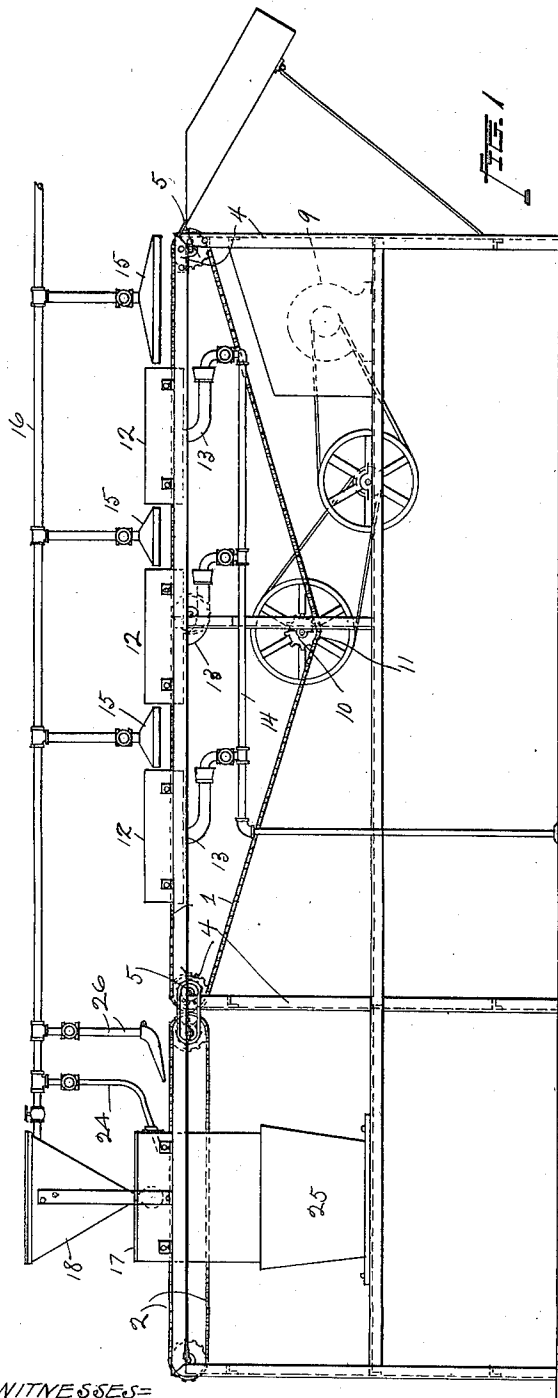


J. W. GOLDHAMER.
 APPARATUS FOR PRODUCING RELIEF PRINTING.
 APPLICATION FILED JUNE 15, 1912.

1,283,155.

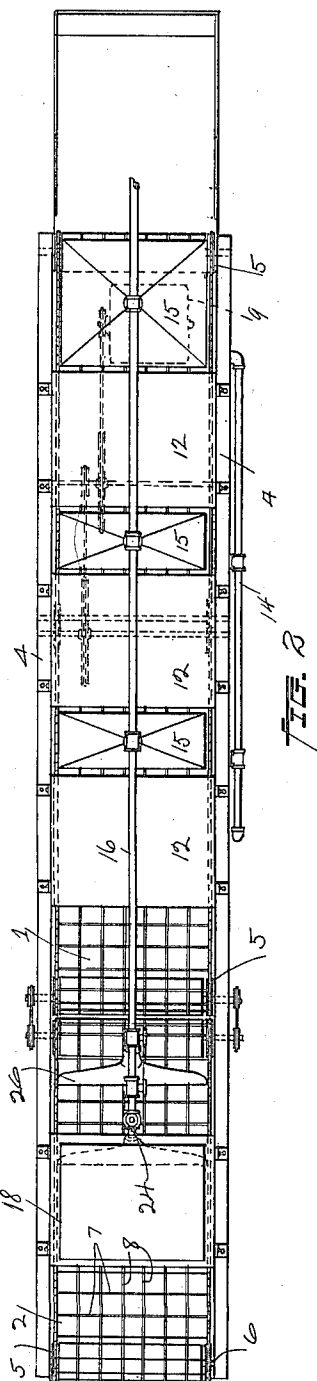
Patented Oct. 29, 1918.

