No. 717,049. Patented Dec. 30, 1902.

J. S. STOKES.

MACHINE FOR PUNCHING METAL STRIPS.

(Application filed Feb. 14, 1900.)

(No Model.) 3 Sheets—Sheet 1.

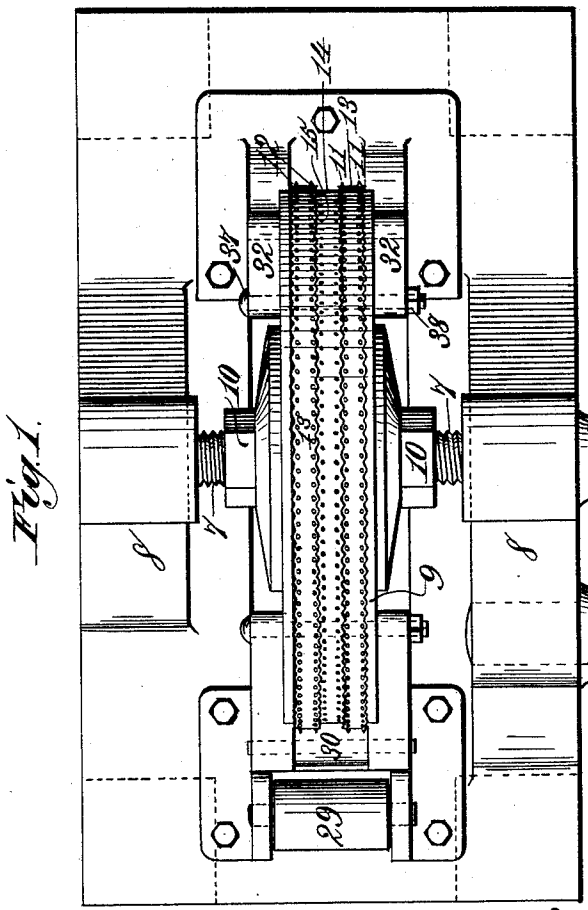


Fig. 1.

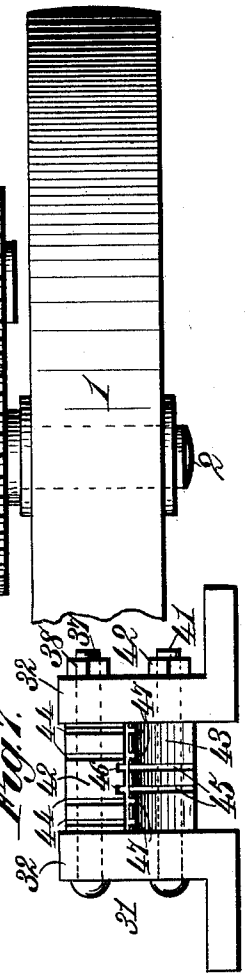


Fig. 4.

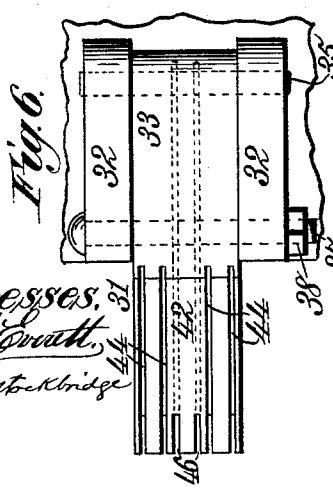


Fig. 6.

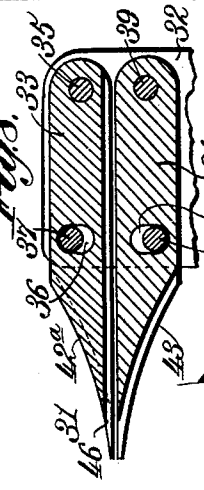


Fig. 8.

Witnesses,
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(No Model.) 3 Sheets—Sheet 2.

