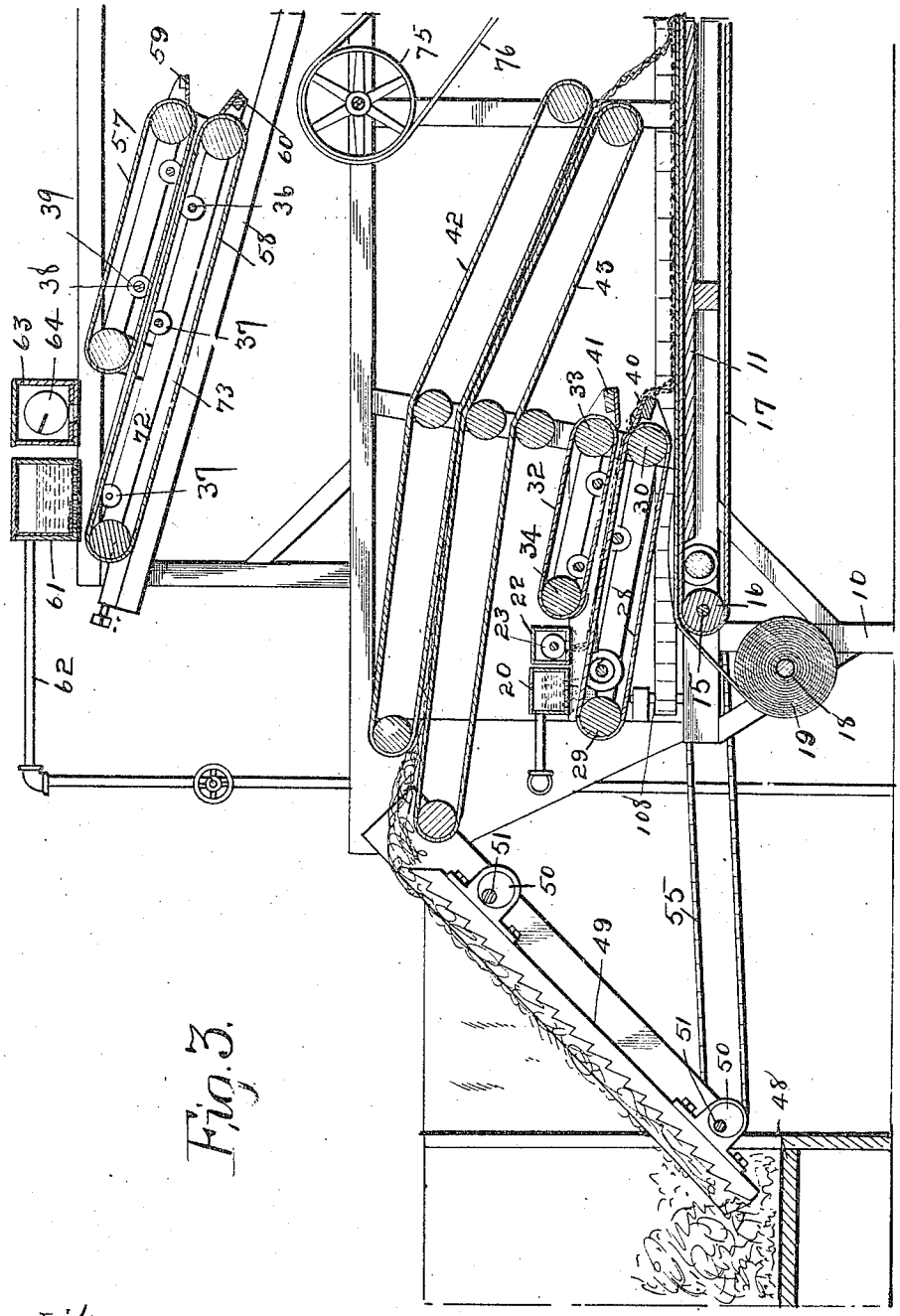

Fig. 3.