2 SHEETS—SHEET 1.



WITNESSES=

Oliver M. Kappeler
Jno. F. Oberlin



INVENTOR=

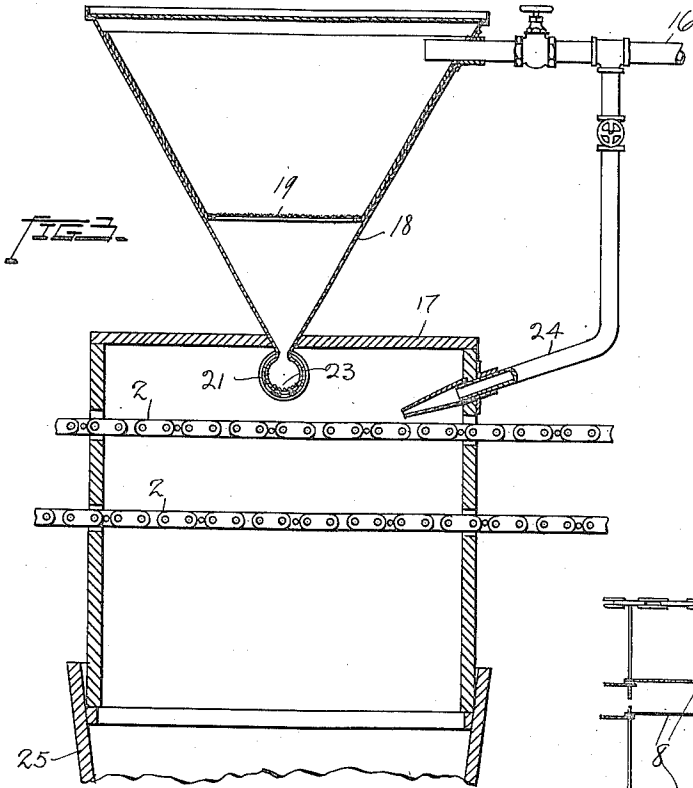
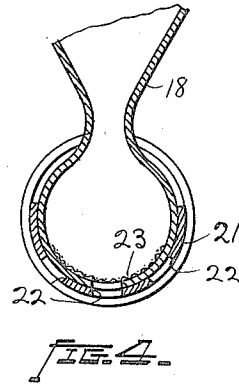
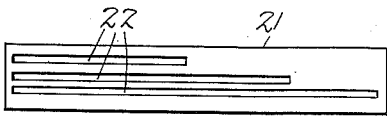
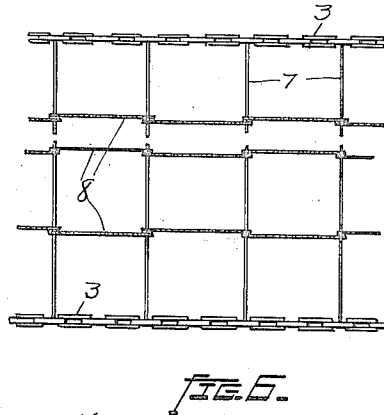
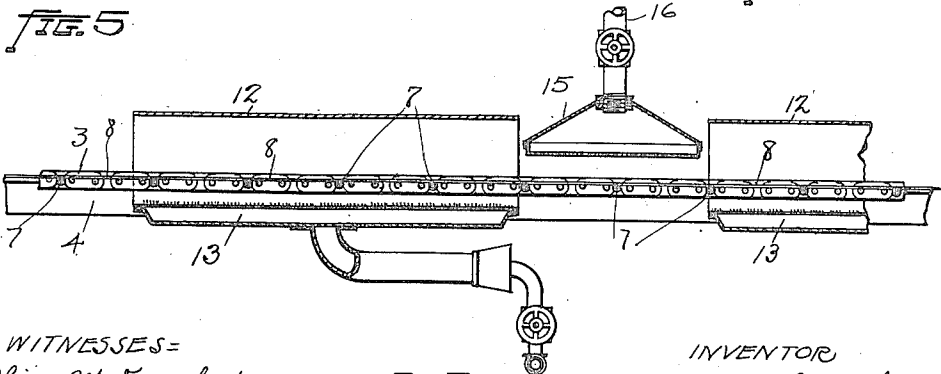
Jacob W. Goldhamer
 BY *J. B. Fay* ATTORNEY-

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2 SHEETS—SHEET 2.



