

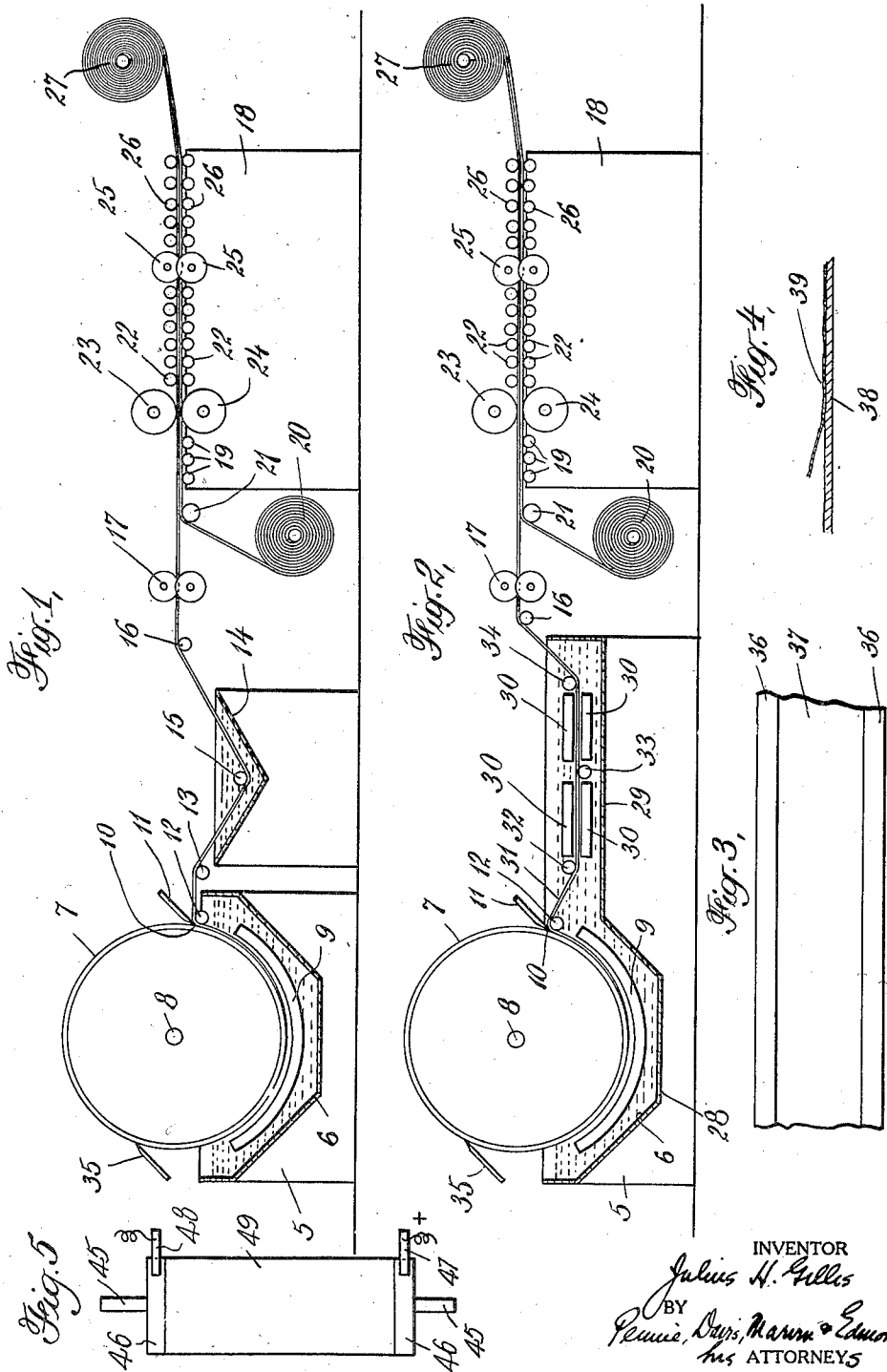
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J. H. GILLIS

PROCESS AND APPARATUS FOR MAKING ROOFING MATERIAL

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JULIUS H. GILLIS, OF ELIZABETH, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS,
TO ANACONDA SALES COMPANY, A CORPORATION OF DELAWARE.

PROCESS AND APPARATUS FOR MAKING ROOFING MATERIAL.

