

No. 875,153.

PATENTED DEC. 31, 1907.

N. E. CLARK.
METAL WORKING MACHINE.

APPLICATION FILED APR. 13, 1907.

3 SHEETS—SHEET 1.

Fig. 3.

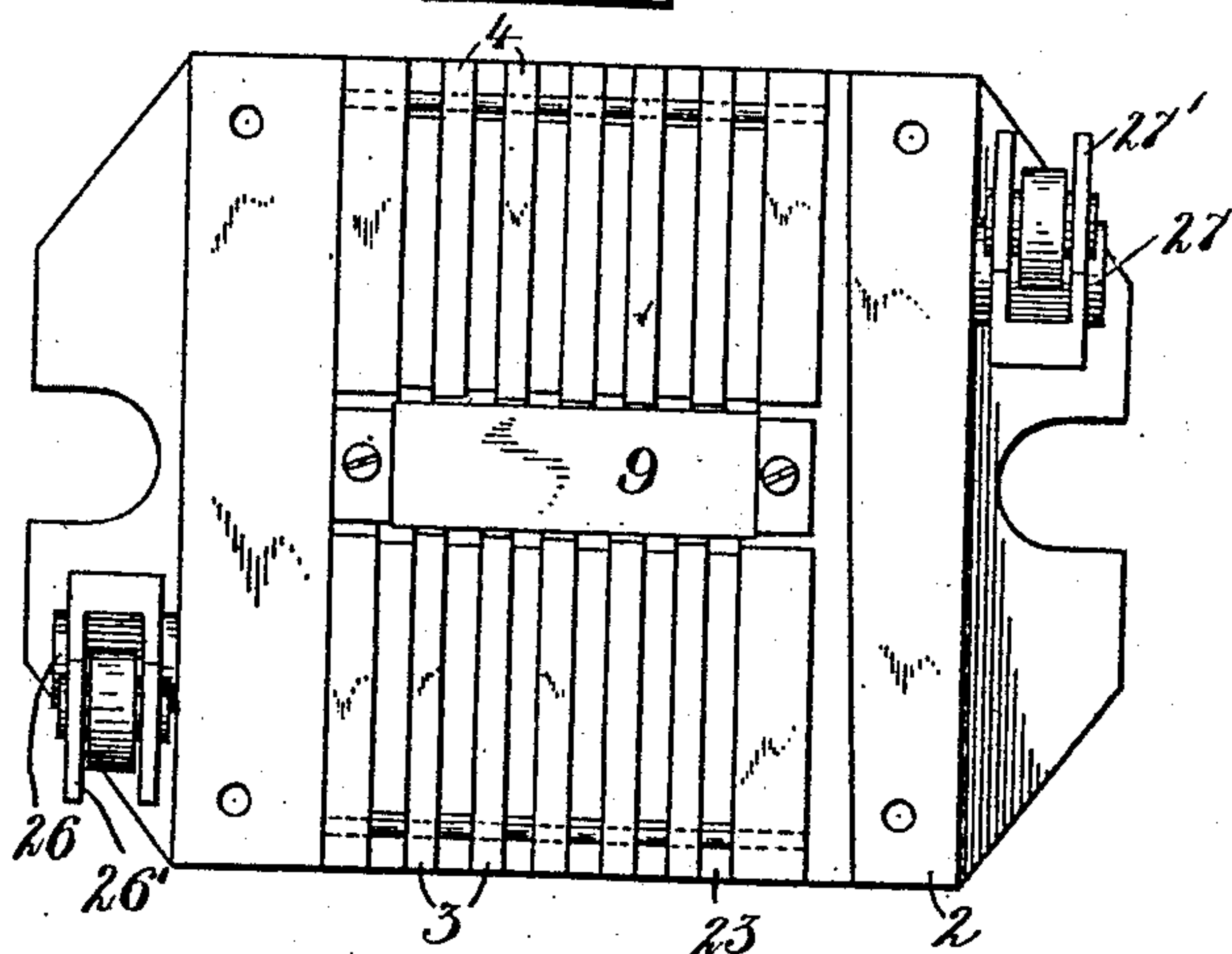


Fig. 4.

