

(No Model.)

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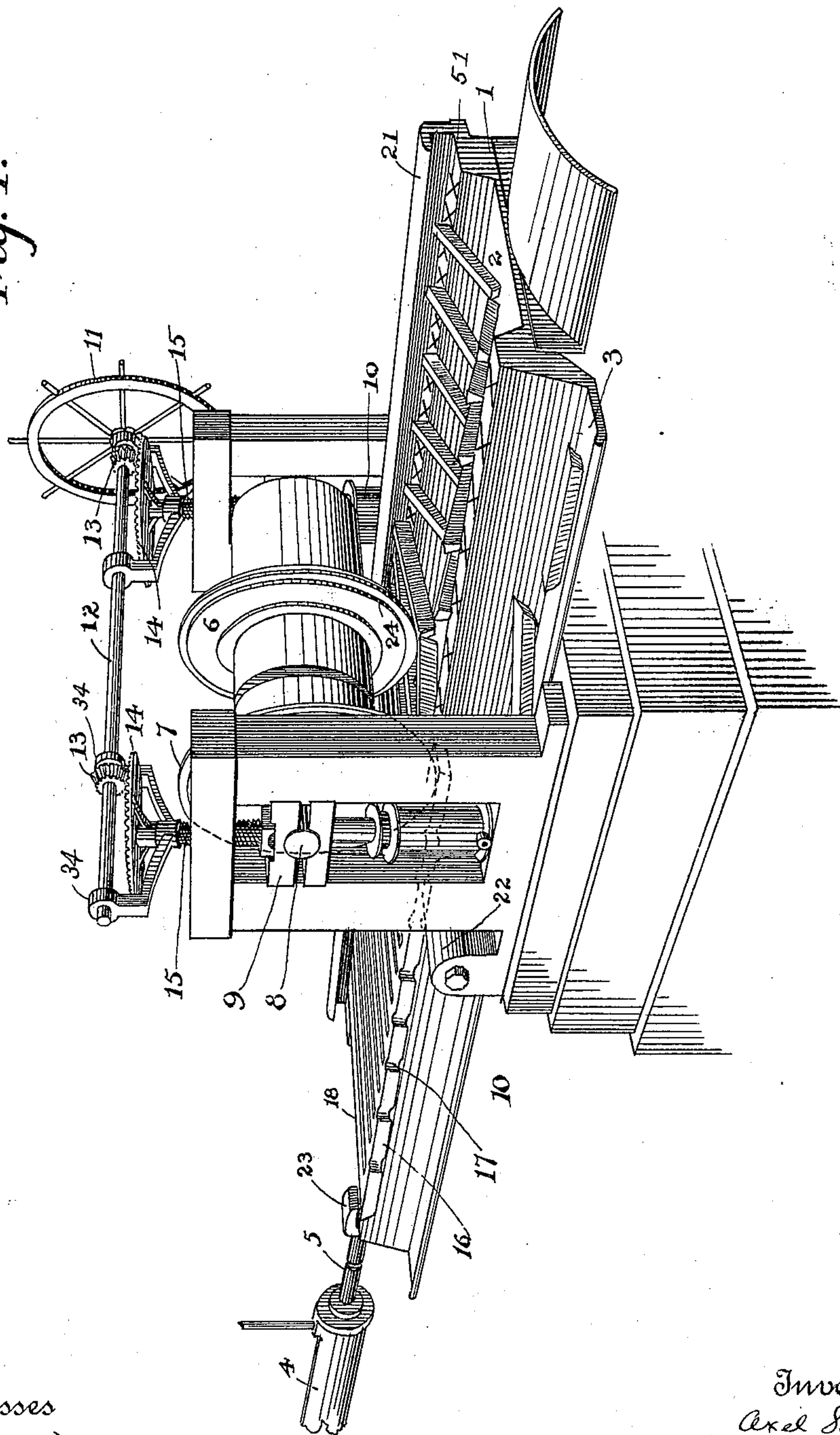
A. SAHLIN.

MACHINE FOR BREAKING AND LOADING PIG IRON.

No. 594,707.