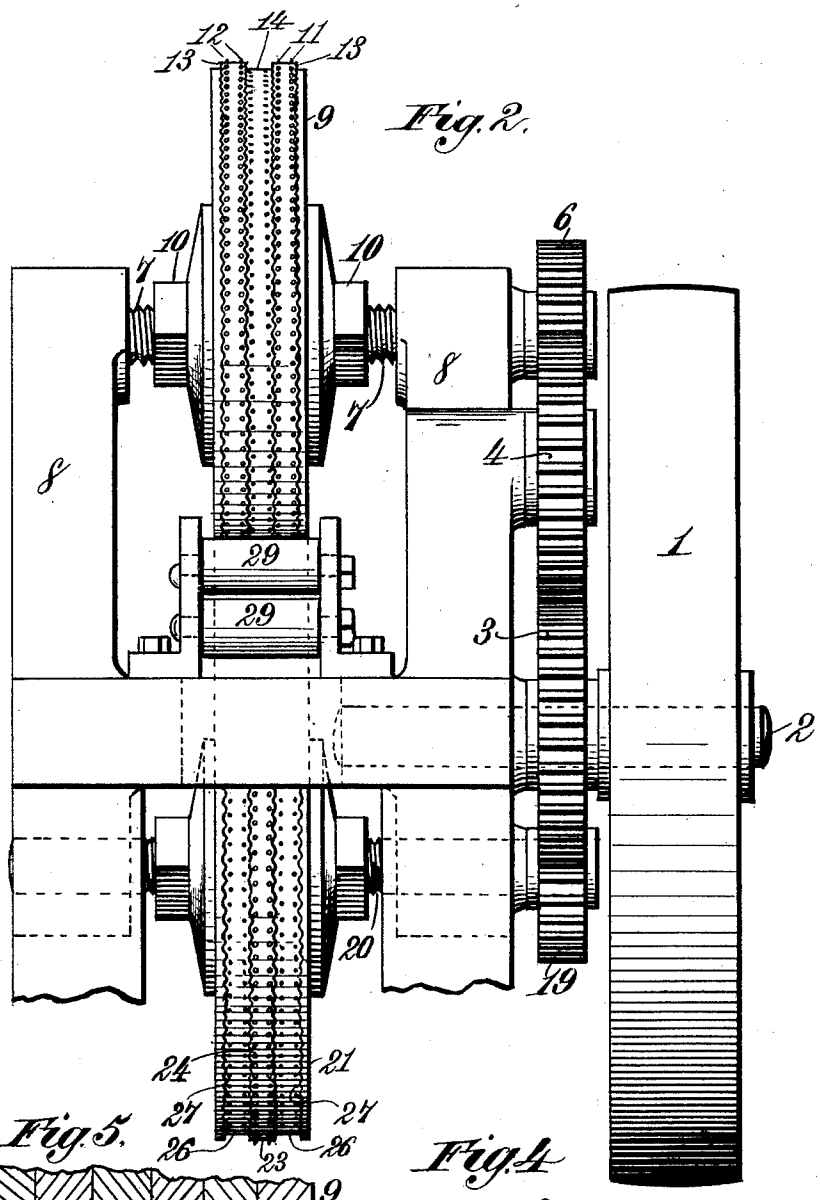


Fig. 2.

Fig. 5.

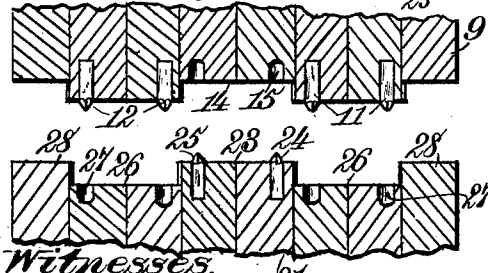
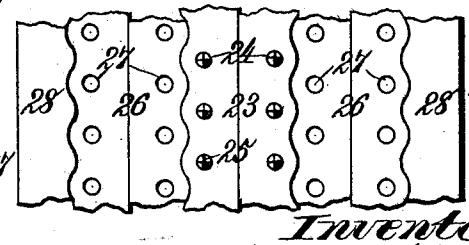


Fig. 4



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MACHINE FOR PUNCHING METAL STRIPS.