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This invention relates to a process and apparatus for the manufacture of a roofing material which is to be used in the web or roll form. The roofing material referred to is shown and described in the co-pending application of Thomas Robinson, Ser. No. 657,472, filed Aug. 15, 1923, and in that application this new roofing is described as consisting of a composition base which is provided with a protective strip of wear-resisting material. The base which is used in this connection may be formed of any of the compositions which are commonly used at the present time under the general designation of composition roofing. Such roofing may be made of impregnated felt, paper, burlap, or finely divided granular or fibrous material, such as asbestos, held together by a suitable binder. The binder, or impregnating material commonly used is a bituminous composition, although magnesite compounds and fire-proof cements are also used. Such composition roofing is in wide use in the form of long strips or webs of relatively flexible material, ordinarily shipped in rolls, and these strips are unrolled on the roof and attached thereto in any convenient manner. Composition roofing is also made in the form of single roofing elements similar to shingles, tiles, and the like, but in this form the elements have a greater degree of rigidity than the web material. Composition roofing material of the type above briefly described has the advantage of cheapness over ordinary wood or slate shingles, and the web type is most conveniently used, particularly at the angles of the roof or in other places where ordinary roofing materials cannot be applied in a continuous layer but must be cut in accordance with the shape of the roof at the point of application. This composition roofing, however is objectionable to some extent by reason of its appearance. Also it has a tendency to deteriorate, due to the volatilization of the lighter oils of the binding compound and the surface is somewhat soft so that when subject to wear it is likely to have a shorter life than other harder materials.

Metal roofing has also been used to a great extent but is objectionable on account of the rapidity with which it transmits heat and also because of its cost. In the co-pending application, above referred to, however, there is described a roofing which overcomes the several disadvantages of both types and the

desired object is attained by applying to a composition base a wear-resisting, protective strip which is preferably made of a non-corrodible metal such as copper or zinc. This roofing is of the web type and the metallic strip is designed to cover only that area of the web which will be exposed when the latter is in position on the roof. By limiting the metallic strip to the weather surface only, it is possible to reduce the cost of the finished product and also to provide for an overlapping joint construction which is more satisfactory than would be the case if the metal covered the entire surface of the strip. Along the edges of the strip is left an uncoated selvage of the base material and when the strips are to be used in the various ways made necessary by the configuration of the roof, the joints between adjacent strips or between the strip and adjacent elements of the shingle type, are formed by overlapping and contacting sections of the base. Since the base material has a relatively soft surface this insures that the two overlapping areas will lie with their surfaces in intimate contact so that a water-tight joint is produced. Also this selvage portion permits of the use of nails for attaching the strip to the roof proper without producing holes in the composition which would wear larger under varying temperature conditions and thus result in leaks. Furthermore, by making the joint between uncoated surfaces of the base it is possible to apply an adhesive compound similar to that used for binding or impregnating processes so as to make a water-proof joint, thus obviating the use of solder, as is necessary in plain metal roofing. Also the use of a joint formed between composition surfaces prevents leakage due to capillarity.

The present invention is intended to provide a process and apparatus for the production of the roofing material above referred to, and in accordance with this invention a strip of the protective metal is progressively applied to the surface of the base web and the two are united by the progressive application of heat and pressure. In producing that adherence between the strip and the base, which is necessary in order that the roofing may be flexed to conform to the roof surface, I take advantage of the fact that the base is ordinarily coated or impregnated with a plastic material which may be used as the adhesive. In applying the heat neces-

sary to soften this material so that it will wet the strip and upon cooling adhere firmly to it, I localize or confine the heat to the strip itself in such a way as not to soften the base throughout its entire thickness, and this localization of heat is best carried on by generating heat in the strip by means of the electric current. Those steps in the present process which relate to the application of heat and pressure have been described in my co-pending application, Ser. No. 657,489, filed Aug. 15, 1923, wherein the particular steps are described in connection with the production of roofing elements of a more or less definite shape and form, these elements having a considerable degree of rigidity. In that process the protective coating is either formed directly on the element by electrolytic processes or else a preformed sheet of the protective metal is subjected to pressure so as to cause it to flow and conform to the irregularities of the base resulting during its formation by reason of the character of the material of which the base is formed, or else produced by special treatment for the desired purpose, and thereafter the coating is subjected to the localized heating so as to produce the desired adherence.