WITNESSES=
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UNITED STATES PATENT OFFICE.

JACOB W. GOLDHAMER, OF CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
EMBOSO SALES COMPANY, A CORPORATION OF THE DISTRICT OF COLUMBIA.

APPARATUS FOR PRODUCING RELIEF-PRINTING.

1,283,155.

Specification of Letters Patent.

Patented Oct. 29, 1918.

Application filed June 15, 1912. Serial No. 703,947.

To all whom it may concern:

Be it known that I, JACOB W. GOLDHAMER, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Apparatus for Producing Relief-Printing, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

The kind of prints, for the manufacture of which the present method and apparatus are more particularly designed, is that shown and described in U. S. Patent No. 644,282, and is characterized by having the design or picture composed of a basic layer of ink or size and a superimposed crust or veneer of varnishing material co-extensive with the color impression and united therewith. In other words, the present invention may be regarded as comprising an improvement in the so-called "Crump" process which forms the subject matter of a companion patent to the one just named, viz., No. 644,281, together with suitable apparatus for carrying on such improved process. In carrying out such Crump process a foundation coating of ink, pigment or size is impressed, transferred or otherwise deposited upon the paper or other fabric in any of the several well known ways. This is then covered with a coating of finely comminuted gum or varnishing material in the form of a powder applied to the print while the first impression is still wet, so that the powder adheres only to the imprinted design. The superfluous powder is then brushed, shaken or blown off, the remaining powder exactly covering the imprinted portion throughout its entire extent. The next step in the process consists in heating the powder covered print to a temperature sufficient to fuse or dissolve the powdered varnishing material, after which the print is allowed to cool.

The object of the present invention is to provide improved means for applying the powder to the print, whereby such powder may be thoroughly removed from all portions of the sheet save those desired, as well as from the apparatus, (the latter conveniently consisting of an endless conveyer that carries the print through a heating oven) since any powder collecting on such

carrier will be fused and stick to the sheet and mar the same. A further object is to provide improved method and means for heating the powdered sheets whereby the powder may be fused so as to unite thoroughly with the basic layer, this union requiring to be, it is assumed, of a more or less chemical nature, if satisfactory results are to be secured. The improvements also comprehend a novel construction of carrier, as also of other details of operation and apparatus, all of which steps and apparatus will be hereinafter fully set forth and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail one improved method of carrying out the invention; together with approved apparatus for use therein, such disclosed mode and means constituting, however, but one of various ways in which the principle of the invention may be used.

In said annexed drawings:—

Figure 1 is a side elevational view of an approved apparatus adapted to carry on the present process; Fig. 2 is a plan view of such apparatus; Fig. 3 is a sectional view on a larger scale than in Fig. 1 of a portion of the feeding mechanism of applying powder to the prints; Fig. 4 is a sectional view of a detail of said mechanism on a still larger scale; Fig. 5 is a plan, or rather a development of such detail; Fig. 6 is an enlarged plan view of the conveyer means; and Fig. 7 is a longitudinal section of the same shown in place in the apparatus.