(Application filed Feb. 14, 1900.)

(No Model.) 3 Sheets—Sheet 3.

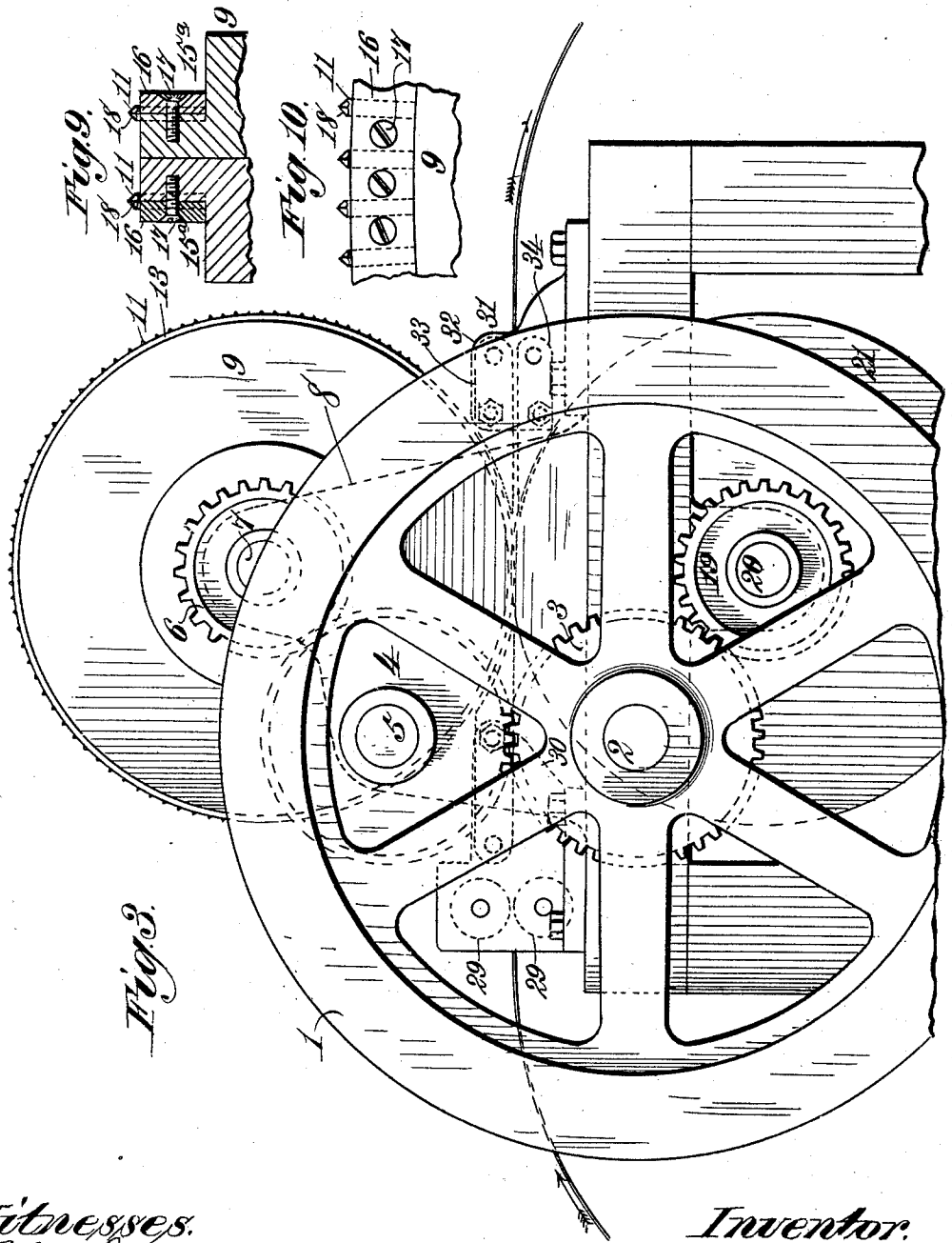


Fig. 3.