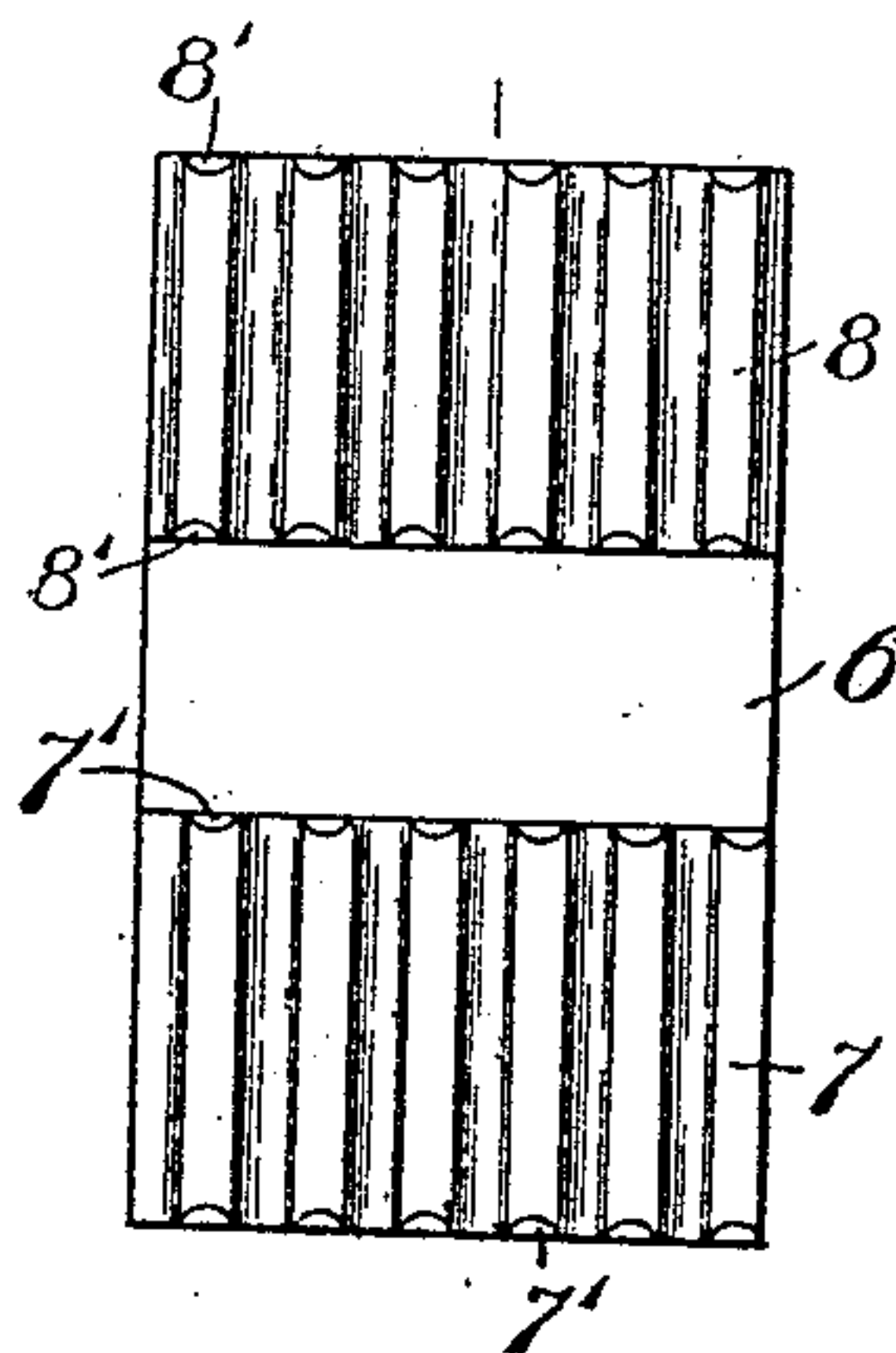


Fig. 1.