In the present process I prefer to produce the protective material by electrolytic methods and then progressively lay a strip of such material on the surface of the web. Thereafter the two materials are passed through pressure rolls which serve to maintain them in intimate contact and during the application of such pressure, heat is generated in the strip by means of an electric current. During this treatment the plastic material in the base softens and expands with a slight bubbling effect with the result that this softened material wets the strip throughout the surface contacting with the base. The base and strip are maintained under pressure for such a length of time as is necessary to permit the plastic ingredient to set, whereupon the finished product is rolled up in rolls of such length as is desired. In the production of such material it is possible to make use of a preformed strip of sheet metal of the desired shape and thickness, although I prefer to produce this protective coating electrolytically for reasons of economy. In the latter case I make use of a rotary cathode having a suitably prepared surface and I cause a layer of the metal to be deposited on the surface of this cathode in a continuous operation. As the cathode rotates the deposit is stripped therefrom and then used directly, or else it may be built up to any desired thickness by passage between spaced anodes in an electrolytic cell. From the electrolytic tank the strip may next pass, if desired, through a vat of coloring material, containing chemicals which would produce desired color effects, and thereafter the strip passes through

a trimming device which gives it a smooth edge. It is possible to make use of a rotary cathode of a length substantially equal to the width of the strip, using a separate electrolytic cell for each line of heating and pressing rolls, although I prefer to make use of a cathode in the form of a drum on which is deposited a sheet of metal sufficient to form a protective covering for several composition webs. As this sheet is stripped from the surface of the drum it is split into the desired widths and the strips so formed may then be led directly to the apparatus for applying the strips to the base material, or else these strips may be wound into rolls and later be applied to the base. By using a drum cathode of considerable width it is possible to produce the metal more economically and with a greater uniformity in quality and thickness.

In the accompanying drawings I have illustrated, more or less diagrammatically, a suitable apparatus for carrying on a continuous process in which the metal strip is formed and directly laid upon and united to the surface of the web of base material. In these drawings,

Fig. 1 is a view in side elevation of the complete apparatus, including a coloring tank,

Fig. 2 is a view similar to Fig. 1, omitting the coloring tank, but showing the necessary modifications for the purpose of building up the deposit by further electro-deposition,

Fig. 3 is a plan view of a length of the finished product, and

Fig. 4 is a longitudinal sectional view of the product, showing the protective strip partially torn away.

Fig. 5 is a side view of a contact roll used in the new apparatus.

Referring now to these drawings, it will be seen that the apparatus includes an electrolytic tank 5, having a somewhat angular bottom 6, so that the quantity of solution to be used may be as small as possible. Mounted in suitable bearings in the end walls of the tank is a rotary cathode 7 having a smooth surface of lead or other metal from which the deposit may readily be stripped. This cathode may be of a light metal structure, having those surfaces which pass beneath the surface of the liquor and are not to receive a deposit enameled or coated with an impervious composition so that the metal is not affected by the electrolyte. The dimensions of the cathode will depend on several factors. The diameter of the cathode will determine the peripheral speed which must be given it to produce a strip of the desired thickness under any selected electrolytic conditions, and the axial length will be determined by the width of the strip to be produced. The cathode may be designed to produce a single strip to be applied to the base web, but preferably is of such length that the deposited material may be slit so as to form several strips to be ap-

plied simultaneously to different webs. The cathode is provided with a shaft 8 which is driven from a suitable source of power and the cathode is also provided with electrical connections which, in this case, may take the form of brushes bearing on the surface of the cathode at spaced points arranged so as to produce a uniform distribution of the current throughout the cathode run. These brushes are not illustrated but are of the common type well-known in the art. The cathode drum or wheel is preferably mounted so that the shaft is above the liquid level in the tank. Located in the tank below the cathode is an arcuate anode 9, which is formed of the metal to be deposited and for convenience will be referred to as copper, although it will be understood that various other metals may be used for producing the strip. The anode is formed on an arc, corresponding to the shape of the cathode and is located a short distance from the surface of the cathode. The anode is connected with a suitable source of power so that current will flow from the anode into the solution and pass outwardly from the cathode brushes, this current flow producing a deposit of the metal from the electrolyte on the surface of the cathode in the usual way.

The cathode is rotated with a slow, uniform movement, and the electrolytic conditions in the tank, that is to say, the current density, the strength of the electrolyte, etc., are so selected that during such rotation there will be deposited a continuous, uniform sheet of metal of the desired thickness on the surface of the cathode. As the cathode rotates this metal is stripped from its surface at the point 10, which is located slightly above the solution line, and if it is found necessary a stripper blade 11 may be employed at this point. The stripped sheet is guided over a roller 12, which insures that the strip produced will be supported above the surface of the electrolyte so that there is no possibility of the metal in the strip again going into solution, and the strip then passes over another guide roller 13, through a coloring tank 14.