Witnesses.
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UNITED STATES PATENT OFFICE.

JOHN S. STOKES, OF MOORESTOWN, NEW JERSEY.

MACHINE FOR PUNCHING METAL STRIPS.

SPECIFICATION forming part of Letters Patent No. 717,049, dated December 30, 1902.

Application filed February 14, 1900. Serial No. 5,176. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. STOKES, a citizen of the United States, residing at Moorestown, in the county of Burlington and State of New Jersey, have invented certain new and useful Improvements in Machines for Punching Metal Strips, of which the following is a specification.

In an application for patent filed by me concurrently herewith, Serial No. 5,175, I have shown and described certain improvements in machines for punching metal strips of unlimited length to be used in the manufacture of paper boxes, the same comprising a rotary feed for the material operated upon and rotary cutters for trimming the strip during or just after the punching operation has been performed. My present invention has in view the same object—that is, of punching holes into and producing burs on the under side of sheet-metal strips and of forming the edges of said strip of an equal maximum width throughout, so that they may be properly handled in the machine which applies the same to the paper boxes.

The invention consists, in the present instance, of a rotary punching-wheel provided with punches adapted to form the holes in and produce the burs on the under side of the strip operated upon and means for cutting the edges of the strip.

It also consists of punching mechanism and means for forming simultaneously a plurality of punched strips.

It also consists of a rotary punching-wheel and coöperating mechanism for receiving the punches carried by said wheel, whereby the extent of the outward bend of the prongs of the burs may be controlled.

It also consists of a pair of coöperating combined punching, cutting, and feeding wheels for a plurality of strips.

It also consists in certain features and details of construction, which will be more fully hereinafter described and claimed.

In the drawings forming part of this specification, Figure 1 represents a plan view of one embodiment of my invention. Fig. 2 is a front elevation of the same. Fig. 3 is a side elevation looking to the left in Fig. 2. Fig. 4 is an edge view of a portion of one of the punching-wheels. Fig. 5 is a detail sectional view showing the edges of both of the wheels. Fig. 6 is a detail plan view of the triple stripper employed. Fig. 7 is a front elevation, and Fig. 8 is a sectional side elevation, of the same. Figs. 9 and 10 are detail sectional and side views of a modified form of punching-wheel, showing the means of securing the separate punches thereto.

Like reference-numerals indicate like parts in the different views.

The fly-wheel or driver 1 is mounted on a shaft or axle 2 and has keyed or otherwise secured to it a gear-wheel 3, which meshes with an idle pinion 4, mounted upon a stud or shaft 5, carried by the main frame of the machine. The pinion 4 in turn meshes with a pinion 6 on one end of a shaft 7, mounted in suitable bearings in the uprights or standards 8 8, forming part of the main frame, and carrying a punching-wheel 9. The said punching-wheel is adjustably mounted on and secured to the shaft 7 by means of the screw-clamps 10 10, which engage the screw-threads on the shaft 7. In the periphery of the punching-wheel 9 are secured, in the form of my invention herein illustrated, a plurality of parallel rows of punches 11 12. These rows of punches are parallel to each other both longitudinally and transversely, and each punch in each row is at an equal distance from the adjacent punch in front of and behind the same. The punches are mounted in the ribs or projecting portions 13 13 on the periphery of the wheel 9, the corners of said ribs or projecting parts being sharpened to form cutting edges. A circumferential recess 14 between the ribs 13 13 has a plurality of rows of recesses or sockets 15, arranged similar to the punches 11 and 12 and adapted to receive the punches on a coöperating punching-wheel, to be described presently.

In Fig. 2 of the drawings I have shown two ribs 13 and a single intervening groove or recess 14. It is obvious, however, that I may dispense altogether with one of said ribs and with said groove or recess or I may increase the number of both of these parts indefinitely.