The apparatus illustrated in the foregoing figures comprises principally a main conveyer or carrier 1 in the form of an endless belt and a feeding conveyer 2, similarly in the form of an endless belt located at one end of said main conveyer, Fig. 1. The detailed construction of the latter is not of particular consequence, although for convenience it may be fashioned the same as the main conveyer, which is formed of two sprocket chains 3, (Fig. 6), one on either side of the open rectangular frame 4 which supports the apparatus, said chains passing around sprocket wheels 5 mounted on shafts 6 suitably journaled in said frame. These sprocket chains are connected at intervals by cross wires 7, to which in turn are attached longitudinal strands 8 running parallel with the chains. Strands 8 I form out of asbes-

tos or equivalent fibrous material that is flexible and unaffected by heat. Furthermore, I preferably coat the transverse wires 7 with the same material. This main conveyer or carrier is driven by means of a motor 9 suitably connected with a pair of driving sprockets 10 on a shaft 11, (Fig. 1).

The supplementary carrier 2, which is desirably constructed, as stated above, in the same fashion as the main carrier, viz., out of two side sprocket chains joined by cross wires to which in turn are attached longitudinal strands, is disposed on a level with such main carrier and closely abutting one end of the same. It is furthermore conveniently driven from the adjacent sprocket bearing shaft 6 around which such main carrier runs. Since this supplementary conveyer is not subjected to any heat, it is not necessary that it be constructed of asbestos on this account.

Suitably supported on the frame of the machine, in line with the upper lap of the main conveyer, is a series of chambers 12 constructed of sheet metal and open at their ends, which are alined with the conveyer so that the latter can pass therethrough bearing the printed sheets. Disposed in the bottom of each chamber is a suitable heating device 13 shown (see Figs. 1 and 7) as consisting of a gas burner, the burners being supplied from a common feeder 14 but independently regulable, so that the heat in each of the chambers can be modified as desired. The chambers are furthermore spaced a certain distance apart, so that a sheet passing from one to the next in line is exposed to the air and thus allowed to cool to a degree. To increase this cooling effect a cooling or chilling device is furthermore located between each chamber, as also at the end of the last of the series, such devices as shown consisting simply of flattened nozzles 15 having slit-like openings in their under faces, said nozzles being connected with a supply line 16 through which air is forced as will be readily understood.

The device for feeding the powder onto the sheets (see Figs. 3, 4, and 5), is supported on the frame 4 over the supplementary conveyer 2, and comprises a box-like inclosure 17 open at its front and rear ends so as to permit said conveyer with a sheet thereon to pass through said inclosure. In the upper wall of the inclosure is mounted a hopper 18 which may be of any suitable construction for holding and feeding the comminuted material downwardly onto the sheets as they pass through such inclosure. As shown in detail in the figures last-named, the present hopper is double, the inner one being removable thereby facilitating the use of different colors or kinds of powder for different kinds of work, by simply removing one inner hopper or container and substitut-

ing another. Such powder-hopper is connected with the air supply-line 16, so that a blast of air can be forced into the same thereby forcing the powder through the bottom of the hopper which is formed by means of a screen 19 that prevents any particles from passing if larger than a predetermined size. The lower portion of the outer hopper has a transverse slot or opening 20 through which the powder drops, such opening being made of regulable size, by means of a valve or gate 21. The latter furthermore has a series of slots 22 of different lengths, any selected slot being brought into register with the slot in the hopper proper, according to the width of the sheets being powdered. Across the slot in the hopper bottom is disposed a second screen 23 thereby insuring the proper grading of the material that is fed on the sheets passing through the inclosure below. Into the forward face of the inclosure extends an air-pipe 24 preferably terminating in a nozzle by means of which a blast of air is directed onto the sheets at a point just after they have passed the lower end of the hopper.

By the aforesaid means the powder is in effect sifted or deposited onto the sheets in an evenly disposed layer, and the excess of powder, that is all that does not cling to the print proper, is blown off, such excess of powder being collected in a box 25 supported beneath the inclosure 17, which latter is open at its lower end. As the sheets pass without the inclosure on their way to the main conveyer a second blast, supplied from a second air-pipe 26 having a suitable nozzle, is directed thereon so as to blow off any particles that may by chance remain, since naturally, even if blown off the sheet within the inclosure, some particles are apt to fall thereon again.