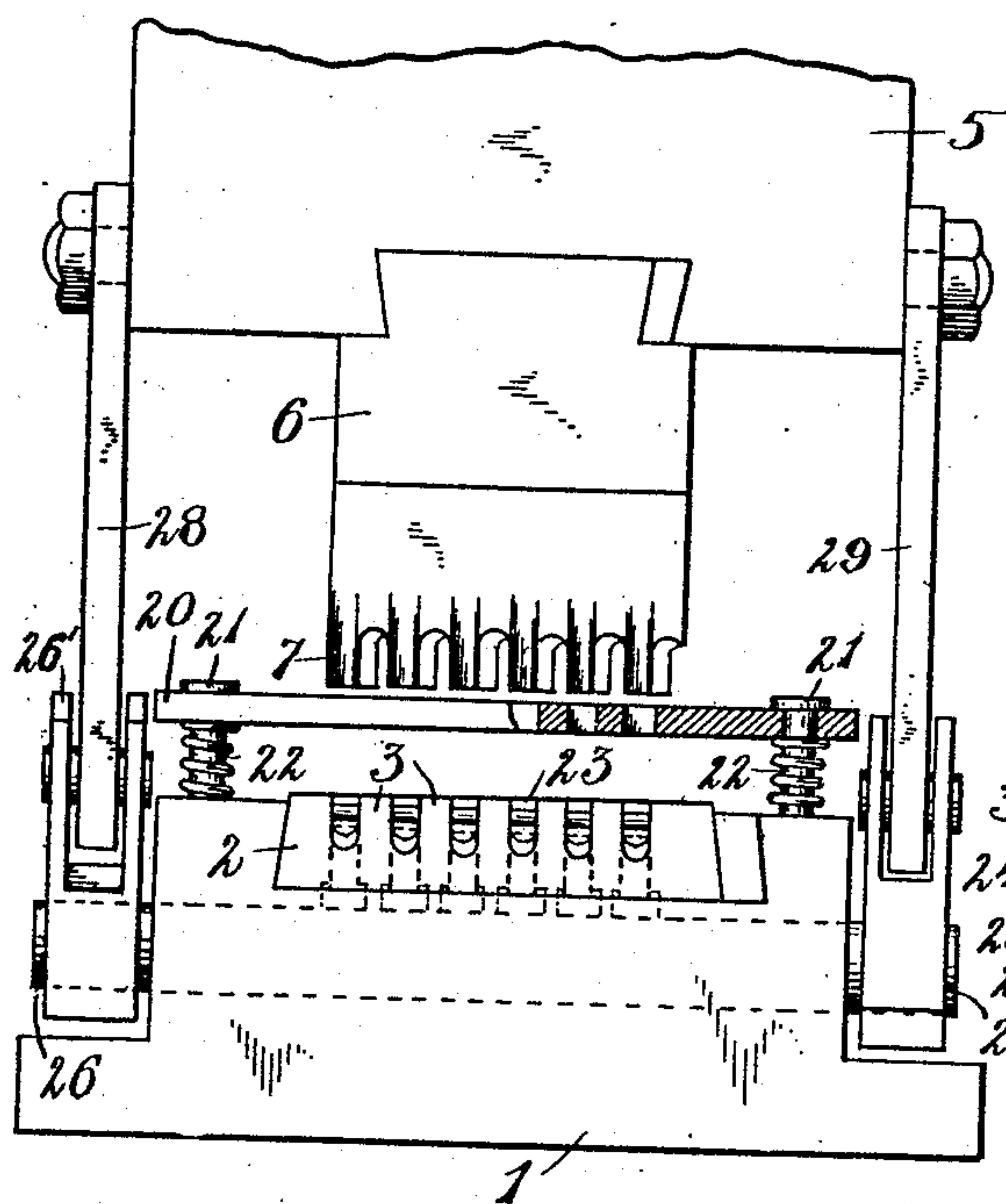
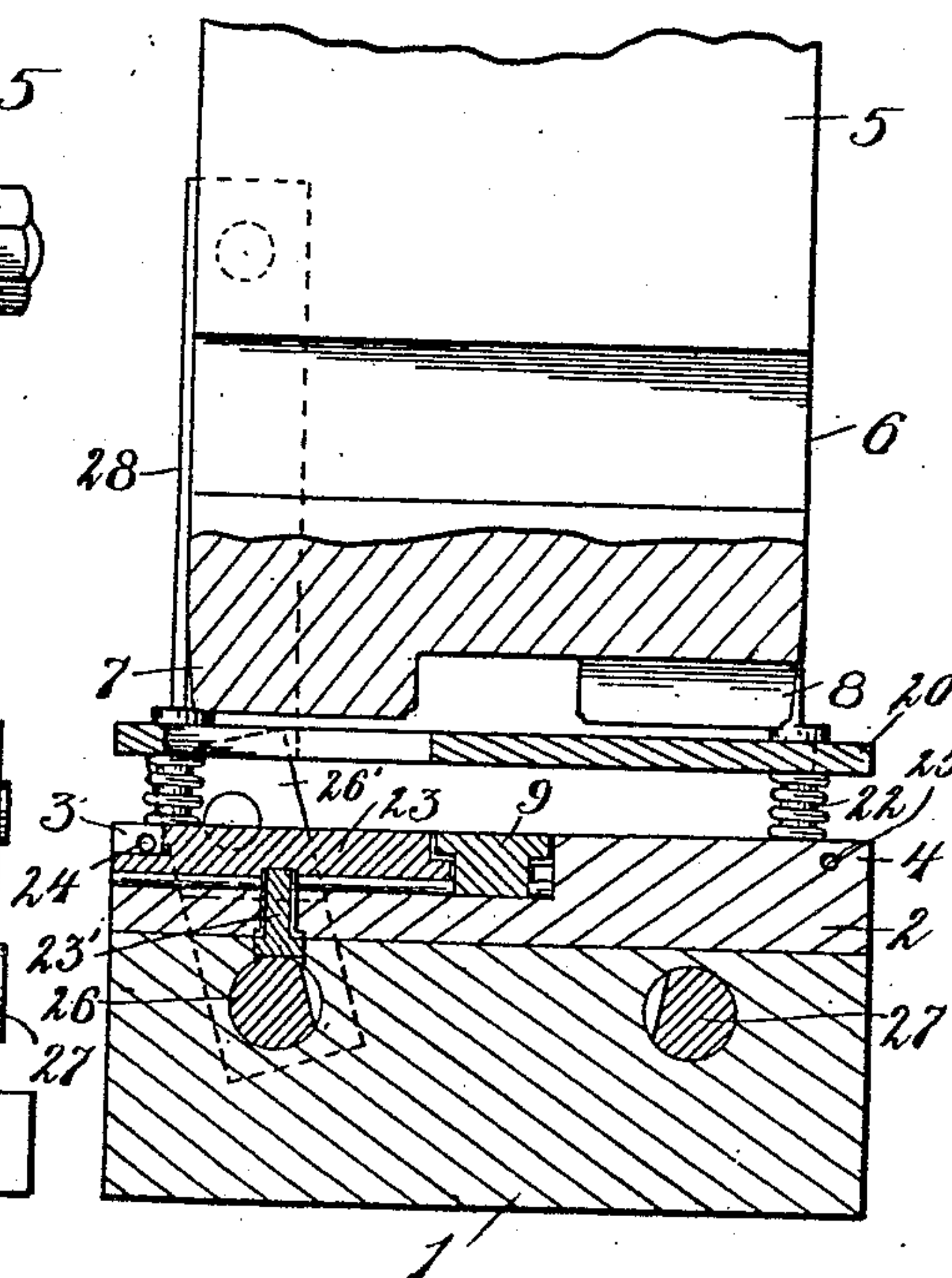