It will be understood that the coloring tank may be omitted from the process where the plain metal is satisfactory, but in many cases this production of color is a desirable feature and different colors may be produced by the selection of the proper chemicals, according to metal deposited and the use to which the strip is to be put. The coloring tank is in the form of a vat having a V-shaped bottom. Located just above the apex of the bottom is a roller 15, so that the strip passing out of the electrolytic tank is led down beneath this roller, thence outwardly over a guide roller 16, from which it passes to the various other parts of the apparatus. If desired, suitable washing tanks, similar in general to the coloring tank 14, may also be provided so that when the strip finally passes over the guide

roller 16 to receive further treatment the coloring operation will be complete and the chemicals neutralized.

Passing from the roller 16, the strip enters trimming rolls 17, which may be in the form of overlapping discs with cutting edges adjustably mounted so as to trim the edges of the strip and produce a strip of the desired width. In many cases this trimming operation may be omitted, as, for instance, where a relatively cheap product is to be formed. From the trimming rolls the strip is next led to the table 18 where it is to be united to the base material. In the apparatus illustrated in the drawings, the pressure is continuous, that is the strip is applied to the base web as rapidly as it is formed, but inasmuch as the electrolytic operation is slow as compared to the step of applying the strip to the base, one uniting apparatus will serve for several electrolytic tanks and for reasons of economy it is preferable to take up the strip formed in the tank on an arbor and use these rolls of metal in the uniting apparatus as they may be needed. In the drawings the strip is shown as being led directly from the trimming rolls to the uniting devices simply for convenience of illustration.

The uniting apparatus consists of a table 18, the upper surface of which is provided with a series of rolls 19, serving to support the strip in its passage thereover. At the front end of the table is supported a supply of base material, here shown in the form of a roll 20, carried on a suitable arbor. The base web is drawn from this supply roll over a guide roll 21 and passes over the top of the table underneath the metal strip, the two being held in intimate contact by a series of pressure rolls 22. In the event that a single uniting apparatus is to serve a number of tanks the metal strip in the roll form will be supported at any convenient location near the supply of base material, and the strip and web will be led together over the roll 21 in a manner similar to that now illustrated.

The base which I prefer to use is a roofing felt impregnated with asphalt and having a coating of asphalt. In the event that such a coating has not been applied, a thin layer of asphalt or the like is applied to the surface of the base before it comes into contact with the strip. The strip and the base lying in contact, pass over the top of the table and near the front edge thereof pass between a pair of rolls 23 and 24. The lower roll is mounted in fixed bearings and is provided with a yielding surface which may be formed of rubber. The upper roll 23 is mounted in adjustable bearings so that it may be caused to bear on the web passing thereunder, with a regulated pressure. The roll 23 is mounted on journals 45 and has at either end contact rings 46, one of which receives current from a brush 47, while another brush 48 withdraws

current from the opposite contact ring. The material of which that part of the roll is formed which lies between the contact rings 46 and indicated at 49 is of yielding material of an insulating character, as, for example, rubber. As the material passes between these rolls current is caused to flow from one contact, into the metallic strip, thence back to the line through the other contact, and this current is regulated so as to produce a heating effect which raises the temperature of the metal strip to a degree sufficient to soften the plastic compound on the base and the impregnating material in a thin stratum along the face upon which the metal has been laid. The heating of this material causes it to soften and swell so as to wet the surface of the metal which is pressed against the base with a regulated pressure.

Passing from between the rolls 23 and 24, the base and strip enter pressure rolls 22, previously referred to, and are there maintained in intimate contact for a period sufficient to permit the plastic substance to set and thus bind the strip firmly to the base. Inasmuch as the metallic layer is comparatively thin, the heating sufficient to produce the desired result may be rapidly carried on and one pair of rolls similar to 23, 24 are ordinarily sufficient. However, it is possible to make use of two or more pairs of such rolls to increase the speed of operation if desired. The heat which has been generated in the metal does not extend, to any considerable degree into the base itself, but simply softens the plastic substance in a thin stratum of the base while the rest of the base is unaffected. The strip also loses its heat quickly by radiation and this permits the plastic substance to set rapidly.