Witnesses
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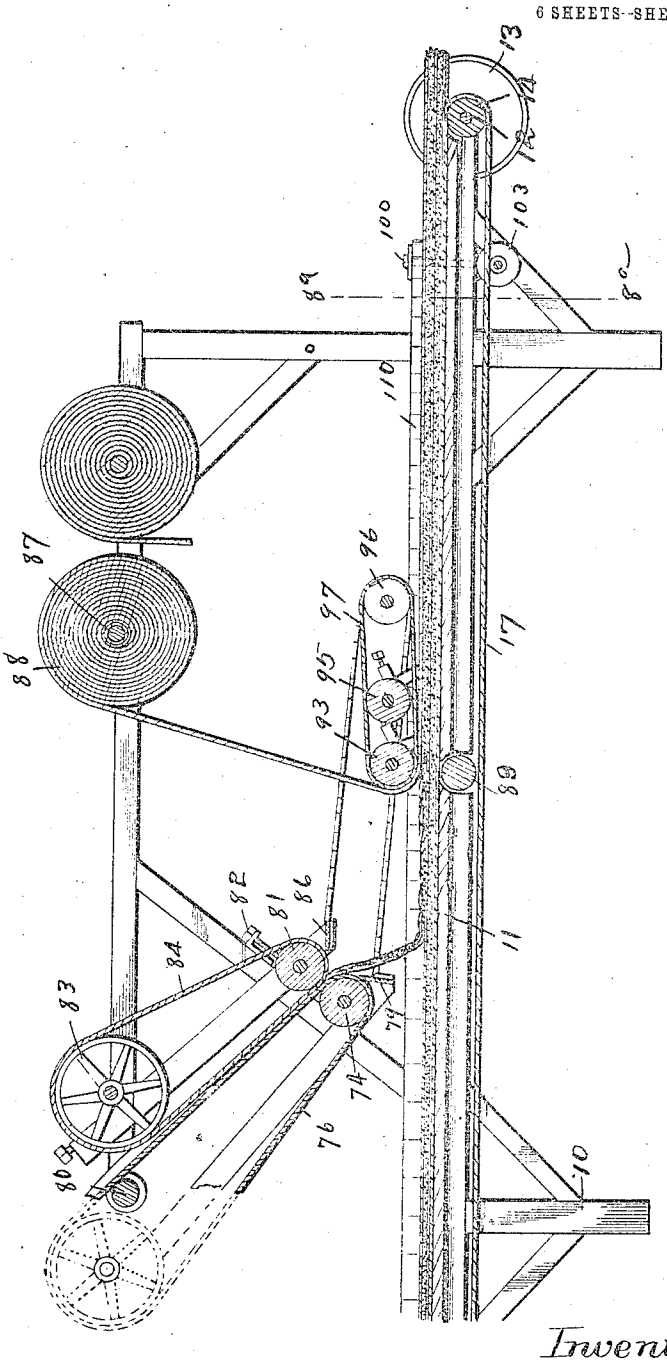

Fig. 4.

Witnesses
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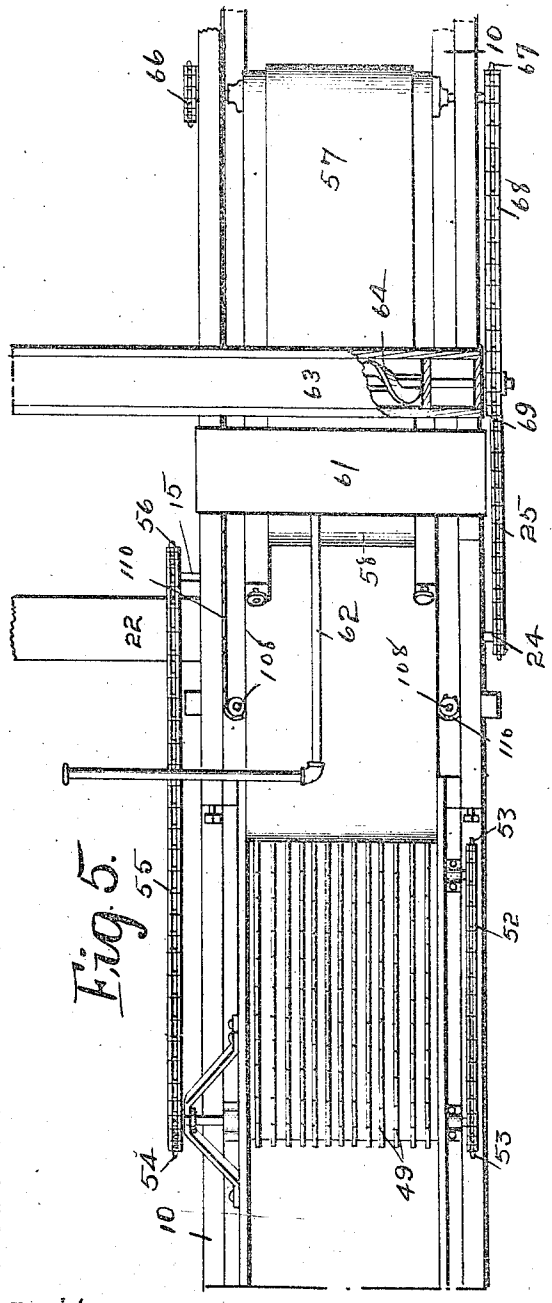

Fig. 5.

