The invention relates to the production of paper boxes or wrappers for protectively containing fragile articles such as electric light bulbs or radio tubes.

Heretofore, so far as I am aware, the most common practice in effecting the production of such wrappers has been to print a sheet or web of material, pile it sheet form or re-wind it in roll form, let it set several hours or days as required, so that the ink would become thoroughly dry, and then make it up into the articles desired. This, of course, interferes with speed of production.

One of the objects of my invention is to effect rapid production of paper boxes or wrappers having corrugated linings, by a sequence of operations comprising the feeding of two webs of paper, printing one of the webs if desired, corrugating the other web, adhesively uniting the two webs, folding the duplex web to tubular condition, and cutting the folded duplex web into sections, without necessitating any stoppage of the machine to enable adjustments to be effected to compensate for accumulative errors.

Another object is to provide a machine which automatically and continuously converts two sheets or webs of paper into completed boxes or wrappers having corrugated linings.

Another object is to produce paper boxes or wrappers each comprising a smooth exterior layer having a continuous corrugated lining, one edge of the smooth layer being unlined and overlying and adhesively secured to the lined other edge of said exterior layer.

With said objects in view, and others hereinafter explained, my invention consists in the method and machine, substantially as hereinafter described and claimed.

Of the accompanying drawing:

Figure 1 is a side elevation of the essential parts of the machine for carrying out my improved method.

Figure 2 is a plan view of the same.

Figure 3 is a plan view of a portion of the combined or duplex web at an intermediate portion of the operation.

Figure 4 is a plan view of a flat blank before it is folded.

Figure 5 is a plan view of a flat blank folded to completed condition.

Figure 6 is a perspective view of one of the wrappers when set up or opened for use.

Similar reference characters indicate similar parts or features in all of the views.

Referring first to Figures 1 and 2, the different parts or members of the machine are mounted on a suitable base indicated by the line 12 in Figure 1.

Mounted in standards 13 at one end of the base 11 is a roll of paper for supplying the web 5 a which is drawn uniformly and continuously through the machine by the action of rolls of other units of the machine to be described presently, it being understood that such other rolls are driven at practically uniform continuous peripheral speed by gearing not necessary to illustrate.

The next unit comprises means for printing the web 5 a, it being understood however that I do not limit myself thereto, as said unit may be omitted, or the web 5 a may be guided to pass the printing unit without having ink applied thereto. As illustrated, the web 5 a passes between rolls 14, 15, supported by standards 16, the upper roll 14 being of any known type to effect printing, usually at predetermined intervals, on the upper surface of the travelling web 5 a.

When color printing is to be effected, ink is supplied to the roll 14 by suitable ink-distributing rolls. And if the printing is to be effected by embossing the web, without colors, then an embossing roll is employed instead of the ink-printing roll 14.

The next unit comprises an oven 17 supported by standards 18, said oven, when in use, being kept at a suitably high temperature by electricity or gas flames as may be preferred. Such heating however may be stopped if no ink-printing is being effected.

The next unit comprises a pair of rolls 19, 20 supported by standards 21, said rolls having cooperating peripheral ribs and grooves to act on a web 20 of paper drawn from a supply roll mounted in standards 22. As the web 20 passes around the upper corrugating roll 19, the crowns of the corrugations receive glue or other suitable adhesive material from a roll 23 supported by the standards 21, the said roll 23 being supplied with adhesive in a pot 24. Above the roll 19 is a pressure roll 25, and therefore the smooth web a and the corrugated web b, issue from between the rolls 19, 25, as a duplex web.

For a reason explained hereinafter, the web a is wider than the web b as best illustrated in Figure 3.

The next unit comprises a pair of rolls 26, 27 supported by standards 28. The lower roll 27 has, at its mid-length, a peripheral knife 29 which, as the duplex web is drawn along, cuts the said web at its mid-width to divide it into...
two strips each having along one edge a projecting edge portion of the web, said projecting edge portion being indicated at 'a' in Figures 4, 5 and 6.

