(No Model.) 3 Sheets—Sheet 1.

J. S. KENNEDY.

MACHINE FOR BREAKING PIG IRON.

No. 543,771. Patented July 30, 1895.

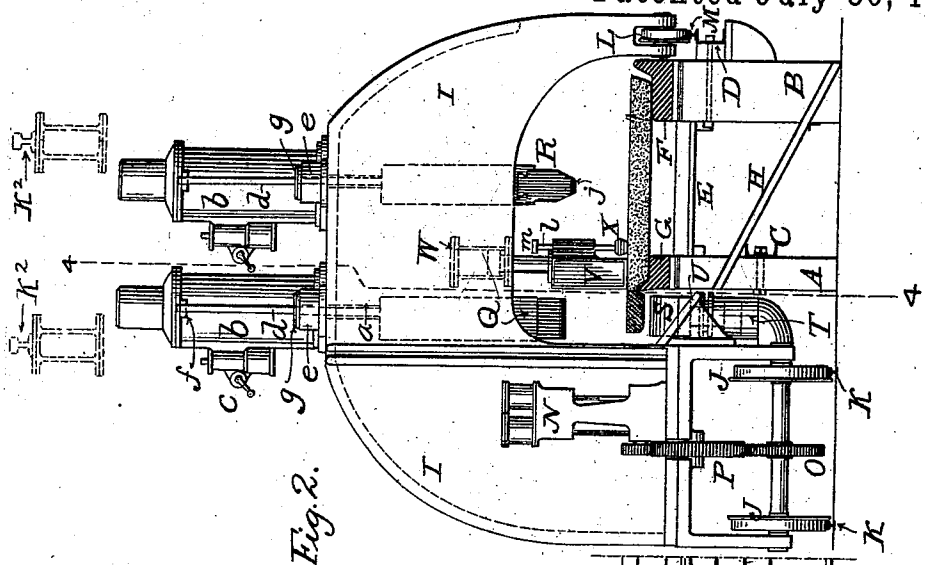

Fig. 2.

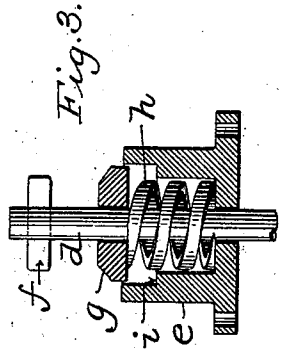

Fig. 3.

Fig. 1.

Witnesses
C. B. Burdine
C. B. Bull.

J. S. Kennedy
Inventor
by Dodger & Sons,
Attorneys.

(No Model.) 3 Sheets—Sheet 2.

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Fig. 7.

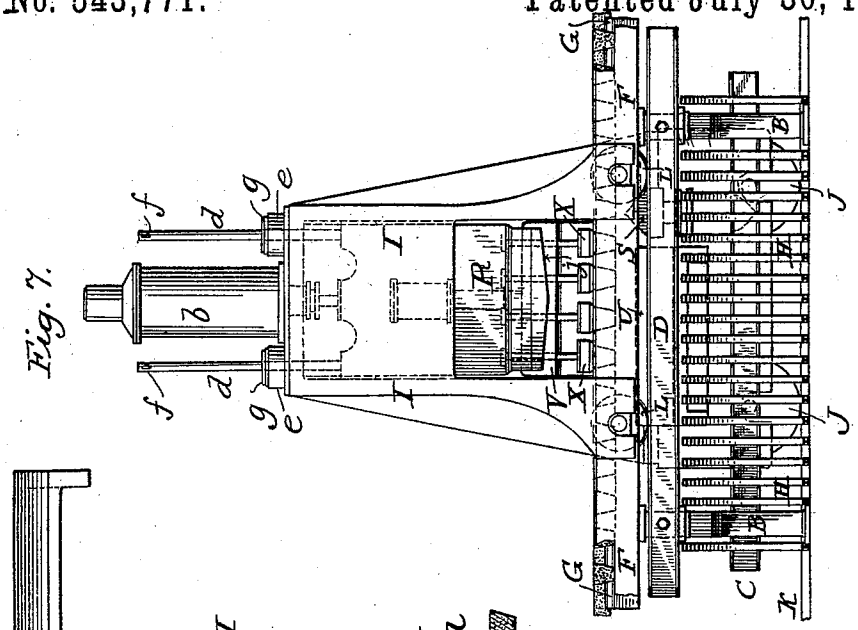


Fig. 5.

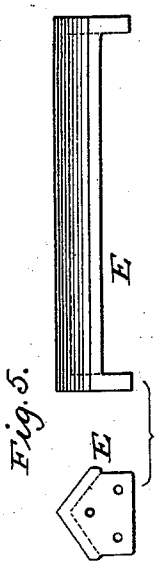


Fig. 6.