Fig. 2.



Witnesses:

Charles A. Reed
Ralph M. Moore

Inventor

N. E. CLARK

By his Attorneys

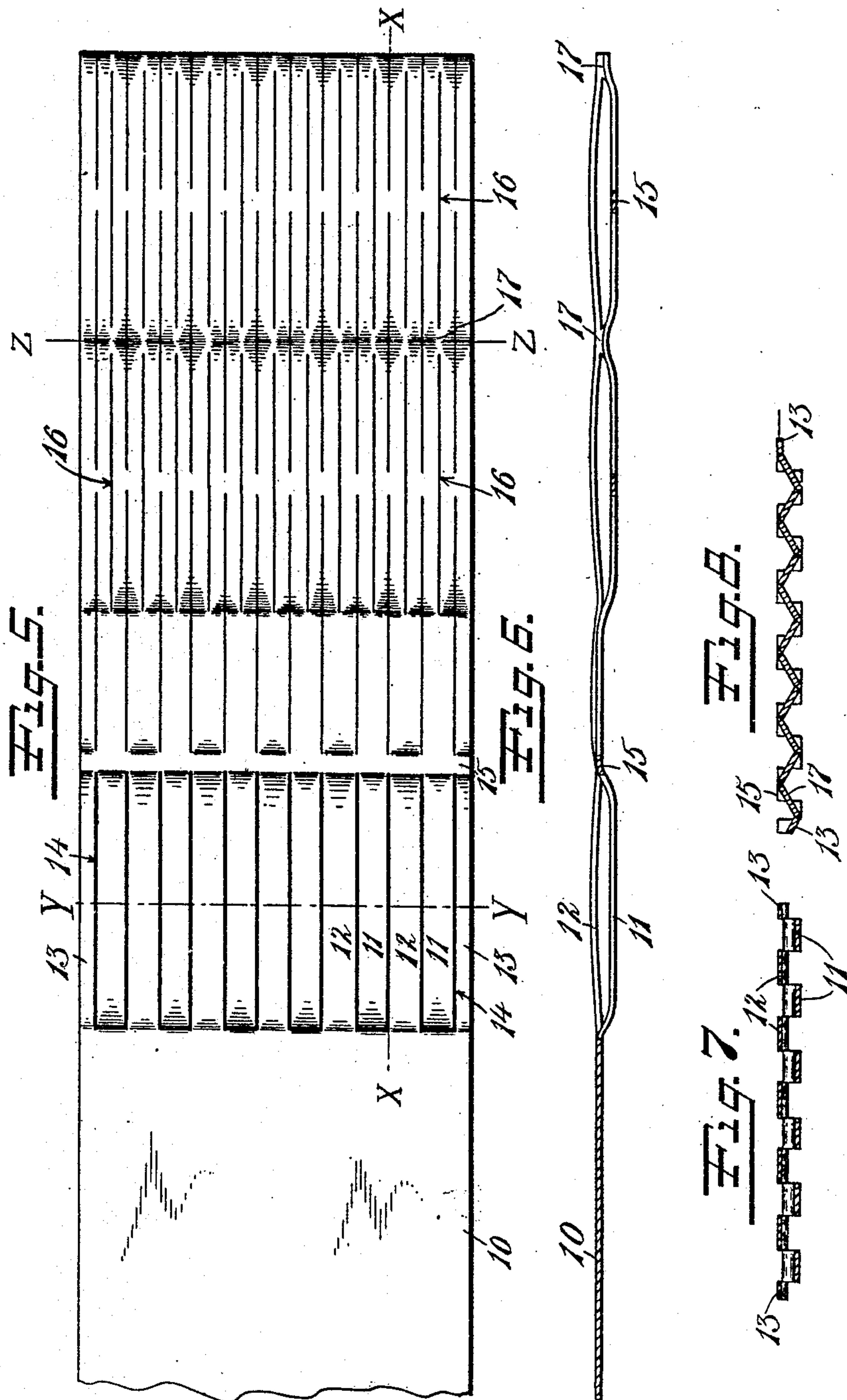
Paul H. Brown & Co.