Upon being received on the main conveyer, the sheets are carried in succession through the series of heating chambers 12 previously described, being subjected to the chilling influence of the blast from the chilling devices 15 as they pass from one such chamber to the other, and as they leave the final chamber. By using a series of these chambers thus arranged and providing for the cooling of the sheets in between successive chambers, the varnish powder is gradually fused so as not only to facilitate its chemical combination with the basic layer, but also permit the gradual raising of the lettering or printed design, all without forcing the liquefied chemicals outside the lines of the type or other design. The result is a more uniformly regular and even embossing or engraving than where the complete fusion or solution of the powder is attempted in a single heating operation, and the firm union of such powder with the composition of the basic layer.

By the use of heat insulating material in the construction of that portion of the carrier (especially in the case of the main conveyer) which comes into direct contact with the sheets, the uniform heating of the sheets is not interfered with, and breaking of the strands is at the same time avoided, since such asbestos, or asbestos-coated, strands do not oxidize or rust, as would bare metal strands, thereby soiling the sheets as they pass over them. Finally, by having the feeding conveyer independent of the main conveyer, it will be noted that should any particles of the varnish powder cling to such conveyer, despite the air blasts from pipes 24 and 26, no harm will result; whereas, if the feeding operation were had in conjunction with the main conveyer, any particles that clung to the conveyer would be fused in passing through the heating chambers, and would be apt to stick to the sheets and thereby soil the same or mar the design imprinted thereon.

The feeding of the powdered sheets onto the main conveyer is, of course, entirely automatic, so that all that the operator needs to do is to place the freshly printed sheets onto the supplementary, or feeding, conveyer. The same operator who attends the press, whereon such printing is being done, can easily transfer the sheets to such feeding conveyer, no further attention being required thereto, except to occasionally remove the pile of finished sheets that collect at the discharge end of the conveyer. By reason of the use of a chilling device at this end of the machine, the prints on the sheets are sufficiently hardened to prevent the objectionable "off-setting" or sticking of sheets together, which has heretofore made it necessary to lay the sheets out without the prints overlapping until they had time to set.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the steps or mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In apparatus of the character described, the combination of a series of heating chambers spaced from each other; an endless traveling sheet-carrier passing through said chambers in succession; and chilling devices located intermediately between said chambers and after the last one of the series.

2. In apparatus of the character described, the combination of a series of heating chambers spaced from each other; an endless traveling sheet-carrier passing through said chambers in succession; and air-blast devices located intermediately between said chambers and after the last one of the series.

3. In apparatus of the character described, the combination of heating means; a main endless traveling sheet-carrier passing in operative relation to said heating means; a supplementary endless traveling sheet-carrier adapted to feed sheets onto said main carrier; powder-feeding mechanism located over said supplementary carrier; and air-blast means adapted to blow any excess of powder from the sheets.

4. In apparatus of the character described, the combination of heating means; a main endless traveling sheet-carrier passing in operative relation to said heating means; a supplementary endless traveling sheet-carrier adapted to feed sheets onto said main carrier; an inclosure surrounding a section of said supplementary carrier; powder-feeding mechanism adapted to distribute powder upon sheets passing through said inclosure; and air-blast means in said inclosure adapted to blow any excess of powder from the sheets.

5. In apparatus of the character described, the combination of heating means; a main endless traveling sheet-carrier passing in operative relation to said heating means; a supplementary endless traveling sheet-carrier adapted to feed sheets onto said main carrier; an inclosure surrounding a section of said supplementary carrier; powder-feeding mechanism adapted to distribute powder upon sheets passing through said inclosure; air-blast means in said inclosure adapted to blow any excess of powder from the sheets; and a second air-blast means located adjacent to said inclosure in the direction of travel of said conveyer.

6. In apparatus of the character described, the combination of an endless traveling sheet-carrier; an inclosure surrounding a section of said carrier; powder-feeding mechanism adapted to distribute powder upon sheets passing through said inclosure; and air-blast means in said inclosure adapted to blow any excess of powder from the sheets.