The punches 11 12 are removably secured in the periphery of the wheel 9, so that when

they become worn or when for any reason it is desired to substitute new or different punches they may be readily withdrawn from the sockets in which they fit and substitutes inserted therein. In Figs. 9 and 10 of the drawings I show one means whereby the said punches may be removably secured in place. In this form of my invention the punching-wheel 9 is rabbeted, as shown at 15ª, on opposite sides adjacent to the periphery thereof, and fitting within the rabbeted portions of said wheel are annular bands or rings 16 16, the said rings fitting against the side faces of the rabbeted portion of said wheel and secured in place by screws 17 or other analogous devices. The sockets in which the punches 11 fit are formed in the adjacent faces of the rings 16 and wheel 9, as clearly shown. By loosening the screws 17, which secure the ring 16 in place, and separating said ring slightly from the face of the wheel 9 it is obvious that the punches 11 may be readily removed and new ones substituted therefor.

Each of the separate punches employed is cylindrical in form, so that it is capable of punching a round hole. The active or engaging end thereof is pointed, however, and adjacent to the point is a plurality of curved faces 18, between which are sharpened cutting edges. This form of punch is adapted to cut separate prongs for each bur and to bend the same so that they will incline outwardly from the opening in order that they will spread and pass into the material on which the completed strip is used at an angle, and thereby clench themselves in said material.

The gear-wheel 3, heretofore referred to, also meshes with a pinion 19, secured to a shaft 20, carrying the lower punching-wheel 21, adjustably secured to the shaft 20 by the screw-clamps 22, similar to the clamps 10, above described. The punching-wheel 21 lies directly beneath the punching-wheel 9 and is a counterpart of the same—that is to say, it is formed with a central circumferential rib 23 opposite to, in line with, and of the same width as the recess 14 in the wheel 9. The said rib 23 has secured therein punches 24, similar in all respects to the punches 11 and 12, heretofore described. The corners 25 of the rib 23 are sharpened and form cutting edges which coöperate with the corresponding sharpened corners of the ribs 13 to produce cutters or trimmers for the edges of the sheet-metal strips operated upon. On opposite sides of the rib 23 the wheel 21 is formed with grooves or recesses 26 26, similar in all respects to the groove 14 on the wheel 9 and lying opposite to, in line with, and of the same width as the ribs 13 on said wheel 9. Sockets 27 are formed in the grooves or recesses 26, which are arranged in parallel rows similar to and adapted to receive the punches 11 and 12 on the wheel 9. Outside the grooves or recesses 26 the corners 28 28 of the projecting portion of the wheel 21 are sharpened and coöperate with the outer corners of the ribs 13 on the wheel 9 to produce cutters for the side edges of the strips operated upon.

From the foregoing description it will be seen that during the operation of the machine the punching-wheels 9 and 21 will be rotated in opposite directions, so that the adjacent edges of said wheels will move in the same direction. The said wheels are so adjusted on the shafts which carry them that the punches on one wheel will register with the sockets on the other, so that during the punching operation of the strip operated upon the prongs forming the burs on the under side of the strip will be received in said sockets, and the side walls of said sockets will limit the outward movement of said prongs to produce burs of uniform shape throughout the length of the strip and control the angle at which said prongs lie to the plane of said strip. It will also be observed that the sharpened corners of the ribs on the two coöperating punching-wheels produce cutters on said wheels themselves, which operate to cut the strip simultaneously with the punching thereof and at the same time separate the strips from each other. This is essential, in that the strips must be held against lateral movement while being punched in order that the punched openings and the burs formed by the punch shall retain an alinement longitudinally of the strip. By employing, therefore, a blank strip of sufficient width a plurality of narrow strips may be cut therefrom at the same time that the punching of said narrow strips is effected. This cutting up of the strips at the same time that the punching is performed insures a uniform maximum width of the completed strip and also makes certain the proper location of the holes by which the burs are formed with respect to the side edges of said strip. It also effects a saving of material, in that all waste is avoided in the trimming of the edges of the material, except that produced along the outer edges of the outer strips. It is obvious that the configuration of the cutters may be whatever is desired. It is preferred that they be fluted or corrugated in order to produce corresponding edges on the completed strip; but they may be straight, notched, or of any other shape desired. It will also be observed that the rotation of the adjacent edges of the punching-wheels 9 and 21 in the same direction, together with the engagement of the strip or strips operated upon by the punches on said wheels, will cause the feeding forward of the strip by the punching-wheels themselves. The wheels 9 and 21 therefore constitute punching, cutting, and feeding wheels.