No. 875,153.

PATENTED DEC. 31, 1907.

N. E. CLARK.
METAL WORKING MACHINE.
APPLICATION FILED APR. 13, 1907.

3 SHEETS—SHEET 2.



Witnesses:
Chas. W. Reed
Ransom Morris

Inventor
N. E. CLARK
By his Attorneys
Ransom Morris

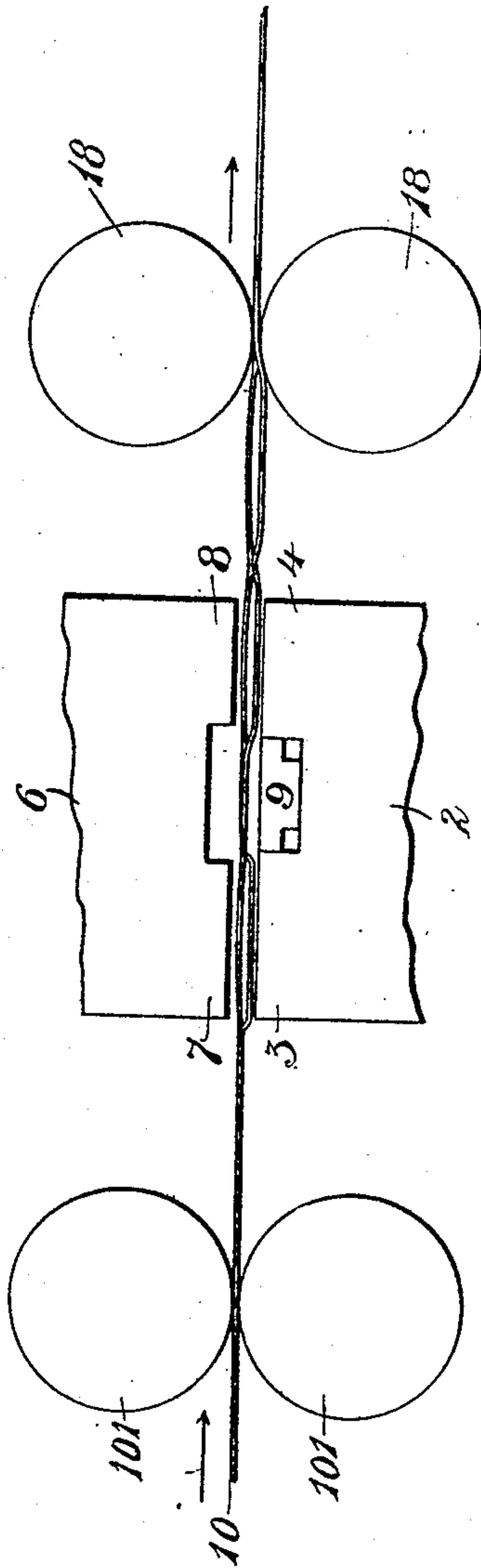
No. 875,153.

PATENTED DEC. 31, 1907.

N. E. CLARK.
METAL WORKING MACHINE.
APPLICATION FILED APR. 13, 1907.

3 SHEETS—SHEET 3.

Fig. 5.



Witnesses:

Chas. A. Beach
Langdon Moore

Inventor

N. E. Clark
By his Attorneys
Barton B. Brown & Thelma

UNITED STATES PATENT OFFICE.

NORRIS ELMORE CLARK, OF PLAINVILLE, CONNECTICUT.

METAL-WORKING MACHINE.

No. 875,153.

Specification of Letters Patent.

Patented Dec. 31, 1907.

Original application filed February 23, 1906, Serial No. 302,406. Divided and this application filed April 13, 1907. Serial No. 368,112.