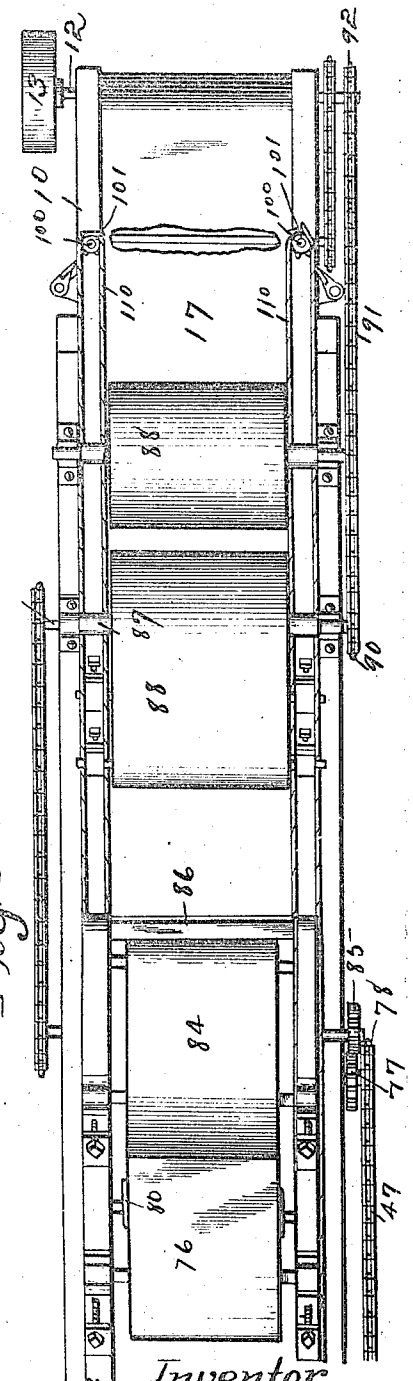

Fig. 6.

Witnesses

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1,008,991.

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6 SHEETS—SHEET 6

Fig. 9.

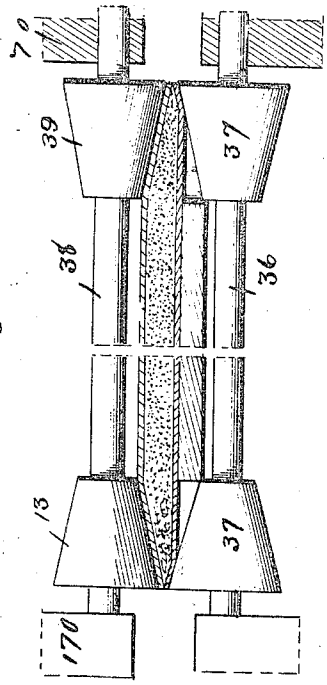


Fig. 10.

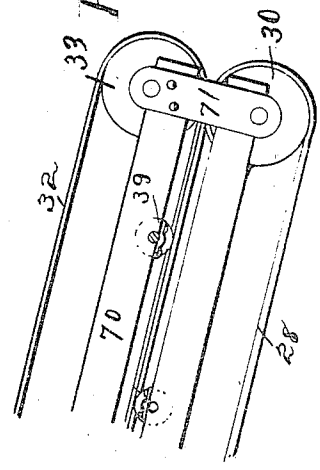


Fig. 7.

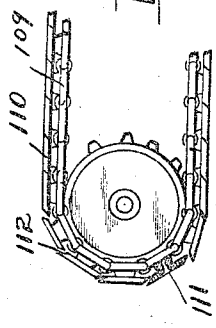
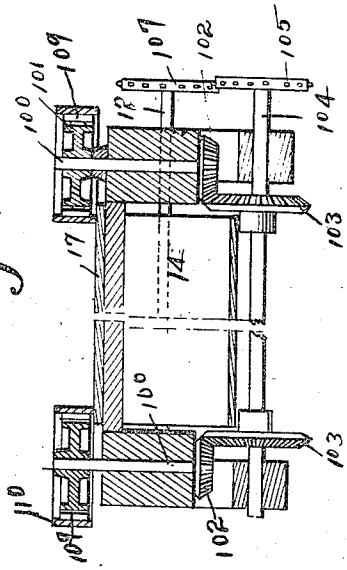


Fig. 8.



Witnesses

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UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR PRODUCING PLASTER-BOARDS.

1,008,991. Specification of Letters Patent. Patented Nov. 14, 1911.

Application filed February 8, 1909. Serial No. 476,684.

To all whom it may concern:

Be it known that I, DAVID E. ROBERTS, a citizen of the United States, residing at Fort Dodge, in the county of Webster and State of Iowa, have invented a certain new and useful Method and Apparatus for Producing Plaster-Boards, of which the following is a specification.