Patented Nov. 30, 1897.

Fig. 1.



Witnesses  
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(No Model.)

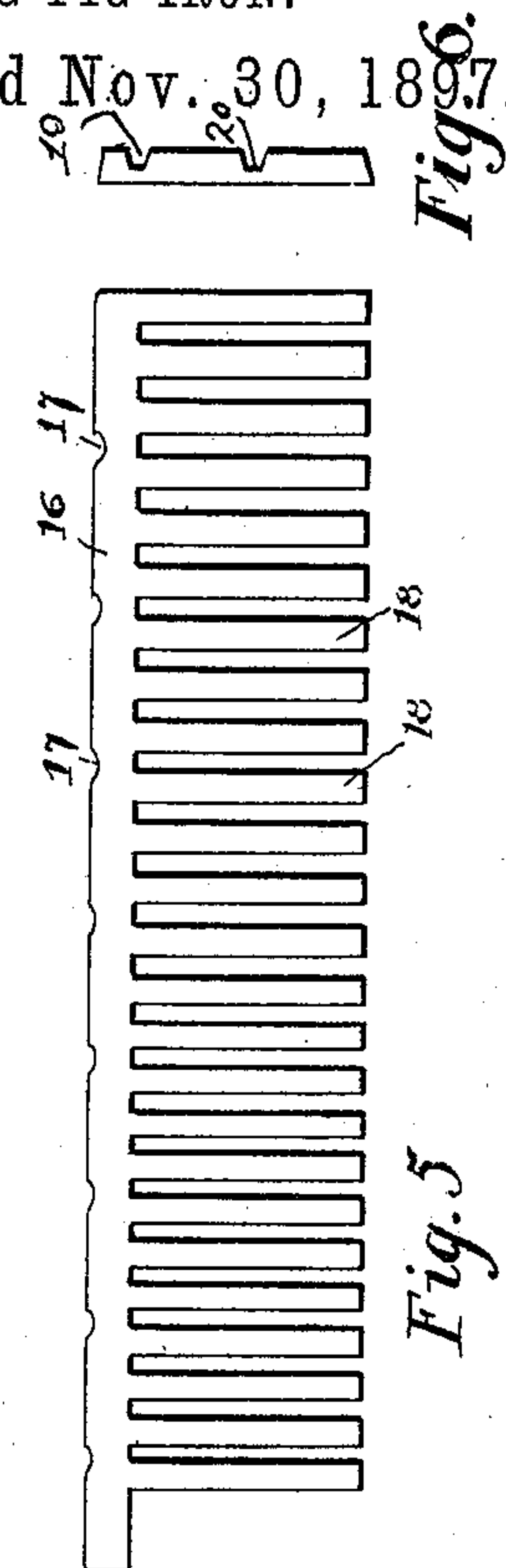
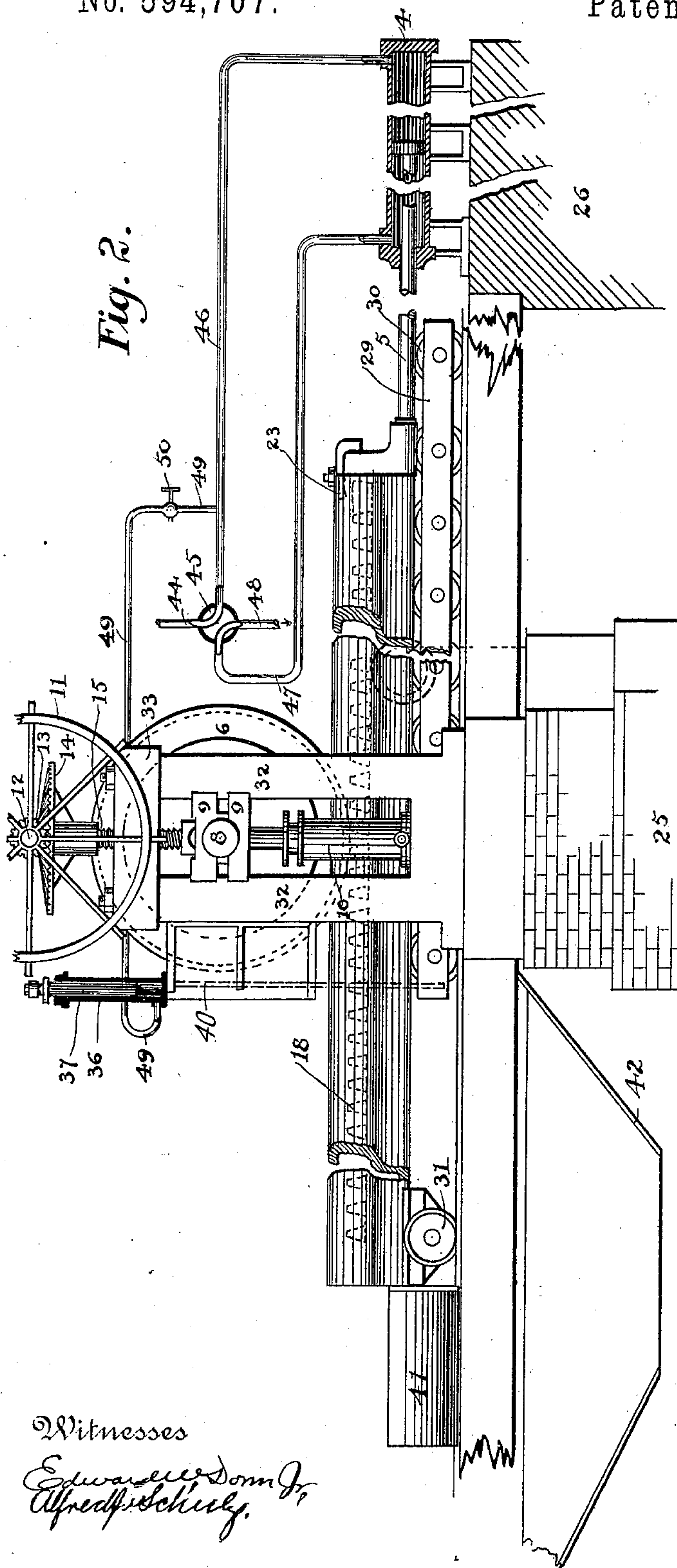
