

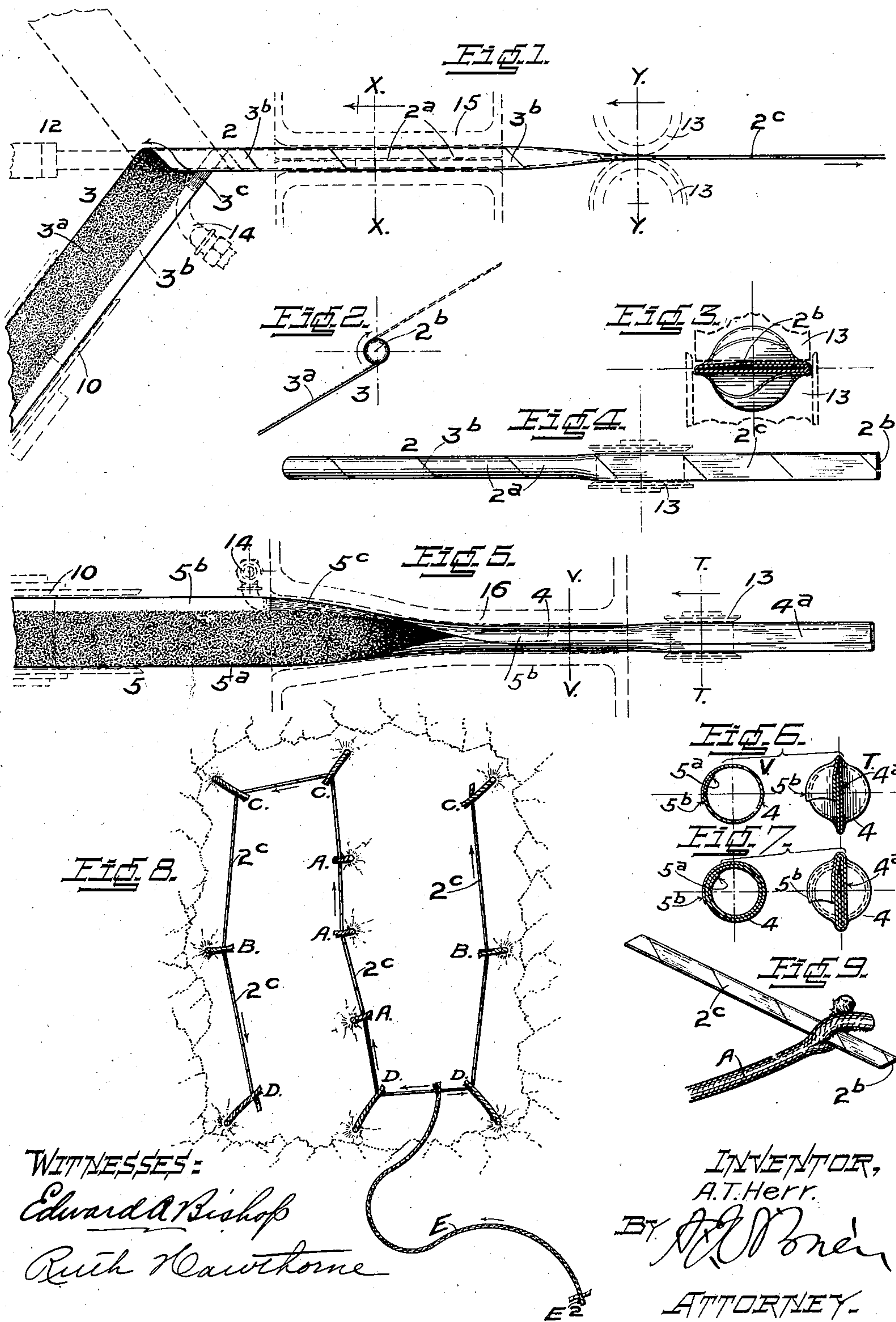
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A. T. HERR.

IGNITING TAPE AND PROCESS OF PRODUCING SAME.

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WITNESSES:

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IGNITING-TAPE AND PROCESS OF PRODUCING SAME.

No. 871,696.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ARTHUR T. HERR, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Igniting-Tapes and Process of Producing Same; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to an igniting device and a process of producing same and has for its object the construction of an inflammable, rapidly burning, explosive, tubular igniting tape, which is prepared by coating a ribbon of cloth, paper or other suitable material upon one side thereof, with an inflammable, explosive compound, which coated ribbon is then formed by any suitable means into a tubular tape of indefinite length, and secured in this form by pasting the fabric, preferably, with a pliable, waterproof, adhesive compound. In forming the ribbon into a tubular tape the side which is coated with the inflammable compound is disposed upon the inner side of the tube, while the side of the fabric forming the outer tubular surface of the tape may be coated with any suitable waterproof compound, rendering the tape impervious to moisture, which property is found necessary to meet the requirements of practice in some of the arts to which the use of the igniting tape pertains. This exterior waterproof coating also reduces the probability of conditions arising, tending to impair the explosive qualities of the interior combustible coating, because of hygroscopic properties, possibly incident thereto. It is also desirable that the waterproof coating shall possess inflammable properties, whereby it will aid the interior compound in the assured thorough combustion of the igniting tape. This tubular tape is formed with an open center circulating vent or flue which aperture, together with the gases of combustion, generated and exploded upon ignition of the tape, causes the same to burn with great rapidity and burst asunder the fabric shell of the tube, flashing flames and sparks

through the fracture which effect the rapid and assured ignition of combustible objects to which a length or circuit of the igniting tape is suitably attached.