Passing from the pressure rolls 22, 22, which may vary in number in accordance with the needs of the material being produced, and which are adjustable so as to permit of regulation of the pressure applied, the composite web now passes between trimming rolls 25, similar to the rolls 17, these rolls serving to trim the edges of the selvage to produce material of a selected width. In some instances this second trimming step may also be omitted. From the trimming rolls the material passes through further pressure rolls 26, 26, and is then led off and rolled up, as indicated at 27.

As has previously been explained, the rotary cathode is driven from a suitable source of power and certain of the pressure rolls and the heating rolls may also be driven, thus providing a means for forwarding the material without subjecting it to undue tension. The several driven elements however, will be properly co-ordinated so that the material is advanced through the apparatus with a uniform movement and this rate of movement will in turn depend on the rapidity with which the deposition is carried on. The ob-

ject of such regulation is to produce a strip of the desired thickness and quality and to carry on this production continuously so that the apparatus may be operated without interruption.

In Fig. 1, the apparatus suitable for the production of a deposit suitable for one width of base material has been illustrated, but in the event that it is desired to use a drum of greater length for the deposition it is only necessary to provide a suitable trimming device to slit this deposit to the desired width, and then pass the different parts of the deposit through heating and pressure rolls which are suitably located so that the production of the different webs will not interfere with each other. For this purpose the structures containing the pressure rolls will preferably be of varying heights and placed in staggered relation.

In the apparatus illustrated in Fig. 2 the construction is, in general, similar to that previously described but in this arrangement the strip taken from the rotary cathode is built up by passage through spaced anodes mounted within the tank. The tank 28 accordingly has a deep portion in which the rotary cathode is supported, and a relatively shallow extension 29 in which spaced anodes 30 are disposed. The strip 31 taken from the drum passes beneath a guide roll 32 between the first pair of anodes, thence over guide roll 33 between a second pair of anodes and thence outwardly from the tank under a guide roll 34. These guide rolls are necessary for the purpose of insuring that the strip will not come in contact with the anodes in its passage therethrough. Coming from the tank the strip passes over the guide roll 16, thence through the trimming device previously described, is then laid as fast as it is formed on a web of the base material and then passes between heating and pressure rolls to cause the metal to adhere to the base. The construction of the apparatus for the latter purpose is similar to that previously described. In Fig. 2 the coloring and wash tanks have been omitted but it is to be understood, of course, that such coloring treatment may be given the strip if desired. In both Figs. 1 and 2 there is shown a cleaner device 35 which may be in the form of a scraper or brush bearing against the surface of the cathode and serving to clean it of impurities which might result in breaking the continuity of the deposit.

In Fig. 3 there is shown a strip of the new material of the preferred form. In that figure the base material is shown to have selvage portions 36, 36, while the protective strip 37 is applied to the base centrally thereof. It will be clear that it may be desirable in some instances to apply the protective strip along one edge of the base or in locations other than that shown. For this purpose it is only

necessary to arrange the source of supply of the base material so that the strip will be laid thereon in the desired location, the other steps of applying heat and pressure remaining substantially the same with such slight adjustments in the position of the contacts and the trimming rolls as may be necessary for the new product.

Fig. 4 illustrates the new product composed of a web of base material 38 to which the protective strip 39 has been applied. It will be noted, particularly at the left in Fig. 4, that the base is of somewhat varying thickness due to inequalities in the material due to its production. The protective strip, however, owing to its passage through the various adjustable pressure rolls, is caused to conform to the irregularities in the base and is held thereto by reason of the plastic material which is caused to wet and adhere to the strip.

While I have illustrated an apparatus in which the metallic strip is formed by electrolytic methods and is then laid, as rapidly as it is formed, on the base material and then united thereto, it is to be understood, of course, that I may dispense with the electrolytic step and use a preformed metallic strip. In this latter instance a supply of the sheet metal will be mounted in a location similar to the supply of the base web and the two materials will then be led across the table 18, passed through the heating and pressure rolls and then to the take-up rolls, as has previously been set forth. I prefer to employ the electrolytic method, however for reasons of economy.

It will be seen that I have devised a process and apparatus suitable for the continuous production of the new roofing material by which such material may be produced with a minimum of expense and attention. The process is carried out without interruption so long as supplies of the base and strip are available, or until the anodes are consumed, if the strip is to be led directly from the tank to the uniting apparatus. In the electrolytic tank the electrolyte will be refreshed from time to time in the tank and new anodes will be mounted in place as the old ones are consumed. The finished material taken from the uniting apparatus is wound into rolls of suitable commercial lengths and is then ready for shipment. The protective strip will be found to be so firmly bound to the base by the process described that the rolling and unrolling of the product produces no harmful effects and the finished material may be shipped immediately without damage to the base, inasmuch as the latter has not been softened to any appreciable degree so that it would be injured in the handling incidental to transportation.