As heretofore stated, I do not limit myself to any particular number of ribs and intervening peripheral grooves, or the reverse, on the punching-wheels described, nor do I limit myself to the combination of two wheels, such as those herein shown and described. One of these wheels may readily be dispensed

with and other mechanism substituted therefor which will coöperate with the remaining punching-wheel to produce the effect of the two wheels combined.

Secured to the main frame of the machine on which the parts heretofore described are mounted are two coöperating brake-wheels 29 29, through which the blank strip to be operated upon is passed before it reaches the punching-wheels 9 and 21. Leading from a point adjacent to the brake-wheels 29 to the point at which the punching-wheels 9 and 21 come in contact with each other is a guide 30, over which the blank strip is passed and which serves to prevent lateral displacement of said strip. Also secured to the framework of the machine in line with the guide 30, but on the side of the wheels 9 and 21 opposite said guide, is a stripper 31, designed for the purpose of removing the punched strips from the wheels 9 and 21 and preventing the same from adhering to said wheels. The said stripper in the form of my invention herein shown consists of a bracket or support made up of the uprights 32 32, secured to the frame of the machine, and the stripper-sections 33 34, pivoted to said uprights and located between the same. The upper section 33 is mounted upon a pivot-pin 35 and is provided with a slot 36, through which passes a bolt 37, having a nut 38 upon the projecting end thereof, the said bolt and nut providing for the upward-and-downward adjustment of the free end of the section 33. The section 34 is mounted upon a pivot pin or bolt 39 and is provided with a slot 40, similar to the slot 36 in the section 33, through which passes a bolt 41, having a nut 42 upon the free end thereof, said bolt and nut providing for the vertical adjustment of the section 34 on its pivot 39. The forward or free ends of the stripper-sections 33 and 34 are pointed and lie adjacent to the wheels 9 and 21, as clearly shown in Fig. 3 of the drawings. The said sections are slightly separated, one from the other, and the adjacent surfaces thereof are flat. The upper surface 42^a of the forward end of the section 33 is longitudinally curved to conform to the shape of the periphery of the wheel 9, and the lower surface 43 of the forward end of the section 34 is longitudinally curved to conform to the shape of the periphery of the wheel 21. The section 33 serves to remove the completed strips from the upper wheel 9, and as said wheel is provided with two projecting ribs 13 and projecting punches 11 12 thereon the surface 42^a of the section 33 is provided with two sets of longitudinally-extending grooves 44 44 to receive the punches 11 12 on the wheel 9 during the rotation of the latter. The lower section 34 serves to remove the completed strip from the lower wheel 21; but as there is but a single rib 23 on said wheel carrying the punches 24 there will be but a single set of longitudinally-extending grooves 45 on the surface 43 of said section 34. The number of grooves 44 or 45 in each set will correspond with the number of rows of punches in each set. As illustrated in the drawings, there are two rows of punches on each of the ribs of the wheels 9 and 21. Consequently there will be two grooves 44 45 in each set on the sections 33 and 34, respectively. The extreme forward ends of the sections 33 34 lie in close contact with the peripheries of the wheels 9 and 21, respectively, and the completed strips as they are removed from said wheels pass between said sections and thence to a storage-reel. In order, however, to provide for the free passage of said strips between said sections, provision must be made for the reception of the burs on said strips. This is effected by forming in the lower surface of the section 33 a single set of grooves 46, the same being located directly opposite the grooves 45 on the section 34, and by forming in the upper surface of the section 34 two sets of grooves 47 47, the same being located directly opposite the grooves 44 in the section 33. The vertical adjustment of the two sections of the stripper is provided for the purpose of causing the extreme forward ends of said sections to be brought into proper position with respect to the wheels 9 and 21, with which they coöperate.