7. In apparatus of the character described, the combination of an endless traveling sheet-carrier; an inclosure surrounding a section of said carrier; powder-feeding mechanism adapted to distribute powder upon sheets passing through said inclosure; air blast means in said inclosure adapted to blow any excess of powder from the sheets; and a second air-blast means located adjacent to said inclosure in the direction of travel of said conveyer.

8. In apparatus of the character described, the combination of a series of heating chambers spaced from each other; an endless traveling sheet-carrier passing through said chambers in succession; and chilling means intermediate adjacent chambers.

9. In apparatus of the character de-

scribed, the combination of a series of heating chambers spaced from each other; an endless traveling sheet-carrier passing through said chambers in succession; and
 5 air-blast devices intermediate adjacent chambers.

10. In apparatus of the character specified, the combination of means for feeding printed sheets, means for applying powder
 10 to the printed sheets, and means for removing surplus powder from the sheets; with a series of heating means spaced apart, and means for carrying the printed and powdered sheets after the surplus powder
 15 has been removed therefrom past said heating means, whereby such sheets are alternately heated and chilled.

11. In apparatus of the character described, the combination of a series of heating chambers spaced from each other; an
 20 endless traveling sheet-carrier passing through said chambers in succession; and chilling devices located intermediately between said chambers; with means for feeding
 25 ing printed sheets onto said sheet-carrier, means for applying powder to the printed sheets carried by the feeding means, and means for removing surplus powder from the printed sheets before they reach the
 30 heating means.

12. In apparatus of the character described, the combination of a series of heating chambers spaced from each other; an
 35 endless traveling sheet-carrier passing through said chambers in succession; and air-blast devices located intermediate said chambers; with means for feeding sheets
 40 onto said sheet-carrier; means for applying powder to the printed sheets carried by the feeding means, and means for removing surplus powder from the printed sheets before they reach the heating means.

13. In apparatus of the character described the combination of means for powdering a prepared sheet, and means for repeatedly alternately heating and chilling the
 45 powdered sheet.

14. In apparatus of the character specified, the combination of means for powdering a printed or sized sheet, and means for
 50 repeatedly heating and chilling in alternation such powdered sheet.

15. In apparatus of the character described, the combination of a series of heating chambers separated by cooling spaces
 55 from each other; and means for passing a sheet successively through said chambers and cooling spaces, substantially as described.

16. In apparatus of the character described, the combination of a series of heating chambers spaced from each other to
 60 leave cooling spaces intermediate such chambers; and an endless traveling sheet carrier passing successively through said

chambers and cooling spaces, substantially as described.

17. In apparatus of the character described, the combination of a series of heating chambers spaced from each other; chilling
 70 devices located intermediate adjacent chambers, and means for passing sheets successively through said chambers and past said chilling devices.

18. In apparatus of the character described, the combination of heating means; a main endless traveling sheet carrier passing in operative relation to said heating
 75 means; a supplementary endless traveling sheet-carrier adapted to feed sheets onto said main carrier; powder-feeding mechanism adjacent said supplementary carrier; and means to remove any excess of powder from the sheets.

19. In apparatus of the character described, the combination of an endless traveling sheet-carrier, a chamber through
 85 which said carrier passes; mechanism adapted to distribute powder upon sheets passing through said chamber, said mechanism including a hopper having an elongated discharge opening disposed transversely of the
 90 direction of travel of said conveyer; and a valve in said hopper having a plurality of discharge openings varying in length.

20. In apparatus of the character described, the combination of an endless traveling sheet-carrier; a chamber through
 100 which said carrier passes; mechanism adapted to distribute powder upon sheets passing through said chamber, said mechanism including a hopper having an elongated discharge opening disposed transversely of the direction of travel of said
 105 conveyer; and a rotatable gate valve in said hopper having a series of slots of different lengths adapted to be brought into register with such opening.

21. In apparatus of the character specified, the combination of means for feeding
 110 printed sheets, and means for applying powder to the printed sheets; with a series of heating means spaced apart to form cooling spaces, and means for carrying the printed and powdered sheets past said heating
 115 means and cooling spaces in succession whereby the sheets are alternately heated and chilled.