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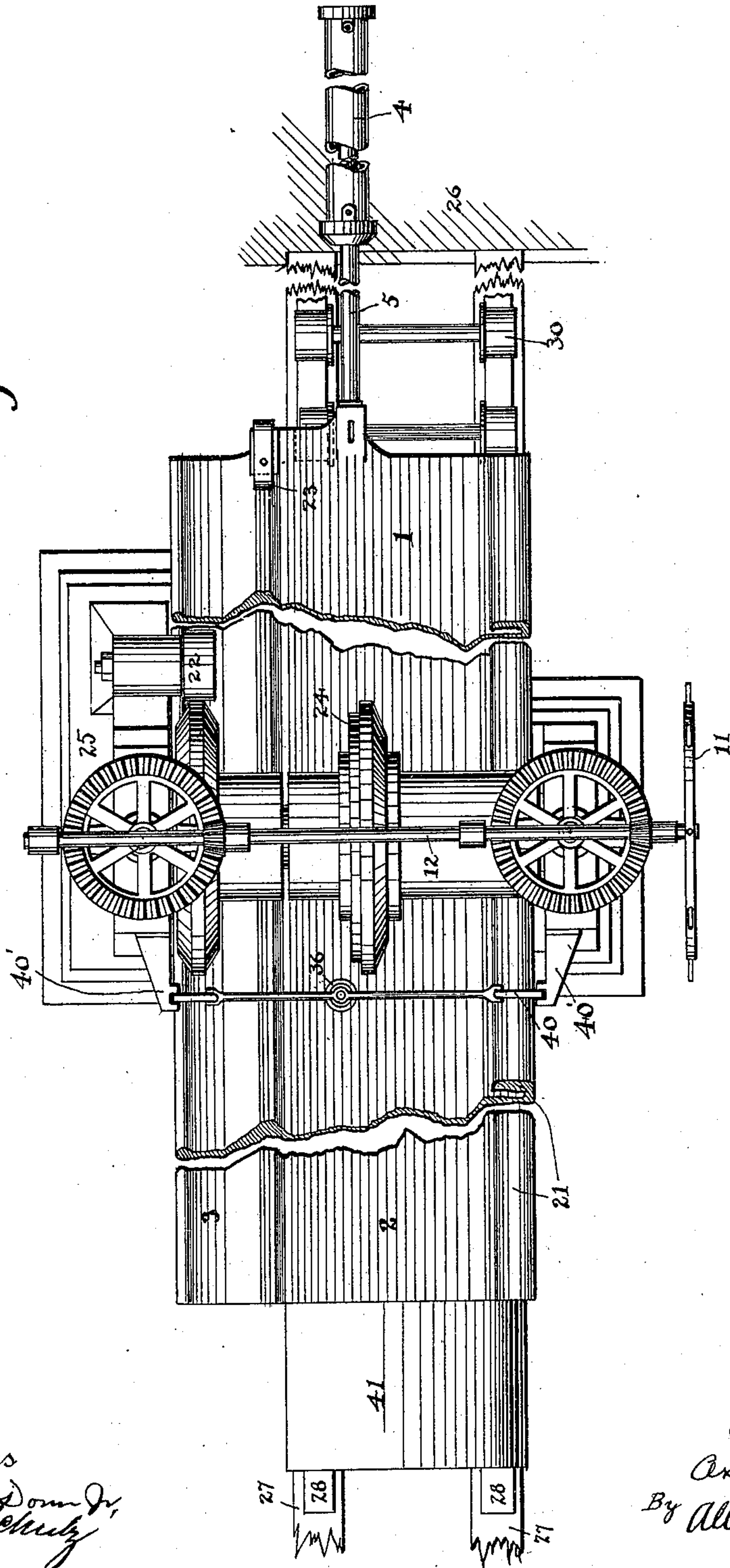
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Fig. 3