To all whom it may concern:

Be it known that I, NORRIS ELMORE CLARK, a citizen of the United States, residing at Plainville, Hartford county, Connecticut, have invented certain new and useful Improvements in Metal-Working Machines, of which the following is a full, clear, and exact description.

My invention relates to metal working tools and machines, and particularly for slitting or lancing sheets or plates and is a divisional from #302,406, filed February 23, 1906.

One object is to provide simple and reliable mechanism for cutting short slits without overstraining the metal.

Another object is to provide cutters of great strength and durability.

Another object is to cut the slits in staggered arrangement.

Another object is to operate two sets of cutters so as to produce uniform and regular spacing of the slits.

Another object is to prepare a sheet for expansion, for instance, by means of punches.

Another object is to provide mechanism for forming a sheet with the slits opened out.

The accompanying two sheets of drawings shows the mechanism for slitting and opening and the product at different stages of manufacture.

The mechanism consists of special punches and dies with strippers and rolls preferably as shown and as hereinafter more fully described. The product may be used as lathing or for grills. It may also be further treated and expanded so that the openings become larger or are changed in shape if desired.

Figure 1 is a front elevation of the slitting mechanism, the punch member being raised and the stripper plate being shown in partial section. Fig. 2 is a longitudinal section and side elevation of the same. Fig. 3 is a plan view of the die member and attached parts. Fig. 4 is a view of the under side of the punch member. Fig. 5 is a fragmentary plan view on a scale somewhat larger than that of the tools and showing the product of their operation at different stages. Fig. 6 is a longitudinal vertical sectional view of the same on the plane of the line X X, of Fig. 5. Fig. 7 is a transverse vertical sectional view on the plane of the line Y Y, of Fig. 5. Fig. 8 is a similar view on the plane of the line Z Z, of Fig. 5. Fig. 9 is a side view showing the feed rolls, the slitting mechanism and the

rolls for flattening the slitted stock so as to slightly open the slits.

The mechanism is mounted in a suitable press frame. The bed plate 1, carries the die member 2, which has a set of projections 3, 3, spaced apart from each and having parallel shearing or cutting edges extending longitudinally. 4, 4, are similar projections alternating laterally with projections 3, 3, for the purpose hereinafter more fully set forth.

The reciprocable head or gate 5, carries the punch member 6, which has two sets of projections such as 7, 7, and 8, 8, arranged to register with the spaces between the die projections 3, 3, and 4, 4. These punch projections have longitudinal cutting edges of substantially the length of the slits to be produced, while their ends are concaved as at 7' and 8' and the lower corners beveled so as to prevent rupturing or otherwise injuring the stock adjacent the ends of the slits. The bridge or table 9, removably carried by the die member, is smaller than, but corresponds substantially to, the space between the ends of the punch projections 7, 7, and 8, 8, and serves to hold the stock up in position and facilitate its feed. The distance between the adjacent ends of the punch projections is approximately equal to one half the length of the slit plus one and one half times the length of the bond. The feed of the stock is approximately equal to the length of a slit plus the length of a bond. The length of slits and bonds being selected, the mechanism is designed accordingly. The length of the die projections, so long as it is slightly greater than the punch projections, is immaterial.

The stock 10, is fed, for instance, by suitable rolls 101, 101 (see Fig. 9). Fig. 5 shows a piece of stock after four strokes of the press, the first stroke having been made when the end of the stock was inserted under one half of the length of the punch projections 7, 7. After the first stroke, the punch projections in conjunction with the die projections form depressed or bent strips 11, 11, separated by strips 12, 12, and bounded at the edges by narrow strands 13, 13. The shearing action stretches the strips 11, 11, so that when the projections are withdrawn, the elasticity of the metal of the depressed strips causes a slight foreshortening which raises or bows the strips 12, 12, as shown in Figs. 5 and 7. The slits 14, 14, are thus produced at each stroke of the press and the length of the bonds 15, 15, is determined by

the feed of the stock between strokes of the press. After the second stroke of the press the punch projections 8, 8, are brought into action to split the ends of strips 11, and 12, at the slits 16, 16. The bonds 17, 17, connect the strands thus formed and the product in cross section appears as shown in Fig. 8. The action of the two sets of punch projections being simultaneous, the stock between the sets is somewhat flattened as shown in the center of Fig. 6.