My invention is found to be of great utility in the art of blasting, and is particularly adapted to use in conjunction with the ordinary powder-core blasting fuses. By using a length of the igniting tape necessary to connect the same consecutively with a round of any number of fuses by suitably attaching the tape to the split end of each, the simultaneous ignition of the same is effected by the rapid combustion and explosion of the tubular tape throughout its entire connected length. The ignition tape being waterproofed, it effects the same positive ignition of fuses in wet mine workings, as in dry. My igniting tape can, in like manner, be utilized in the instantaneous ignition of set fireworks pieces, being made upon automatic continuous process machines, in indefinite lengths, of uniform combustible force and of quite pliable texture, it is especially adapted to be connected throughout a circuitous line to objects such as the profile lights of figure pieces, portraits, etc.

Referring to the drawings, Figure 1 is a side view of one form of construction of the tubular igniting tape. Fig. 2 is a cross section on line $x-x$ of Fig. 1. Fig. 3 is a cross section on line $y-y$ Fig. 1 on an enlarged scale. Fig. 4 is a plan view of the corresponding portion of the tape shown in side and edge view in Fig. 1. Fig. 5 is a plan view of a modified construction of the igniting tape. Fig. 6 is cross-sections V and T, taken respectively on lines V and T of Fig. 5 on an enlarged scale. Fig. 7 is a cross-section on line V of a further detail modification of the construction, shown in Fig. 5 on an enlarged scale. Fig. 8 is a graphic illustration of the application of my igniting tape to the blasting fuses of a round of shots in a mine tunnel or drift. Fig. 9 is a detail, enlarged scale illustration, showing the preferred method of attaching the igniting tape to the split end of the ordinary powder-core blasting fuse.

The same reference characters indicate the same parts in all the views.

It will be understood that to produce this igniting tape as a commercially valuable article of manufacture, a method of con-

tinuous-process, automatic machine manufacture must be resorted to, and in describing the detail features of composition and construction of the tape, reference will be made to the detail parts of such machines, only so far as is necessary to give a clear and concise description of the detail construction of the tape, since a description of such machine construction is intended to form the subject matter, of an entirely separate and distinct application.

Referring to Fig. 1, I show the tubular tape 2, being continuously produced by the uniformly pitched spiral winding, 2^a, of the combustibly charged ribbon 3. This ribbon is made of any suitable material, as cloth, paper, etc. As a matter of economic production, I prefer to use a commercial brand of light texture, cotton cloth, not too closely woven, a slightly open mesh being best adapted to my requirements. By any best adapted method as brushing, rolling, spraying, etc., I charge or coat about three-fourths the full width of one side of the ribbon as 3^a with an inflammable compound, the remaining uncoated strip 3^b, (being the following-edge of the spiral wind) being the paste carrying portion of the ribbon. This coated ribbon may be paid out from the usual construction of revolvably mounted reel 10, and thereby spirally wound upon a fixed, end-tapered arbor or mandrel 12, with the inflammably coated side disposed upon the inner side of the spiral tube. A tape of greater explosive strength may be produced, if desired, by winding two or more inflammably charged ribbons into the spiral, as indicated by broken lines in Figs. 1 and 2. By this method a spirally wound tube is formed having a longitudinally disposed central vent or aperture, 2^b, as shown in Figs. 2, 3, 4 and 9. The adhesive paste is applied, from any convenient receptacle 14, revolvably mounted to rotate in unison with the reel 10 immediately in advance of the closing spiral wind, as at 3^c, and is immediately dried by being passed through a conveniently arranged drying box 15. The spiral tube is stripped from the fixed mandrel by carrying rollers 13, arranged adjacent the taper end of the same. These rollers also serve as flattening rolls, pressing the spiral tube into the form of a flat tubular tape as shown at 2^c, Figs. 1, 4 and 9. The flattening of the tube in this manner does not seal up the longitudinal central vent 2^b inasmuch as the engaging inner surfaces of the combustibly charged tube are of a dry, minutely-particled, granulous nature. This flattened shape of the tubular igniting tape permits of winding the same into a comparatively compact mass, when reeling it into packages for the market. Preceding this reeling process, however, the flattened tape 2^c, immediately after leaving the winding

arbor and flattening rolls is subjected to any suitable method of coating the exterior surface with a waterproofing compound, as for example, immersing the same in a vessel of liquid coating, (not shown) being carried through the solution by conveniently disposed guide rollers, and if necessary, then passed through drying chambers, (not shown) and subjected to enforced drying, permitting the continuous-process production, from which last treatment, it is carried to the reeling process above referred to.