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(No Model.)

4 Sheets—Sheet 4.

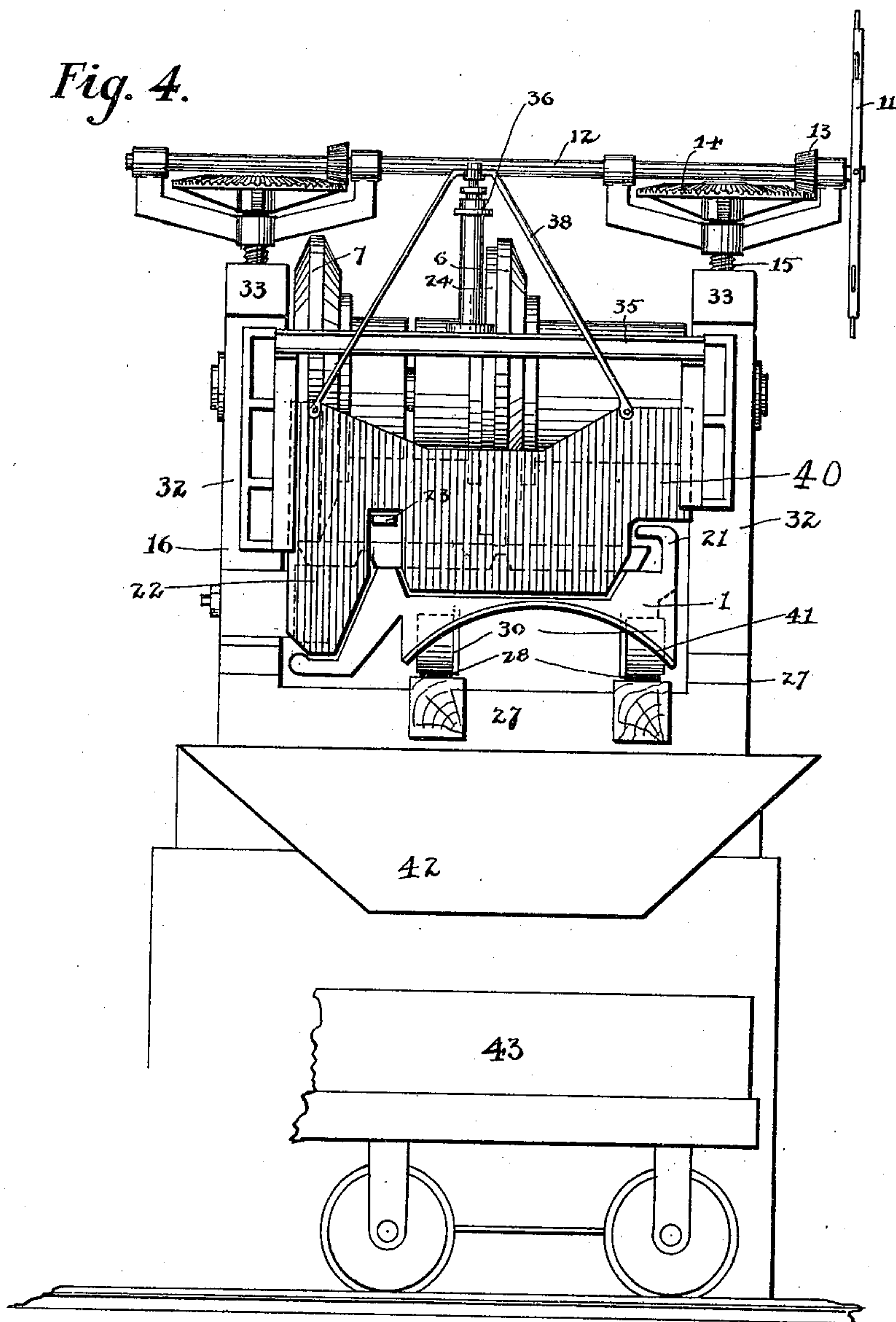
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Fig. 4.