The action of the punch member 6, forces the strands of the strip down between the projections of the die member 2, and also wedges the strips between the projections 7, of the punch. To automatically release the strands from the punch and die, I provide strippers, shown particularly in Figs. 1 and 2. 20, is a plate having a series of openings corresponding to the punch projections. This plate is guided on headed posts 21, 21, and forced upward by springs 22, 22. The strip is fed between the die 2, and the plate 20. In operation the punch projections pass through the openings in the plate 20, and lance or slit the strip. When the punch is retracted, tending to carry with it the strip, the plate 20, forced upwardly by the springs 22, 22, frees it automatically. 23, 23, are stripper bars located between the projections 3, 3, and 4, 4, of the die. The inner ends of the stripper bars extend under the edges of the table 9, while the outer ends are beneath rods 24, and 25. 26, and 27, are cam shafts mounted in the bed 1, and adapted to coöperate with the lifter pins 23'. The cam shafts have crank arms 26' and 27' respectively, which are connected by links 28, and 29, to the gate or head 5. When the gate with the punch 6, moves down, the cam shafts 26, and 27, are rocked and permit the strippers 23, to fall, so that the punch may act. When the gate is retracted, the cam shafts are rotated to the position shown in Fig. 2, so as to operate the lifters and stripper bars and force the metal of the strips from between the projections of the die.

The material as it comes from the slitting tools is of substantially the same width as the original stock but slightly foreshortened. It is sometimes desirable to expand the slitted material. A partial expansion or opening of the slits is accomplished by means of rolls 18, 18, which are so adjusted as to flatten it. Owing to the peculiar disposition of the raised and depressed portions and the angular disposition of the connecting portions, this flattening causes the strands to separate laterally. The degree or extent of this lateral expansion depends upon the gage of the stock and the character of the slitting, which, in turn, depend upon the proportions of the slitting mechanism and the stroke of the punch member. The material may be further expanded by suitable means, for in-

stance, punches, if desired. The rolls 18, 18, when used in conjunction with the slitting tools, also serve to feed the slitted material away. I wish it understood, however, that my invention contemplates the action described whether accomplished in a single machine or whether the material is rolled in a subsequent operation which may or may not be accompanied by other operations.

What I claim is:

1. In a metal working machine, means for slitting a sheet and producing alternating bonds and bent strands and means for flattening the strands and opening the slits laterally.

2. In a metal working machine, means for slitting a sheet of metal and forming strands in staggered arrangement, with parts of the strands inclined relative to the general plane of the sheet, and means for straightening the strands and opening the slits laterally.

3. A metal working machine, including means for forming alternating raised and depressed strips side by side, and means for slitting parts of the strips to form strands connected at intervals by bonds arranged in staggered relation.

4. In a metal working machine, means for producing a series of parallel depressed strips laterally separated by similar raised strips and means for slitting the ends of the adjacent raised and depressed strips to form strands in staggered arrangement.

5. A metal working machine, including means for forming alternating raised and depressed strips, parts of which are slitted to form strands connected at intervals by bonds arranged in staggered relation, and means for opening the slits laterally.

6. In a metal working machine, means for producing a series of parallel depressed strips separated by similar raised strips, means for slitting the ends of the adjacent raised and depressed strips to form strands in staggered arrangement and means for opening the slits laterally.

7. Slitting mechanism, including punch and die members having complementary spaced projections with parallel cutting edges and concave on the ends.

8. Slitting mechanism, including a punch member having projections with parallel cutting edges, concave on the ends and beveled at the corners.

9. Slitting mechanism, including a punch member having two sets of spaced and staggered projections with square shouldered cutting edges terminating in sharp corners for preventing injury to the metal during the punching cut.

10. Metal slitting mechanism, comprising punch and die members having sets of complementary spaced and staggered projections concave on the ends.

11. Metal slitting mechanism, including a

punch member having a plurality of projections substantially flat on the face and with parallel cutting edges, said projections being concave on the ends between the cutting edges.

12. Metal slitting mechanism, including a die member and a reciprocating punch member, and having a feed passage between them, said punch member having a plurality of projections arranged side by side but spaced apart and having parallel cutting edges extending longitudinally of the feed passage and terminating in sharp corners for avoiding injury to the stock during the punching cut.

13. Metal slitting mechanism, including a die member and a reciprocating punch member, and having a feed passage between them, said punch member having a plurality of cutting projections arranged side by side but spaced apart and having parallel cutting edges extending longitudinally of the feed passage, the ends of the cutting projections between the cutting edges being beveled.

14. A reciprocating punch member for slitting mechanism, having two sets of spaced projections with lateral cutting edges, the distance between the ends of the sets of projections being greater than one half of the length of a single projection, the projections of one set being staggered relative to the projections of the other set.

15. A reciprocating punch member for slitting sheet metal, comprising a plurality of sets of projections having parallel cutting edges, the cutting edges of the projections of one set being arranged substantially in line with the longitudinal axes of the projections of the other set.

16. Slitting mechanism, including a reciprocating punch member having two sets of projections with cutting edges longitudinal of the direction of feed of the stock, the projections of one set alternating in lateral arrangement with the projections of the other set, the adjacent ends of the projections of the two sets being spaced apart.