The punches 11, 12, and 24, heretofore referred to, have been described as being cylindrical in form with the active or engaging ends thereof pointed and provided with a plurality of curved faces, between which are sharpened cutting edges. While this is the form of punch I prefer to use, it is obvious that the body of the punch may be of other form than cylindrical and that the pointed end thereof between the cutting edges may be curved either longitudinally or transversely, or both. I do not desire to limit myself to any particular form of punch, as my invention contemplates the use of any punch which will produce an opening in the strip operated upon and simultaneously form burs on one side of the strip, which are bent back slightly upon themselves, so as to be readily clenched when applied to the material upon which the strip is to be used.

The operation of the machine from the foregoing description will be apparent, and no detail description thereof is necessary to be entered into herein.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a punching-machine, two rotating punching-wheels, each having high and low portions arranged to coact to simultaneously cut and separate the sheet into separate strips, and punching mechanism carried by said wheels for forming burred openings in each of said strips, the burs in contiguous strips extending in opposite directions, said punching mechanism operating simultaneously with said cutting and separating mechanism.

2. In a punching-machine, two rotating

punching-wheels, having coacting punching and cutting mechanisms arranged alternately throughout the width of the wheels, to form a series of strips from a single sheet, said strips each having burred openings, the burs in contiguous strips extending in opposite directions, said punching mechanism operating simultaneously with the cutting mechanism, substantially as described.

3. In a machine for punching metal strips, a pair of coöperating punching-wheels having parallel rows of punches thereon, and parallel rows of punch-receiving sockets therein, the punches on one wheel adapted to fit within the punch-receiving sockets in the other wheel, and a plurality of coöperating cutters on each of said wheels, said cutters being located at points to cut the material contiguous to the outer sides of the openings formed by the coöperating punches and sockets, whereby the punched openings will be accurately positioned in the resultant strip relative to the edges thereof.

4. In a machine for punching metal strips, a pair of coöperating punching-wheels having parallel rows of punches thereon, and parallel rows of punch-receiving sockets therein, the punches on one wheel adapted to fit within the punch-receiving sockets of the other wheel, a plurality of coöperating cutters on each of said wheels, said cutters being located at points to cut the material contiguous to the outer sides of the openings formed by the coöperating punches and sockets, whereby the punched openings will be accurately positioned in the resultant strip relative to the edges thereof, and stripping mechanism for separating the punched strip from the punches and also from the material on the opposite sides of the strip.

5. In a machine for punching metal strips, a pair of coöperating punching-wheels, one of said wheels having projecting circumferential ribs thereon with an intervening groove, punches projecting from said ribs, and punch-receiving sockets in said groove, and the other of said wheels having a rib in line with, and adapted to fit in the groove on the first wheel, provided with punches adapted to be received by the sockets in said groove and further having circumferential grooves on the sides of said rib adapted to receive the ribs on the first wheel and provided with punch-receiving sockets for the punches on the ribs of the first wheel.

6. In a machine for punching metal strips, a pair of coöperating punching-wheels having parallel rows of punches thereon, and parallel rows of punch-receiving sockets therein, the punches on one wheel adapted to fit within the punch-receiving sockets in the other wheel, and a plurality of coöperating cutters on each of said wheels, whereby a plurality of strips may be punched and cut from a single blank simultaneously.

7. In a machine for punching metal strips, a pair of coöperating punching-wheels, one of said wheels having projecting circumferential ribs thereon with an intervening groove, punches projecting from said ribs, and punch-receiving sockets in said groove, and the other of said wheels having a rib in line with, and adapted to fit in the groove on the first wheel, provided with punches adapted to be received by the sockets in said groove and further having circumferential grooves on the sides of said rib adapted to receive the ribs on the first wheel and provided with punch-receiving sockets for the punches on the ribs of the first wheel, the corners of the ribs on the respective wheels being sharpened and constituting cutters, whereby a plurality of strips may be punched and cut from a single blank simultaneously.

8. In a machine for punching metal strips, the combination with a rotary punching-wheel provided with a plurality of sets of punches and with a plurality of cutters, for punching and cutting simultaneously a plurality of strips from a single blank, of a multiple stripper for removing the several punched strips from said wheel.