Each side of the knife 29 the roll 27 also has three peripheral ribs 30 which act on the corrugated member or layer of the duplex web to effect creasing of the corrugations to facilitate the folding of the articles, as presently described, to the condition illustrated by comparing Figures 5 and 6. Such creasing is indicated at 'b' in Figures 3 and 4.

The roll 27 also has, at each end, a disk 31 (Fig. 2) supplied with glue or other suitable adhesive in a trough 32 (Fig. 1). Said disks 31 are narrow and apply adhesive only to the under surfaces of the two projecting margins or edges 'a' of the smooth member or layer of the duplex web.

As the duplex web approaches the unit just described, it is in the condition shown in the left-hand portion of Figure 3, and as it leaves said unit, it is cut or divided on the line 'b', and the corrugated layer is creased on the lines 'b'.

Said Figure 3 illustrates another portion of the duplex web as it would appear looking upward in the neighborhood of the rolls 26, 27.

As illustrated in Figure 2, the duplex web, divided into two longitudinal sections, passes to the next unit which comprises two suitable supported folders 33. The said folders are so mounted and shaped as to bend the two edge sections downwardly on the two crease lines nearest to the cut edge 'b' (Fig. 4) and the edge having the projecting flap 'a', and to then turn them toward each other with the adhesive-carrying flap overlying the margin where the cut 'b' was effected, as illustrated by comparing Figures 4, 5 and 6. It is to be understood however that Figures 4 and 5 do not illustrate the condition of a web as it leaves the folders, because the cutting, yet to be described, has not been effected. In other words, each of the two duplex webs, as it approaches a folder is a long flat duplex strip both members of which are in alignment along one edge and the other edge having the thin flexible flap 'a' and as it leaves a folder, it is a long folded strip, the overlapping seam being underneath. Figure 5, although illustrating a completed wrapper, serves to illustrate the condition of each duplex web as it leaves the folders.

The next unit comprises a pair of pressure rolls 34 supported by standards 35. The two strips of duplex folded webs pass between said rolls to effect reliable adhesion of the glue-carrying margins or flaps 'a' to the surface along the opposite edge, so as to be in condition for the cutting into such condition as illustrated in Figure 6. This last-mentioned condition is effected by the cutting unit comprising rolls 36, 37, supported by standards 38, one of said rolls having knives 39 which simultaneously cut the two duplex folded strips into such sections as illustrated in Figure 5, and deliver them onto a suitable delivery apron 40. Said Figure 3 illustrates a portion of the duplex web, the cutting into lengths which may vary according to the uses to which the wrappers are to be put. This may be done by employing a knife-carrying roll 36 of greater or lesser circumference.

While I have illustrated and described the roll 27 as having three peripheral creasing ribs 30 each side of the dividing knife 29, or in other words, a total of six ribs 30, it is to be understood that the number of creasing ribs 30 carried by the roll 27 may vary. For instance, if the finished article is to be hexagonal, then the roll 27 will have five ribs 30 each side of the knife 29, and if the finished article is to be octagonal, then the roll 27 will have seven ribs 30 each side of the knife 29.

It will be readily understood, without need of illustration, that any suitable motor may be employed for operating the machine, and that suitable gearing is employed in practice to cause the various rolls to rotate at uniform peripheral speed to effect the travel of the webs through the machine under uniform continuous tension, in order that the operations of the web will be effected in the sequence described and without having to effect adjustments to compensate for what is known as accumulative errors. This is illustrated by the straight line of travel of the webs indicated in Figure 1.

I do not claim herein the article produced by the method or machine which I have described, as the same forms the subject matter of my application Serial No. 26,153, filed June 12, 1935.

Having now described my invention, I claim:

1. The making of article containers by a sequence of operations, consisting in feeding two webs of paper, corrugating one web and printing the other, adhesively uniting the two webs, folding the duplex web to tubular condition, maintaining the webs under uniform continuous tension throughout the sequence of operations, and cutting the folded duplex web into sections.