The object of my invention is to provide an improved method which may be practiced by continuously operated machinery, or either wholly or partially by hand, whereby a plaster board may be produced of simple and inexpensive construction that will be strong and durable in operation and will not be easily cracked or broken when being placed in position for permanent use.

My object is, further, to provide an improved machine of simple, durable and inexpensive construction whereby the above described method may be practiced and the plaster board produced by means of continuously operating mechanism which is entirely automatic in its operation.

My invention consists in the construction, arrangement and combination of the various parts of the device whereby the objects contemplated are attained as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which—

Figure 1 shows a side elevation of the receiving end of an apparatus embodying my invention. Fig. 2 shows a side elevation of the delivery end of the same machine. The dotted lines in Fig. 2 show the adjacent portions of the mechanism, which are also shown in Fig. 1, to clearly illustrate the relation and arrangement of the parts shown in said two figures. Fig. 3 shows a vertical, central, sectional view of the mechanism shown in Fig. 1. Fig. 4 shows a similar view of the part of the machine shown in Fig. 2. The dotted lines in said figure show the adjacent portion of the mechanism that is also shown in Fig. 3 to illustrate the relative arrangement of the parts. Fig. 5 shows a top or plan view of the part of the apparatus shown in Fig. 1. Fig. 6 shows a top or plan view of the part of the apparatus shown in Fig. 2. Fig. 7 shows a top or plan view of a portion of one of the edge-forming devices. Fig. 8 shows a detail, transverse, sectional view on the line 8—8 of Fig. 4 to illustrate the edge-forming devices. Fig. 9 shows an enlarged, detail, sectional view illustrating the means for holding the edges of the plaster conveying belts toward each other to prevent the plaster from moving laterally from the sides of the belts, and—Fig. 10 shows an enlarged, detail view illustrating the lower end portions of the frames of the plaster conveying belts to illustrate the means whereby the upper frame may be tilted upwardly relative to the lower frame to permit the cleaning of the adjacent surfaces of both of the conveyer belts.

Referring to the accompanying drawings, I have used the reference numeral 10 to indicate the main supporting frame of the device. Mounted on this frame is a stationary flat-topped table 11 extended substantially throughout the entire length of the frame. This table is the one on which the plaster board is formed. At the delivery end of the frame is a power shaft 12 provided with a pulley 13. Mounted on the shaft 12 is a roller 14 and arranged at the other end of the table 11 is a shaft 15 having a roller 16 thereon. An endless conveyer belt 17 is passed over these two rollers, the upper portion of which moves longitudinally over the table top and the lower portion returns under it. The foundation upon which the plaster board is formed is preferably of paper and for this purpose I provide a rotatable shaft 18 adjacent to the receiving end of the conveyer 17 and on this shaft is a roll of paper 19 which is placed on top of the conveyer 17 and which travels with the conveyer. The first material that is placed upon the paper consists of a thin layer of plaster in a comparatively wet condition so that it will easily spread out over the entire layer of paper. To feed this layer of plaster evenly and smoothly over the layer of paper, I have provided the following mechanism: The reference numeral 20 indicates a water tank extended transversely of the main frame above the receiving end of the conveyer. Adjacent to the tank 20 is a conveyer chute 22 having a screw-conveyer 23 therein. This conveyer communicates with a source of supply for plaster which, however, is not shown in the accompanying drawings. The means for operating the conveyer 23 comprise a sprocket wheel 24 on the end of the conveyer chute connected by a sprocket chain 25 with a sprocket wheel 26 on a shaft 27 mounted in the frame. The shaft 27 is driven in a manner hereinafter described.