17. A reciprocating punch for slitting mechanism, comprising two sets of flat ended projections having lateral cutting edges extending longitudinally, the projections of each set being laterally spaced apart and the two sets being longitudinally separated, the cutting edges of one set of projections being substantially in line with the center of the intervals between the projections of the other set.

18. Slitting mechanism, including a die member having two sets of spaced and staggered projections rigidly connected, a plate or table between the ends of the two sets and a punch member.

19. Slitting mechanism, including a punch member having spaced projections with lateral cutting edges, a die member having

spaced projections, a stripper plate arranged between the two members yielding means for normally holding said plate up and strippers arranged between the die projections.

20. Slitting mechanism, including a punch member having spaced projections with lateral cutting edges, a die member having spaced projections, a stripper plate arranged between the two members and cam operated strippers arranged between the die projections.

21. Slitting mechanism, including a die member having two sets of spaced and relatively staggered projections rigidly connected between the ends of the two sets, strippers arranged between the projections and a punch member.

22. Slitting mechanism, including two sets of spaced and relatively staggered projections having lateral longitudinally extending cutting edges, strippers arranged between said projections and means for operating said strippers.

23. Slitting mechanism, including punch and die members having two sets of cooperating spaced and relatively staggered projections, a stripper plate between the members, stripper bars between the projections of one member and means for operating said stripper bars.

24. Slitting mechanism, including punch and die members having projections with cutting edges, a stripper plate between said members, stripper bars between the die projections and means independent of said projections for operating said stripper bars.

25. Slitting mechanism, including punch and die members having projections with cutting edges; a spring supported stripper plate between said members, stripper bars between the die projections and means for operating said stripper bars.

26. In a slitting machine, a die member, a reciprocating punch member, means carried by said die and punch members for forming a plurality of alternating raised and depressed strips, and means carried by said members for slitting the ends of said strips to form strands connected in staggered arrangement.

27. Slitting mechanism, comprising a die member, a reciprocating punch member, means carried by said members for producing a set of relatively short longitudinal slits connected by bonds and means carried by said members for splitting the bonds and parts of the strands longitudinally while another set of slits is being produced by the first mentioned means and cam operated stripper bars for releasing the stock from both of said slitting means.

28. Slitting mechanism, including punch and die members, one of which is reciprocatory, complementary projections carried by said members for producing relatively

short slits between alternating raised and depressed strips, and projections carried by said members for splitting the ends of said strips.

5 29. Slitting mechanism, including a die bed, a reciprocating head, cooperating spaced projections carried by said bed and head, stripper bars located between the die bed projections and means operated by the
10 motion of the head for operating the stripper bars in advance of the descent of said head projections.

30. Slitting mechanism, including a plurality of stationary projections, a plurality
15 of complementary movable projections, stripper bars arranged between the stationary projections and cam-like means for operating said stripper bars.

31. Slitting mechanism, including sets of
20 stationary and movable projecting cutters, a stripper plate for the movable cutters and separate means for automatically stripping the stationary cutters.

32. Slitting mechanism, including two sets
25 of spaced and relatively staggered projections, a set of stripper bars arranged for each set of projections and means for automatically operating both sets of stripper bars.

33. Slitting mechanism, including two sets
30 of spaced projections, a supporting table or plate between the two sets, stripper bars arranged between the individual projections and means for operating the stripper bars.

34. Slitting mechanism, including two sets
35 of spaced projections, stripper bars arranged between the projections and normally substantially flush with the upper surfaces thereof, and means for causing said bars to be depressed prior to the slitting action.

40 35. Slitting mechanism, including means

for producing a series of relatively short slits and bending some of the strands, and means for partially straightening the bent strands and producing another series of relatively short slits alternating with the first series. 45

36. In a slitting machine, punch and die members having two sets of complementary spaced and relatively staggered cutting projections, stripper bars arranged between the projections of one of said members, and
50 means for causing the retraction of said bars independently of the complementary projections.

37. In a slitting machine, punch and die members having sets of complementary
55 spaced and relatively staggered cutting projections, stripper bars arranged between the projections of one of said members, and means for raising said bars to a predetermined position after the slitting action. 60

38. In a slitting machine, a die bed, two sets of spaced and relatively staggered cutting projections carried thereby, stripper bars arranged between said projections, and means carried by said bed and co-operating
65 with said bars for controlling their movement.

39. In a slitting machine, a die bed having a set of cutting projections, stripper bars located between said projections, a reciprocating head having a set of punching projections
70 above said bars, an oscillating shaft carried by said bed and co-operating with said bars, and means of connection between said head and said shaft.

NORRIS ELMORE CLARK.

Witnesses:

M. G. CLARK,

H. L. GOODRICH.