22. In combination sheet carrying means; a powderer for discharging a surplus quantity of fusible powder on the printing area
 120 of each one of a succession of sheets conveyed by said carrying means; an instrumentality for automatically operating upon each of the powdered sheets to remove powder from non-inked portions thereof; and a
 125 heating device for automatically receiving each of the sheets and for subjecting them to a sufficient heat to cause the fusible powder to fuse on to and amalgamate with the

inked portions of said sheets to form a raised surface thereover, said powderer, instrumentality and heating device cooperating with the carrying means.

23. In combination carrying means adapted to convey a train of separate sheets; with a powderer for sprinkling fusible powder on each of said sheets; means for removing superfluous powder from non-inked portions of said sheets; and a heater for automatically receiving said train of sheets and fusing the powder heaped on the inked portions thereof cooperating with said carrying means.

24. An automatic apparatus for producing raised printing, combining an automatic powder-applying mechanism; a sheet-carrying means adapted automatically to convey a succession of separate freshly-printed sheets into effective relation with said mechanism, whereby it may automatically apply a superfluous quantity of fusible powder to the printed regions of said sheets; an instrumentality for effecting the removal of the powder cooperating with said carrying means from the non-inked portions of said sheets; and means for fusing the powder adhering to the inked portions also cooperating with said carrying means.

25. An automatic apparatus for producing raised printing, combining a mechanism for applying an excess quantity of fusible powder to the printed region of each one of a succession of sheets received from a printing press; automatic means for removing the powder from the non-inked portions of the sheets; a melter for fusing the powder remaining on the inked portions to form raised printing; and means for causing the sheets to be brought successively to the action of said mechanism, said means and said melter.

26. An automatic apparatus for producing raised printing, combining means for applying an excess quantity of fusible powder throughout a printed region of each one of a succession of freshly-inked sheets of paper; means for automatically removing the powder from the non-inked portions of said sheets while leaving it heaped on the inked portions thereof; means adapted to subject said sheets to an elevated temperature to fuse the powder adhering to the inked portions, to form raised printing thereof; and means for causing said freshly-inked sheets of paper to be subjected successively to the action of said three above mentioned means.

27. An automatic apparatus for producing raised printing, combining means for conveying separate freshly-inked and pow-

dered sheets of paper; means for removing from said sheets the powder on the non-inked portions; a device for receiving the sheets from said first means and conveying them; and means automatically cooperating with said device to subject said sheets to a high temperature whereby the powder on the inked portions will be fused into the ink to form raised homogeneous printing.

28. A unitary apparatus for automatically producing raised printing, combining means for applying a fusible powder in excess quantity throughout the printed area of separate freshly-inked sheets of paper; mechanism for receiving said powdered sheets and for automatically removing the powder from the non-inked portions of said sheets while leaving it heaped on the inked portions; and automatic means adapted to receive said sheets and subject them temporarily to a relatively high temperature to fuse the powder adhering to the inked portions so as to form raised homogeneous printing; said means and mechanism being connected together to operate successively and automatically upon said sheets.

29. A unitary machine for making raised printing, combining a carrier for conveying a succession of sheets of paper with their freshly-printed areas exposed; a device adapted to automatically deposit a quantity of fusible powder on said areas during the transit of said sheets whereby the inked lines may retain a coating of said powder; means for receiving the superfluous powder freely separate from the non-adhesive non-inked portions of said sheets; and heating means adapted during the transit of said sheets to fuse the powder and cause it to amalgamate with the ink to form raised printing.

30. An automatic apparatus for producing raised-printing combining means for applying an excess quantity of a readily fusible powder throughout the entire surface of freshly inked separate sheets of paper, means for automatically removing the powder from the non-inked portions of said sheets while leaving it heaped on the inked portions, and automatic means adapted to subject said sheets to a high-temperature treatment to fuse the powder adhering to the inked portions to form raised-printing; said three means operating successively and automatically upon said sheets.

Signed by me this 12th day of June, 1912.

JACOB W. GOLDHAMER.

Attested by—

ANNA L. GILL,
JNO. F. OBERLIN.