Arranged below the water tank 20 and the conveyer chute 22 is an endless conveyer belt 28 extended around rollers 29 and 30, the said rollers 30 having on one end the sprocket wheel 26 and a large pinion 31. The bottom of the water tank is perforated so that water may flow slowly through it to the receiving end of the conveyer belt 28, and the bottom of the chute 22 is provided with a slot through which the plaster may be discharged to the top of the conveyer belt. Arranged above the upper portion of the conveyer belt 28 is a second conveyer belt 32 which is passed around the rollers 33 and 34, the latter being adjacent to the conveyer trough 22. The upper conveyer belt 33 is driven at a considerably higher speed than the lower conveyer belt 28 by means of the small pinion 35 connected therewith and in mesh with the large pinion 31 on the shaft of the lower conveyer. In order to prevent material from passing out laterally between the edges of the said conveyer belts 28 and 32, I have provided the following means, which are fully illustrated in Figs. 9 and 3. Beneath the upper portion of the belt 28 and immediately below the point where the water is discharged from the tank 20, I place a shaft 36 having on each end a cone-shaped idler roller 37 largest at its outer end. This will cause the side edges of the upper portion of the belt 28 to be elevated above the central portion of the belt so that the water will not run off the sides of the belt. A number of similar shafts with idlers thereon are placed under the upper portion of the belt below the belt 32 and, above the lower portion of the belt 32, I have arranged one or more shafts 38 with cone-shaped idlers 39 at their ends designed to press the side edges of the lower portion of the belt 32 downwardly and toward the belt 28 so that the edges of the belts are thereby held toward each other to thereby prevent the plaster from passing outwardly between the edges of the belts. It is to be understood in this connection that the upper belt 32 is arranged to run somewhat faster than the lower belt 28 and to compress the material passing between the belts. Therefore, the plaster will be smoothly and evenly distributed throughout the entire surfaces of the belts but will not be permitted to pass out beyond the sides of the belts. In order to prevent the plaster from adhering to the belts, I provide a stationary scraper 40 for the lower belt 28 and a similar scraper 41 for the upper belt 32, hence the material after passing between the belts will be delivered on top of the paper 19 that is traveling along the table top 11 on the belt 17.

The next step in the operation of the machine is the delivering on top of the layer of plaster of a layer of fibrous material such, for instance, as hemp. To continuously deliver an even layer of fibrous material on top of the first layer of plaster, I have provided the following mechanism: Mounted on suitable rollers connected to the machine frame are two endless conveyer belts 42 and 43, the lower portion of the belt 42 being arranged to run close to the upper portion of the belt 43. These belts are arranged to run at the same speed and the rollers at the lower ends thereof are connected with each other by the pinions 44 and 45, the latter pinion being driven by means of a sprocket wheel 46 and chain 47, which chain is driven in a manner to be hereinafter described.

Arranged adjacent to the front of the machine is a table 48 and arranged adjacent to one end of this table is a series of toothed feeder bars 49 arranged parallel with each other and inclined upwardly and toward the belt 43. Each feeder bar is provided with two eccentrics 50 mounted on shafts 51 which shafts are connected by means of the sprocket chain 52 and sprocket wheels 53 to run in unison. The arrangement of the eccentrics on the shafts is such that the alternate feeder bars move in opposite directions. The lower ends of said feeder bars are adjacent to the end of the table 48 and the upper ends are arranged to discharge on top of the conveyer belt 43. I provide for driving the lower shaft 51 by means of a sprocket wheel 54 placed on one end thereof and connected by a sprocket chain 55 with a sprocket wheel 56 which sprocket wheel is mounted upon the shaft 15 of the main conveyer belt 17. In operation with this fiber-feeding device, a large quantity of the fiber is placed upon the table top 48 and the operator feeds it toward the feeder bars 49. When they engage it, it is carried by them upwardly and is evenly distributed throughout the entire surface of the feeder bars so that, when delivered between the belts 42 and 43, there will be an even and uniform layer of the fiber and this layer is then discharged by the belts 42 and 43 on top of the layer of plaster on the paper 19.

The next step in the operation of the machine is the depositing of a second layer of plaster preferably thicker than the first on top of the layer of fiber. For this purpose, I have provided the following mechanism: Mounted in the frame 10 above the conveyer belt 42 are two conveyer belts 57 and 58 similar to the belts 32 and 28 before described. These conveyer belts are also provided with idlers similar to the idlers 37 and 39 before described in connection with the belts 32 and 28. They are also provided with scrapers 59 and 60 similar to the scrapers 41 and 40. Above the conveyer belt 48 is a water supply tank 61 communicating with a supply pipe 62 and having openings therein to discharge on top of the conveyer belt 58

and adjacent to it is a conveyer chute 63 having a conveyer 64 therein arranged to discharge plaster downwardly on top of the belt 58. It is intended that the layer of plaster delivered by the belts 57 and 58 be somewhat thicker and in a less moist condition than the layer delivered by the belts 32 and 28 and it is therefore necessary that the material be thoroughly worked and evenly distributed. For this reason, I have provided gearing devices at the ends of the rollers over which the belts 57 and 58 pass, which gearing devices comprise the pinions 65 and 66, both of the same size, and the lower roller to which the pinion 66 is attached is also provided with a sprocket wheel 67 connected by a sprocket chain 68 with a sprocket wheel 69 on the end of the shaft of the conveyer 64. The upper conveyer 57 is mounted upon a frame 70 which frame, as clearly shown in Fig. 10 of the drawings, is supported at its lower end by means of links 71 pivoted to the shafts of the adjacent rollers. The upper end of the frame 70 is provided with a block 72 having its lower face inclined downwardly and away from the delivery end of the conveyers. This block 72 rests upon a mating inclined block 73 on the main frame. By this arrangement, the upper conveyer will be held by gravity downwardly and toward the lower conveyer and whenever desired the upper conveyer may be elevated away from the lower one with the links 71 serving as pivots, so that access may be had to the adjacent surfaces of the conveyer belts. The said belts 57 and 58 will deliver the material in a comparatively smooth and uniform manner from the delivery ends thereof.