Witnesses

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# UNITED STATES PATENT OFFICE.

AXEL SAHLIN, OF SPARROW'S POINT, MARYLAND.

## MACHINE FOR BREAKING AND LOADING PIG-IRON.

SPECIFICATION forming part of Letters Patent No. 594,707, dated November 30, 1897.

Application filed January 16, 1897. Serial No. 619,464. (No model.)

*To all whom it may concern:*

Be it known that I, AXEL SAHLIN, a citizen of the United States, residing at Sparrow's Point, in the county of Baltimore and State of Maryland, have invented certain new and useful Improvements in Machines for Breaking and Loading Pig-Iron, &c., of which the following is a specification.

My invention relates to apparatus for breaking pig-iron and other materials and loading it upon cars or other vehicles. It has been the practice to run the liquid iron tapped from the blast-furnace into molds of sand formed on the floor of the cast-house and to break up the pig-beds so cast into pieces light enough for one man to carry, leaving them upon the floor of the cast-house until they become cold, and removing them by hand. In this way much time is lost and very large cast-houses are required, while the labor cost is at the same time very high. Though certain machines have been invented for breaking up the pig-bed, I am not aware that prior to the date of my invention any such machines without direct-acting breaking-hammers have been devised which have been satisfactory upon a commercial scale. It is usual to cast the pig-beds in the form of a long sow, with pigs attached thereto and extending at right angles therefrom. In the use of my improved machine and method I take the whole sow, or a part thereof, with the pigs attached, from the sand, preferably when it has cooled, by a traveling crane or otherwise and place it upon a support forming part of my improved machine. Upon this machine and movable relatively to the support I provide one or more cam wheels or rollers, preferably circular, so placed that when each pig is brought under the roller it will be broken from the sow and also broken at or near the middle. I also provide a roller which breaks the sow into lengths. I prefer to move the support under the rollers, keeping the rollers stationary, but providing for their adjustment, and have illustrated the form in which this is done, but I am not restricted to that form, as the gist of my invention lies in the relative movement between the roller and the pigs.

It also comprises a scraper which automatically loads the broken substance into cars

and various other improvements to be hereinafter described and claimed.