I claim:

1. The method of manufacturing sheet material for roofing and other purposes, which

comprises moving longitudinally a web of fibrous material coated with an asphaltic substance in non-adhesive condition, progressively laying a strip of metal on the coated surface of the web, and thereafter progressively uniting the strip and web by electrically generating heat in the metal at one point in the movement of the strip and web, the heat being sufficient to soften the asphaltic coating on the web and render it tacky, and by subjecting the strip and web to pressure applied at the point where the heating takes place and also applied beyond this point.

2. The method of manufacturing sheet material for roofing and other purposes, which comprises moving longitudinally a web of fibrous material coated with an asphaltic substance in non-adhesive condition, progressively laying a strip of metal on the coated surface of the web, and thereafter progressively uniting the strip and web by electrically generating heat in the metal at one point in the movement of the strip and web, the heat being sufficient to soften the asphaltic coating on the web and render it tacky, and by subjecting the web to the application of recurring pressures applied during the generation of the heat and thereafter.

3. The method of manufacturing sheet material for roofing and other purposes, which comprises progressively laying a strip of metal on a surface of a web impregnated and coated with a plastic substance, this substance in the coating being in non-adhesive condition, progressively applying pressure to the strip and web to hold the two in intimate contact, simultaneously generating heat electrically in the strip sufficient to soften the plastic coating to render it tacky, and regulating the heating to prevent any substantial softening of the plastic material within the web.

4. The method of manufacturing sheet material for roofing and other purposes, which comprises laying a strip of metal progressively on the surface of a base coated with a plastic compound in non-adhesive condition, causing an electric current to flow through the strip after it is so laid along a path moving relatively to the strip in a direction lengthwise of the latter to raise the temperature of the metal to an extent sufficient to soften the plastic coating and render it tacky, and applying pressure to the strip and web to cause the two to be united by the softened plastic compound.

5. The method of manufacturing sheet material for roofing and other purposes, which comprises moving a strip of metal past a supply of fibrous material in the form of a web, this material having a coating of a plastic compound in non-adhesive condition, drawing the web material from the supply at a speed corresponding to the movement of the metallic strip, placing the strip in con-

tact with the coated surface of the web during such movement, and thereafter uniting the strip and web progressively by causing an electric current to flow through the strip to raise the temperature thereof to an extent sufficient to soften the plastic coating and render it tacky, and by applying pressure to the strip and web to cause the two to be united by means of the coating.

6. Apparatus of the type described, comprising means for placing in motion a web of fibrous material of indefinite length, this material being coated on one surface with a plastic compound in non-adhesive condition, means for continuously laying a strip of metal on the coated surface of the moving web, electrical means for progressively generating heat in the strip as it moves along in contact with the web, the heat being sufficient to soften the plastic coating and render it tacky, and means for applying pressure to the strip and web to cause the plastic coating to adhere to the strip to unite the strip and web.

7. Apparatus of the type described, comprising means for setting in motion a web of fibrous material of indefinite length, one surface of this material being coated with a plastic compound in non-adhesive condition, means for continuously laying a strip of metallic material on the coated surface of the web, means disposed at one point in the path of travel of the strip and web for electrically generating heat in the strip while it is in contact with the web sufficient to

soften the plastic coating on the web, the pressure means acting progressively on the strip and web after the strip has been heated and causing the strip and web to be united by the softened plastic coating on the web.

8. In apparatus of the class described, the combination of means for setting in motion a web of base material having one surface coated with a layer of plastic material in non-adhesive condition, means for continuously laying a strip of metal on the coated surface of the web, means for causing an electric current to flow through the metal after it is in place on the web, including contact devices bearing on the surface of the strip and pressure devices for applying pressure to the strip and web after the strip has been heated by the passage of the current.

9. Apparatus of the type described, comprising driven rolls for drawing a web of fibrous material from a supply, this material having a coating of plastic material in non-adhesive condition on one surface thereof, means for continuously laying a strip of metal on the coated surface of the web, a pair of rolls through which the web and strip are passed, contact members in one of these rolls connected to a source of electrical energy and arranged to cause a current to flow across the strip to raise the temperature thereof, and pressure rolls through which the web and heated strip are passed arranged to force the strip and web into intimate contact.

In testimony whereof I affix my signature.

JULIUS H. GILLIS.