In Fig. 5 I show a modified construction of the tubular igniting tape, wherein the ribbon 5 paid out directly from a fixed bearing reel 10, and rolled transversely, into the hollow, longitudinal tubular form 4, by drawing the ribbon through a suitably constructed spiral forming die 16, or by other suitable means disposing the inflammably coated edge 5^a, of the ribbon, within the outer, lapping paste-charged edge 5^b, as is shown in cross section in Fig. 6 V. This tube is then flattened by suitable carrying rolls, as shown in plan view at 4^a Fig. 5, and in cross section in Fig. 6 T. This form of tubular igniting tape may be produced, with increased explosive strength, by transversely rolling; by suitable means, an inflammably charged ribbon, of properly increased width, into a double-lapped, hollow, longitudinal tube, as shown in cross section in Fig. 7, and then rolled into a flat tubular tape, as also shown in cross section in this figure.

In Fig. 8 I show the method of applying the rapid burning, explosive, tubular igniting tape, when used in firing a round of blasting fuses in a mine tunnel. It is desirable in practice to fire the several charges in a predetermined order, to effect the breaking of the rock to the best advantage, as for example, the center cut group A, A, A should be fired first. The sides B, B next and so on. Any desired order of firing can be controlled to a certainty by cutting the blasting fuses accordingly, as to their lengths in the respective groups, those to fire first, as A, A, A having the shortest cut fuses, and those next in order, B, B having the fuses cut slightly longer, with a uniform interval of increasing length, for the fuses of each succeeding group next in order to be fired, as C, C, C and D, D, D. The tape flashing its circuit with instantaneous rapidity, practically ignites all fuses to which it is attached simultaneously, their varying lengths determining the order of firing the charge of each. By this method of ignition a material saving of blasting fuse is effected, as compared with the lengths of fuses required for safety when igniting by candle or torch, in lieu of the circuit of igniting tape consumed. The igniting tape, however, being the cheaper commercial commodity, affords the miner a more economic method of mining, enables

him to break rock to better advantage and assures him a greater degree of safety in the execution of his work.

Inasmuch as the short cut fuses A, A, A ignited by the miner directly, with the rapid burning igniting tape, may explode their charges before he has time to reach a place of safety, I interpose, for his protection, the use of a necessary length of the ordinary slow-burning blasting fuse E, which is attached to the igniting tape 2° at any convenient point. The miner ignites this fuse only, at the free end E², and while it is slowly burning its length to the end attached to the igniting tape, he is afforded ample time to remove to a place of safety before the explosion occurs. The fire from the time fuse E ignites the tape 2°, which instantly flashes its igniting flames in both directions, as indicated by the arrows in Fig. 8, firing all the fuses to which it is attached.

From the above description, showing clearly the utility of the igniting tape in controlling the firing of powder charges in mine blasting, those skilled in the art will readily comprehend the advantages to be gained by using this article as a "quick match" in igniting the set pieces, etc., of fireworks.

Having thus described my invention, what I claim is:

1. The herein described process of forming an igniting device consisting in applying an inflammable coating to one surface of a strip of material, also applying a coating of adhesive material to a portion of the same surface of the strip, and forming the said strip into a tube with the inflammable coating innermost and with the portion having the adhesive coating overlapping whereby the tubu-

lar form is maintained and finally flattening 40 the device thus formed.

2. An igniting tape composed of a strip of material coated on one surface with an inflammable substance and having an edge overlapping portion or part coated with an 45 adhesive substance, the said strip being spirally wound to conceal the inflammable substance whereby the portion containing the adhesive substance is made to overlap the body of the strip on the outside, the de- 50 vice being flattened for the purpose set forth.

3. An igniting tape composed of a strip of material coated on one side with an inflammable substance and also having a portion of the same surface coated with adhesive mate- 55 rial and spirally wound to protect the inflammable coated surface.

4. An igniting device composed of a strip of material coated on one surface with an inflammable substance and also having a por- 60 tion of the same surface coated with adhesive material, the same being spirally wound to protect the inflammable coated surface and flattened for the purpose set forth.

5. A process of forming an igniting device, 65 consisting in applying an inflammable coating to one surface of a strip of material and applying an adhesive coating to a portion of the same surface, forming the said strip into a tube and applying to the exterior of the 70 latter a waterproof coating.

In testimony whereof I affix my signature in presence of two witnesses.

ARTHUR T. HERR.

Witnesses:

DENA NELSON,
MAY GAWLEY.