In the drawings attached to this specification, Figure 1 is a perspective view of a machine containing the elements of my invention. Fig. 2 is an end elevation of my improved machine with the cylinders in section. Fig. 3 is a plan of the same. Fig. 4 is an end elevation of the same. Fig. 5 is a plan of the sow, with the pigs attached, as it is taken from the sand. Fig. 6 is an end view of the sow and pigs.

Referring now to Fig. 1, 1 is a movable support or platform or carriage formed with a depression 2 to receive the broken pigs and a depression 3 to receive the sow. It will be seen that the carriage is so shaped that the pigs are supported at the ends only. This carriage is moved in the direction of its length in any suitable way, as by the hydraulic cylinder 4 and piston-rod 5. Upon the carriage is placed the pig-bed, as shown. 6 7 are two circular cams or rollers supported on the shaft 8 in suitable bearings 9, supported in turn by the hydraulic cylinders 10 10 or otherwise. The hand-wheel 11, working through shaft 12, bevel-gears 13 13 and 14 14, and screws 15 15, serves to adjust the height of the rollers to allow for any irregularities on the pig-bed.

The shape of the pig-bed as cast according to my invention is shown in Figs. 6 and 7. 16 is the sow, with nicks or notches 17 17, while 18 18 are the pigs, with notches 19 and 20. The notches serve to determine the exact point of breakage.

If now the carriage be run back and the pig-bed be placed in position, as shown, and the carriage be then advanced, the roller 6 will bear upon the pigs successively and break them one by one at the center. As the sow is held down by the roller 7 the pigs will be broken off from the sow at the same time at the notches 19, Fig. 6. As the diameter of the roller 6 is preferably large as compared with the depression of its lower edge below the top of the pig-bed the leverage secured is enormous, while the slow rotation of the roller in its bearings 9 or upon the shaft, as may be preferred, prevents friction. The breaking action is therefore even and uni-



form, without serious shocks or jars, and when the carriage reaches the end of its travel the pigs lie in the depression 2, broken and ready for loading. It will be noticed that  
 5 the breaking mechanism is automatically actuated by the relative motion between it and the pigs. The carriage is preferably provided with an overlapping edge or flange 21, under which the ends of the pigs extend, which prevents the broken pieces from flying up and  
 10 doing damage.

It will be observed that the pigs are forced against the edge of the roller and that they exert a horizontal, nearly tangential, pressure upon the roller. The reaction of the  
 15 roller against this pressure is radial and may be resolved into two components, one of which is opposite to the pressure and one of which is downward or at right angles to the pressure. This second component, which acts to  
 20 break the metal, is very large in proportion to the horizontal pressure, and the breaking action is very powerful and even, while only a comparatively small force need be exerted  
 25 by the cylinder 4.

The sow is broken by the action of the small roller 22 in conjunction with the roller 7. The back end of the sow is held down by its own weight and also preferably by the flange 23.  
 30 The roller 22 forms, as it were, a fulcrum, and the roller 7 is so adjusted that it tends to force the sow downward. At a certain point the pressure will become so great that the sow will break at its weakest point, one of the  
 35 notches 17, and fall onto the depression 3 of the carriage 1. It is therefore evident that at each reciprocation of the carriage I am able to automatically break up the whole pigbed into lengths suitable for shipping without the use of hammers and without exposing  
 40 the machinery to dangerous shocks. I prefer to provide the roller 6 with a flange 24, so that if a pig happens to break first in the middle it will be held down and broken off from the  
 45 sow by the flange acting in conjunction with the roller 7. I also prefer to roughen or corrugate the support 1 to prevent the pigs from slipping upon it, as shown at 51, Fig. 1.

It is evident that while the roller 7 forms  
 50 an almost frictionless device its purpose so far as the breaking of the pigs is concerned is simply that of a clamp holding the sow down while the pigs are being broken from it.

Having now explained my invention in its  
 55 simple form, I will proceed to describe the preferred machine as built for actual use on a large scale.