Below the delivery ends of the belts 57 and 58 are two additional belts for smoothing and flattening out the layer of plaster. The lower belt is supported upon the lower roller 74 and an upper roller or pulley 75 and the belt 76 passes around them. Said lower roller 74 is provided with a large pinion 77 and a sprocket wheel 78 to which the chain 47 before described is connected. A scraper blade 79 is provided for the belt 76 and an auxiliary roller 80 is placed under the upper portion of the belt 76 at the point where the material is discharged to said belt from the belts 57 and 58. Above the roller 74 is a roller 81 vertically adjustable relative to the roller 74 by means of the set-screws 82 so that said rollers may be adjusted to any proper distance relative to each other. Adjacent to the said roller 80 is a roller or pulley 83 and a belt 84 is passed around the rollers 83 and 81. The shaft of the roller 81 is provided with a small pinion 85 meshed with the pinion 71 so that the upper belt 84 is driven at a greater speed than the lower belt 76. A scraper 86 is provided for the belt 84. By this arrangement it is obvious that the material, after being first flattened out and evenly distributed by the belts 57 and 58, will then be discharged between the belts 76 and 84 and will be further compressed and flattened out and smoothed by said belts and delivered in an even and smooth layer on top of the layer of fiber. By having the upper belt 84 rotated at a greater speed than the belt 76, the said belt 84 will be prevented from adhering to the plaster and it will have a troweling effect on the plaster.

The next step in the operation of the machine is the placing of a layer or web of material such as burlap on the top of the upper layer of plaster. For this purpose, I provide a shaft 87 on the machine frame and on this shaft is a roll 88 of material such as burlap. The end of the roll of burlap is then extended downwardly on top of the layer of plaster. In the drawings, I have shown a second roll of burlap in position to be used when the first roll is exhausted.

In order to firmly press all of the layers together and make a smooth and uniform plaster board, I provide, in the table top 11, a roller 89 connected by a sprocket gearing with the power shaft 12. This gearing comprises a sprocket wheel 90 on the roller shaft, a sprocket chain 91 connected with it, and a sprocket wheel 92 on the power shaft 12 also connected with the sprocket chain 91. This roller extends upwardly through the table top to engage the under surface of the plaster board. Above the roller 89 is a roller 93 mounted in an adjustable bearing provided with an adjusting screw 94. Adjacent to the roller 93 is a similar roller 95 also provided with an adjustable bearing. Adjacent to the roller 95 is a third roller 96 which roller is normally supported in a plane slightly higher than that of the roller 93 and passed around the rollers 93 and 96 is an endless belt 97. I provide for driving the rollers by means of a pinion 98 on the shaft of the roller 96 which pinion is in mesh with a pinion 99 on the shaft 89. The layer of burlap extends under the belt 97 and as the plaster board passes between the rollers 89 and 93 it obviously will be smoothed and made of regular and uniform thickness throughout its entire width and the various layers will be firmly compressed. This operation will force some of the plaster up through the layer of burlap and, in order to prevent the belt 97 from adhering to the plaster that extends up through the layer of burlap, I elevate the rear end portion of the belt 97 in the manner clearly shown in Fig. 4 so that said belt gradually detaches itself from the layer of burlap and the plaster board is thereby prevented from adhering to the belt 97.