9. In a machine for punching metal strips, the combination with two coöperating punching and cutting wheels for punching and cutting a plurality of strips from a single blank simultaneously, of a stripper for removing the completed strips from the edges of the respective punching-wheels.

10. In a machine for punching metal strips, the combination with two coöperating punching-wheels, each provided with cutting mechanism for producing a plurality of strips from a single blank and each provided with punches and punch-receiving sockets, the punches on each of said wheels adapted to fit within the sockets in the other of said wheels, of a multiple stripper for removing the completed strips from the punches on the respective wheels.

11. In a machine for punching metal strips, the combination with a pair of coöperating punching-wheels each provided with a plurality of punches and separating-cutters for producing a plurality of independent strips from a single blank, of a multiple stripper comprising a plurality of sections located in the angle between said punching-wheels on the delivery side thereof, one of said sections having a curved face lying adjacent to the periphery of one of said wheels and adapted to remove the completed strip from the punches thereon and the other of said sections having a curved face lying adjacent to the periphery of the other of said wheels and adapted to remove the completed strip therefrom.

12. In a machine for punching metal strips, the combination with a pair of coöperating punching-wheels each provided with cutting mechanism for producing a plurality of strips from a single blank and each provided with punches and punch-receiving sockets, the punches on one of said wheels adapted to fit

within the sockets in the other of said wheels, of a multiple stripper for removing the completed strips from the punches on the respective wheels, the same comprising a plurality of sections located in the angle between said punching-wheels on the delivery side thereof, the upper of said sections having a curved face lying adjacent to the periphery of the upper of said wheels, provided with longitudinally-extending grooves for receiving the punches on said wheel and having grooves on the under side thereof for receiving the burs on the strips removed from the lower of said wheels, and the other of said sections having a curved surface lying adjacent to the periphery of the lower of said wheels, provided with longitudinally-extending grooves therein for receiving the punches on said wheel and having grooves in its upper surface for receiving the burs on the strips removed from the upper of said wheels.

13. In a machine for punching metal strips, the combination with a pair of coöperating punching-wheels each provided with cutting mechanism for producing a plurality of strips from a single blank and each provided with punches and punch-receiving sockets, the punches on one of said wheels adapted to fit within the sockets in the other of said wheels, of a multiple stripper for removing the completed strips from the punches on the respective wheels, the same comprising a plurality of sections located in the angle between said punching-wheels on the delivery side thereof, the upper of said sections having a curved face lying adjacent to the periphery of the upper of said wheels, provided with longitudinally-extending grooves for receiving the punches on said wheel and having grooves on the under side thereof for receiving the burs on the strips removed from the lower of said wheels, and the other of said sections having a curved surface lying adjacent to the periphery of the lower of said wheels, provided with longitudinally-extending grooves therein for receiving the punches on said wheel and having grooves in its upper surface for receiving the burs on the strips removed from the upper of said wheels, and means for adjusting said sections.

14. In a machine for punching metal strips, the combination with two continuously-operating and coöperating punching, cutting and separating wheels and feeding mechanism for the strip, of means for resisting the feeding movement of the strip, whereby the latter is maintained taut during the punching operation.

15. In a machine for punching metal strips, the combination with two continuously-operating and coöperating combined punching, cutting and separating and feeding wheels, of a brake engaging the strip for resisting its feeding movement, whereby the latter is maintained taut during the punching operation.

16. In a machine for punching metal strips, the combination with two continuously-operating and coöperating combined punching, cutting and separating and feeding wheels, of a brake engaging the strip for resisting its feeding movement, and a guide for preventing its lateral movement.

17. In a machine for punching metal strips, the combination with two continuously-operating and coöperating combined punching, cutting and separating and feeding wheels, of a brake engaging the strip for resisting its feeding movement, a guide for preventing its lateral movement, and a stripper for removing the completed strip from said wheels.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN S. STOKES.

Witnesses:
A. P. RUTHERFORD,
JAMES L. GOOD.