Referring to Figs. 2, 3, and 4, the parts appearing in Fig. 1 will be found numbered as  
 60 before, and therefore need not be particularly described. Foundations 25 26 support beams 27 27, which carry rails 28 28. On these rails I prefer to place a roller-cradle consisting of the side pieces 29 29 and wheels 30 30 to diminish the friction. On this cradle runs the  
 65 carriage 1, supported at one end by the truck 31. To the carriage is fastened the piston-rod

5 of the hydraulic cylinder 4, resting on the foundation 26.

Stout uprights 32 32, resting on the foundations 25, serve as ways for the bearings 9  
 70 of the shaft 8 and also take through the cross-pieces 33 33 and screws 15 15 the strain of the breaking. The shaft 8 carries, as before, the roller 6 with its flange 24 and the roller 7.  
 75

The shaft 12, connected to the hand-wheel 11, is supported and alined by bearings 34 34, as shown in Figs. 1 and 4, and serves to adjust the position of the rollers 6 and 7, working against the pressure of the hydraulic cylinder 10. It should be understood that while  
 80 I prefer to use a hydraulic cylinder as a counterbalance I am not restricted thereto.

So far the operation of the machine will be obvious from what has already been said, but  
 85 it is advantageous to provide some means for loading the metal which falls to the floor of the carriage into railroad or other cars, or at least to deliver it from the machine.

Supported from the frame 32 by the beam 90  
 35 is a cylinder 36, containing a piston 37. From the top of the piston is hung by the tie-rods 38 a plate 40. (Shown dotted in Fig. 2 and solid in Figs. 3 and 4.) This plate travels in guides 40' 40', and its lower end is shaped  
 95 to fit the outlines of the carriage, as shown in Fig. 4. The scraper, which is constituted by the plate 40, is raised when the carriage is on the outstroke—that is to say, when the metal is being broken—but is lowered as the  
 100 return stroke begins. The result is to sweep or scrape the broken pieces both of the pigs and of the sow over the end of the carriage 1, onto the curved plate 41, (which protects the rails 28 and beams 27 from injury,) and  
 105 into the hopper 42, whence it is delivered to the ground or into cars 43, as preferred. I have described this scraper as a simple plate; but it is obvious that its structure may be varied in various ways.  
 110

In order to simplify the control of my machine, I prefer to make the hydraulic or other power connections such that the motion of the plate 40 is automatically controlled, preferably by the same power which reciprocates  
 115 the carriage. 44 is the pipe from the pressure-tank, leading through the valve 45 by pipe 46 to the head end of the cylinder 4. It is evident that in the position shown the carriage is being forced in or to the left in Fig. 2 and  
 120 the breaking is taking place. The fluid ejected from the inner end of the cylinder 4 flows by pipe 47 and valve 45 to the waste-pipe 48. At the same time fluid passes by the pipe 49 through valve 50 to the cylinder  
 125 36 and raises the scraper 40. For the return stroke the valve 45 is reversed, the pressure is transferred to the other end of the cylinder 4, and the piston 37 in cylinder 36 falls, dropping the scraper 40 into position. As it is  
 130 sometimes necessary to run the carriage 1 back a short distance to adjust the height of the rollers—as, for instance, when the metal has not completely filled the molds for the



whole length and the pigs at one end of the bed are of greater thickness than at the other, so that one or more pigs may get by without being broken—I prefer to provide a simple  
5 valve 50 in the pipe 49 in order that the piston 36 may be cut off from the piston 4 when necessary.

I have shown and described my improved machine as particularly adapted to use on pig-  
10 iron; but it is evident that with slight changes in form it may be applied to a variety of uses, the essential principles remaining unchanged, and though I have described and shown a movable support or carriage and stationary  
15 rollers I consider any arrangement by which the proper relative motion between these parts is secured within the scope of my invention; nor do I limit myself to hydraulic power or to any specific power whatever for  
20 operating my machine, nor to the particular construction, combination, and arrangement of parts shown and described, as it is evident that many changes may be made without departing from the spirit of my invention; but  
25 I claim as my invention and desire to secure by Letters Patent—

1. In a metal-breaking machine, the combination of a breaking-roller with a support for the article to be broken, and means for causing a relative motion between the support  
30 and the roller, substantially as described.