In order to hold the various layers of

the plaster board accurately centered over the main conveyer belt 17 and in order to prevent any of the material of the plaster board from moving out beyond the sides of the conveyer belt 17 and for the purpose of making a plaster board of exactly uniform width throughout, I have provided edge-forming devices as follows: A similar edge-forming device is arranged on each side of the conveyer belt 17 and hence only one will be hereinafter fully described. Adjacent to the delivery end of the table 11 is a vertical shaft 100 having a sprocket wheel 101 fixed to its upper end. On its lower end is a beveled gear wheel 102 in mesh with a beveled gear wheel 103 on a shaft 104, which shaft is provided with a sprocket wheel 105 connected by a sprocket chain 106 with a sprocket wheel 107 on the power shaft 12. By this arrangement, the sprocket wheel 101 is made to rotate, during the operation of the machine, at the same rate of speed as that of the main conveyer belt 17. At the opposite end of the machine frame is an upright shaft 108 which is provided with a sprocket wheel similar to the sprocket wheel 101. A sprocket chain 109 is passed around the sprocket wheels 101 and 108 and each link thereof is provided with a flat plate 110 which plate is connected with the adjacent link of the chain by means of pivot-pins 111 so arranged that each plate may have a slight tilting movement relative to the link to which it is attached. The adjacent edges of the plates 110 are beveled or inclined at 112 and said parts are so arranged that the said plates will all stand in line with each other at a point above the side edges of the belt 17. The lower edges of the plates preferably rest upon or close to the top surface of the belt 17 and the top edges of the plates are above the layer of plaster board. In this way, the plaster board is accurately centered on top of the belt 17 and none of the material on it can work out beyond the sides of the belt 17 and the plaster board is made of exactly uniform width throughout. The object in having the plates 110 pivotally connected with the links and beveled at their ends is that said plates may move in a straight line until they pass around the sprocket wheel 101 so far that the plates may tilt without projecting one of their ends into the adjacent edge of the plaster board and so that they may withdraw from the plaster board without causing the plaster board to adhere to them. Obviously, if a continuous belt were employed for this purpose, it would adhere to the edges of the plaster board and leave the edges in a rough and unfinished condition, whereas, by means of the pivoted and beveled plates, the edges of the plaster board are left smooth and even.

In order to impart motion to the shaft 27, I have connected it by a sprocket gearing device with the shaft of the lower roller which supports the belt 43, which lower roller is driven by means of the chain 47 as before described. The sprocket gearing device comprises a chain 113 and sprocket wheels 114 and 115 on said shafts, as clearly shown in Fig. 1, and in order to drive the conveyer belts 57 and 58, I employ a sprocket gearing device 114 connecting the lower roller of the conveyer belt 42 with the shaft of the conveyer belt 57, as shown in Fig. 1.

In practical operation, it is obvious that all of the machinery may be driven by power applied to the main power shaft, or, if desired, any one or more of the operations of the machine may be carried on by hand. As of each of the various parts of the machine have been described in detail, it is believed that the operation of the machine as a whole will be readily understood.

My improved method consists in first providing a continuous layer of paper or the like, then continuously applying thereto a thin, moist layer of plaster which will adhere to the layer of paper, then applying, on top of the plaster, a continuous layer of fiber which will adhere to the layer of plaster, then applying a second continuous layer of plaster on top of the fiber, then applying a layer of material such as burlap on top of the last layer of plaster, and then firmly compressing the layers together to make them of uniform thickness and to cause the plaster to thoroughly commingle with the layer of fiber and the layer of burlap and also to continuously smooth out the edges of the plaster board as it continuously moves over the table on which it is supported. It is obvious that these various operations may be performed wholly or partially by hand, and, hence, a patent on the machine or apparatus itself might be insufficient to protect the method or process.

I claim as my invention.

1. In a machine of the class described, the combination of a movable support, means for feeding a sheet of flexible material to the movable support, means for feeding a layer of plaster on top of the flexible material, means for feeding a second flexible sheet on top of the plaster, and a pressing device to operate upon the second flexible sheet after it has been placed on the plaster, said pressing device comprising a surface capable of movement in the same direction as the material on which it is operated and being arranged in position to firmly engage the material at one end and being inclined away from the material at the end of the machine toward which the material is moving.

2. In a machine of the class described, the combination of a movable support, means for feeding a sheet of flexible material to the movable support, means for feeding a

layer of plaster on top of the flexible material, means for feeding a second flexible sheet on top of the plaster, and a pressing device to operate upon the second flexible sheet, said pressing device comprising an endless belt and suitable rollers over which it may travel, said belt being arranged in firm contact with the material at its forward end and elevated above the material at its rear end.

3. In a machine of the class described, means for supplying a continuous layer of plaster, comprising two endless conveyer belts having their adjacent portions slightly spaced apart and arranged for movement in the same direction, and means for depositing a layer of plaster on the upper surface of the lower conveyer belt, and means for supplying water on the upper surface of the lower conveyer belt in advance of the plaster.

4. In a machine of the class described, means for supplying a continuous layer of plaster, comprising two endless conveyer belts having their adjacent portions slightly spaced apart and arranged for movement in the same direction, and means for depositing a layer of plaster on the upper surface of the lower conveyer belt, and means for turning up the side edges of the upper portion of the lower conveyer belt.

5. In a machine of the class described, means for supplying a continuous layer of plaster, comprising two endless conveyer belts having their adjacent portions slightly spaced apart and arranged for movement in the same direction, and means for depositing a layer of plaster on the upper surface of the lower conveyer belt, and means for turning up the side edges of the upper portion of the lower conveyer belt, and means for turning down the side edges of the lower portion of the upper conveyer belt.