2. The method of making article containers by a sequence of operations, consisting in feeding two webs of paper, corrugating one web, adhesively uniting the two webs, dividing the result- ing duplex web into longitudinal sections, folding said longitudinal sections to tubular condition, maintaining the webs under uniform continuous tension throughout the sequence of operations, and transversely cutting the said longitudinal sections.

3. The method of making article containers by a sequence of operations, consisting in feeding two webs of paper, printing one web and corrugating the other web, adhesively uniting the two webs, folding the duplex web to tubular condition, maintaining the webs under uniform continuous tension throughout the sequence of operations, and cutting the folded duplex web into sections.

4. The method of making article containers by a sequence of operations, consisting in causing two paper webs of different widths to travel, corrugating the narrower web and adhesively connecting it with the wider web to provide a duplex web having thin margins, applying adhesive to said thin margins and dividing the duplex web into longitudinal sections, folding each section to flat condition with its adhesive-coated margin overlying the other margin, and cutting the two folded sections into predetermined lengths.

5. The method of making article containers by a sequence of operations, consisting in causing two paper webs of different widths to travel, printing the wider web, corrugating the narrower web and adhesively connecting it with the wider web to provide a duplex web having thin margins, applying adhesive to said thin margins and dividing the duplex web into longitudinal sections, folding each section to flat condition with its adhesive-coated margin overlying the other margin, and cutting the two folded sections into predetermined lengths.
6. The method of making article containers by a sequence of operations, consisting in causing two paper webs of different widths to travel, corrugating the narrower web and adhesively connecting it with the wider web to provide a duplex web having thin margins, longitudinally creasing the corrugated web and applying adhesive to said thin margins and dividing the duplex web into longitudinal sections, folding each section to flat condition with its adhesive-coated margin overlying the other margin, and cutting the two folded sections into predetermined lengths.

7. A machine for making article containers, comprising means for causing two webs of paper to travel, corrugating rolls for operating on one of the webs, means for adhesively connecting the corrugated web with the other web to provide a duplex web, cutting and creasing rolls for dividing the duplex web longitudinally and creasing the corrugated layer, folders for converting the divided duplex web into flat tubes, and means for transversely cutting said flat tubes into sections.

8. A machine for making article containers, comprising means for causing two webs of paper to travel, printing mechanism for operating on one of the webs, corrugating rolls for operating on the other web, means for adhesively connecting the corrugated web with the other web to provide a duplex web, cutting and creasing rolls for dividing the duplex web longitudinally and creasing the corrugated layer, folders for converting the divided duplex web into flat tubes, and means for transversely cutting said flat tubes into sections.

9. A machine for making article containers, comprising means for causing two webs of paper to travel, printing mechanism for operating on one of the webs, a heater past which said web travels from the printing mechanism, corrugating rolls for operating on the other web, means for adhesively connecting the corrugated web with the other web to provide a duplex web, cutting and creasing rolls for dividing the duplex web longitudinally and creasing the corrugated layer, folders for converting the divided duplex web into flat tubes, and means for transversely cutting said flat tubes into sections.

10. A machine for making article containers, comprising means for causing two webs of paper to travel, printing mechanism for operating on one of the webs, a heater past which said web travels from the printing mechanism, corrugating rolls for operating on the other web, means for adhesively connecting the corrugated web with the other web to provide a duplex web, cutting and creasing rolls for dividing the duplex web longitudinally and creasing the corrugated layer, folders for converting the divided duplex web into flat tubes, and means for transversely cutting said flat tubes into sections.

11. A machine for making article containers, comprising means for causing two webs of paper to travel, printing mechanism for operating on one of the webs, a heater past which said web travels from the printing mechanism, corrugating rolls for operating on the other web, means for adhesively connecting the corrugated web with the other web to provide a duplex web, cutting and creasing rolls for dividing the duplex web longitudinally and creasing the corrugated layer, folders for converting the divided duplex web into flat tubes, and means for transversely cutting said flat tubes into sections.