2. In a pig-breaking machine, the combination of a support for the pigs, means for advancing said support, and automatic means  
35 actuated by the motion of the pigs for breaking the pigs successively, substantially as described.

3. In a metal-breaking machine, the combination with a breaking-roller of a movable  
40 support for the article to be broken, and means for advancing said support, substantially as described.

4. In a metal-breaking machine, the combination of a stationary, adjustable, revolving  
45 roller, and a movable table carrying the article to be broken passing under said roller, substantially as described.

5. In a pig-breaking machine, the combination of a support for the pigs, two rollers,  
50 one mounted to bear on the sow, and one mounted to bear on the pigs successively, and means for causing a relative motion between the support and the rollers, substantially as described.

6. In a pig-breaking machine, the combination of a support for the pigs, a breaking-roller, means for causing a relative horizontal motion between the support and the roller,  
60 and means for adjusting the height of the roller, substantially as described.

7. In a pig-breaking machine, a carriage having a continuous overlapping flange at one side, substantially as described.

8. In a pig-breaking machine, a movable  
65 carriage having a support for each end of the pigs, depressions to receive the pigs and the

sow, and a flange upon one side projecting over the ends of the pigs, substantially as described.

9. In a breaking-machine, the combination  
70 of a support for the article to be broken, a roller bearing upon one side of the article, a roller bearing upon the other side, and means for causing a relative motion between the support and the rollers, the two rollers being  
75 so situated with relation to each other that as the article is advanced between them lengths are successively broken from it, substantially as described.

10. In a pig-breaking machine, the combination of a support and three rollers, the first  
80 roller bearing upon the pigs, the second roller holding the sow in place while the pigs are being broken, and also, in conjunction with the third roller, breaking the sow into lengths,  
85 substantially as described.

11. In a pig-breaking machine the combination of a support, means for breaking the pigs, mechanism so adjusted as to cause a  
90 relative motion between the support and the means for breaking the pigs, and an overhanging flange at one end of the support for holding the sow in place, substantially as described.

12. In a breaking-machine, a carriage provided with an overhanging flange at one end,  
95 substantially as described.

13. In a breaking-machine the combination with a reciprocating carriage of a scraper reciprocating in a different plane, substantially  
100 as described.

14. In a breaking-machine, the combination of a carriage, means for reciprocating  
said carriage, a scraper, means for reciprocating said scraper, and a connection between  
105 the scraper and the carriage such that the scraper is automatically adjusted in place at the proper time, substantially as described.

15. The combination in a breaking-machine of a support for the article to be broken, a  
110 scraper, and means for causing two independent motions at right angles between the support and the scraper, substantially as described.

16. In a pig-breaking machine, the combination of a reciprocating support having an  
115 overhanging flange at one end, with two rollers, one above the level of the pig-bed and one below said level, one of said rollers bearing on the pigs and one bearing on the sow,  
120 substantially as described.

17. In a pig-breaking machine, the combination of a reciprocating support having an  
overhanging flange at one end to hold the end of the sow in place, and an overhanging flange  
125 at one side to prevent the pigs from flying up, and two rollers, one above the level of the pig-bed and one below said level, one of said rollers bearing on the pigs and bearing on the sow, substantially as described.  
130

18. In a breaking-machine, the combination of a breaking-roller, with a support for



the article to be broken, said support being so formed as to leave the article to be broken unsupported at the point where the roller acts upon it, and means for causing a relative motion between the support and the roller, substantially as described.

19. In a pig-breaking machine, the combination with means for holding the sow in place, of a roller bearing on the pigs successively, said roller having a flange of reduced diameter on the side nearest the sow, substantially as described.

20. In a metal-breaking machine, the combination with a stationary breaker, of a carriage for the material to be broken, and a

roller-support for said carriage, substantially as described.

21. In a pig-breaking machine the combination with a support for the pigs, roughened or corrugated upon its edge, a breaking-roller, and means for causing a relative motion between the support and the roller, substantially as described.

It witness whereof I have hereunto signed my name, in the presence of two witnesses, this 13th day of January, in the year 1897.

AXEL SAHLIN.

Witnesses:

E. R. JONES,

B. V. SPINNEY.