6. In a machine of the class described, means for supplying a continuous layer of plaster, comprising two endless conveyer belts having their adjacent portions slightly spaced apart and arranged for movement in the same direction, and means for depositing a layer of plaster on the upper surface of the lower conveyer belt, and means for turning up the side edges of the upper portion of the lower conveyer belt, and means for turning down the side edges of the lower portion of the upper conveyer belt, and a stationary scraper at the discharge end of each conveyer belt.

7. In a device of the class described, the combination of a conveyer belt inclined downwardly and toward the delivery end of the device, means for supplying water to the top surface of the conveyer belt for preventing plaster from adhering to it, means for holding up the side edges of said conveyer belt to prevent the water from running off of the sides of the belt, and means for supplying plaster on top of the conveyer belt below the point where the water is applied so that the plaster is applied to the water on the belt to prevent it from adhering to the belt.

8. In a device of the class described, the combination of two endless conveyer belts with their adjacent portions arranged close to each other, means for moving them so that the adjacent portions of the belts travel in the same direction, and means for holding the side edges of the adjacent portions of both belts toward each other.

9. In a device of the class described, the combination of two endless conveyer belts with their adjacent portions arranged close to each other, means for moving them so that the adjacent portions of the belts travel in the same direction, and means for holding the side edges of the adjacent portions of both belts toward each other, said means comprising a number of shafts extended transversely of each belt, and cone-shaped rollers on said shafts to engage the edge portions of the belts.

10. In a device of the class described, the combination of two endless conveyer belts, one arranged above the other and designed to receive plaster between them, means for moving the lower conveyer belt, and means for moving the upper conveyer belt so that the part thereof adjacent to the lower belt will move in the same direction and at an increased speed.

11. In a device of the class described, the combination of an endless conveyer belt, means for supplying plaster to the upper surface thereof, a second endless conveyer belt above the first, a frame for supporting the upper conveyer belt, links for pivotally supporting the discharge end of said upper frame, and an inclined support for the other end of said frame, for the purposes stated.

12. In a device of the class described, the combination of two rollers, an endless conveyer belt passed around them, a second endless conveyer belt above the first, two rollers for said second conveyer belt, links connecting the rollers of the upper and lower conveyer belts at one end, and an inclined support for the other end of the upper conveyer belt.

13. In a device of the class described, a means for delivering a continuous layer of fiber, comprising a series of toothed bars, means for oscillating them, and two endless conveyer belts arranged one above the other in position to receive the fiber from the discharge end of said oscillating bars, and means for operating said conveyer belts with their adjacent portions moving in the same direction.

14. In a device of the class described, the combination of a table top and a series of toothed bars extended upwardly and away

from the table, means for oscillating said toothed bars, the alternate ones thereof being arranged to move in opposite directions.

15. In a device of the class described, the combination of an endless conveyer belt, arranged for movement in a substantially horizontal direction, means for applying plaster to said belt, and a second endless conveyer belt above the first and so arranged that its forward portion will engage the material on the first belt and its rear portion will be elevated slightly above said material, and means for operating the latter belt, said parts being so arranged that the upper belt will gradually move away from the material on the lower belt so that the material will not adhere to the upper belt.

16. In a device of the class described, the combination of a belt arranged for horizontal movement, means for applying plaster to the belt, two rollers arranged transversely above the layer of material on the belt, means for independently adjusting them toward and from the belt, a third roller in the rear of the first two and elevated above them, an endless belt passed around said three rollers, said parts being so arranged that the said upper belt will have its lower portion inclined rearwardly and away from the material on the lower belt, for the purposes stated.

17. In a device of the class described, the combination of a belt arranged for horizontal movement, means for applying plaster to the belt, two rollers arranged transversely above the layer of material on the belt, means for independently adjusting them toward and from the belt, a third roller in the rear of the first two and elevated above them, an endless belt passed around said three rollers, said parts being so arranged that the said upper belt will have its lower portion inclined rearwardly and away from the material on the lower belt, and a roller arranged below the lower belt in line with the first one of the rollers above the lower belt, for the purposes stated.

18. The method of producing plaster board which consists in providing a continuous sheet of flexible material and continuously advancing same, then applying a continuous layer of plaster in moist condition on top of the sheet, then applying a continuous layer of fabric such as burlap on top of the layer of plaster and then applying a pressing movement to the layer of fabric, said pressing movement being applied by a device having its pressing surface moving in the same direction as the material and held firmly in contact with the material at its forward portion and held slightly away from the material at its rear portion.

Des Moines, Iowa, Jan. 7, 1909.

DAVID E. ROBERTS.

Witnesses:
T. B. KERSHAW,
T. P. BUSBY.