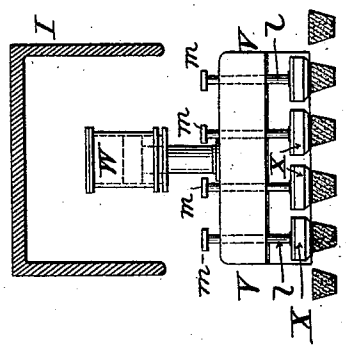
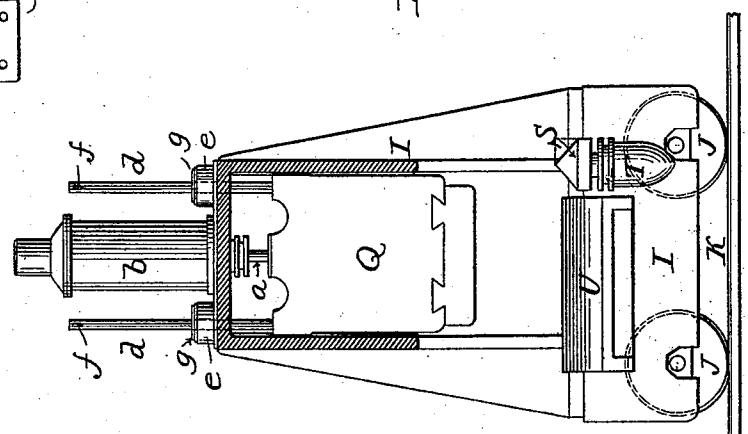


Fig. 4.



Witnesses
C. B. Burdine
C. B. Bull.

John S. Kennedy Inventor
by Dodger Lowe
Attorneys.

(No Model.)

3 Sheets—Sheet 3.

J. S. KENNEDY.

MACHINE FOR BREAKING PIG IRON.

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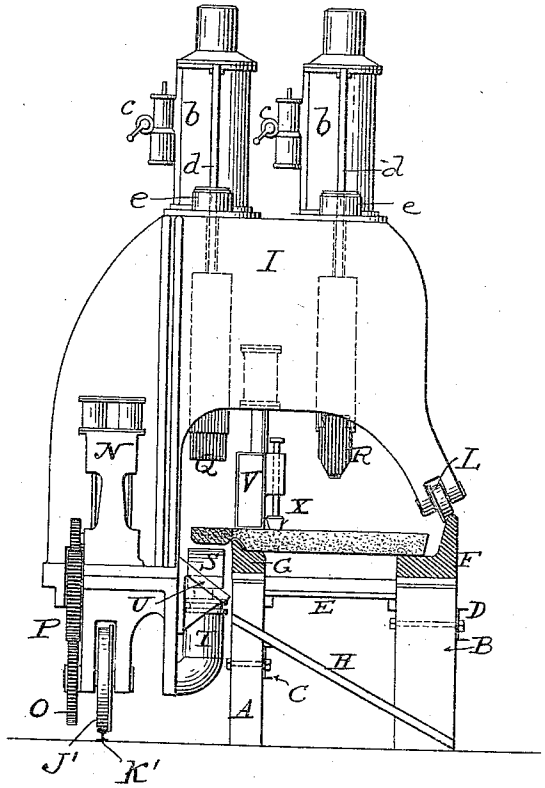
Fig. 8.



Witnesses
C. E. Burdine
C. B. Bull.

John S. Kennedy
Inventor
by Dodger & Sons,
Attorneys.

UNITED STATES PATENT OFFICE.

JOHN S. KENNEDY, OF CHAMBERSBURG, PENNSYLVANIA.

MACHINE FOR BREAKING PIG-IRON.

SPECIFICATION forming part of Letters Patent No. 543,771, dated July 30, 1895.

Application filed January 16, 1895. Serial No. 535,136. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. KENNEDY, a citizen of the United States, residing at Chambersburg, in the county of Franklin and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Breaking Pig-Iron, of which the following is a specification.

My invention relates to a novel apparatus for breaking pig-iron, and is designed as an improvement upon that for which Letters Patent No. 520,685 were issued to me May 29, 1894.

In breaking iron in accordance with the present invention, the "bed" is placed upon the table. Then a section of the sow is first detached, and then the corresponding pigs are broken, the operation of detaching a sow-section and breaking the corresponding pigs being repeated until the entire bed is broken up.

In order to simplify the construction of the breaking mechanism and reduce the number of hammers, I mount the sow-and-pig-breaking hammers in a traveling housing, frame, or support, which is designed to overhang or straddle the breaking-table and the bed thereon, and to be moved longitudinally thereof, so that sections of the bed may be successively broken. The use of this traveling breaking mechanism results in or necessitates the employment of various novel features of construction which will be hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a front face view of a portion of a breaking-table and my improved mechanism; Fig. 2, a vertical transverse sectional view on the line 2 2 of Fig. 1; Fig. 3, a detail view of the spring-box; Fig. 4, a vertical sectional view on the line 4 4 of Fig. 2; Fig. 5, a view illustrating the construction of the spreader-plates; Fig. 6, a vertical sectional view through the traveling housing, showing the hold-down block and dogs and their actuating cylinder and piston; Fig. 7, a rear face view of the table and the traveling breaking mechanism, and Fig. 8 a view illustrating a modification in the manner of supporting the traveling housing.

In carrying out the present invention I arrange at one end of the cast-house a breaking-table, and employ in connection therewith a hoisting mechanism, preferably a crane, by means of which the bed is raised and placed upon the table.

The table which I now employ differs somewhat from that heretofore invented by me, as will be seen upon reference to Figs. 1 and 2, wherein A A and B B indicate two series of uprights or posts connected by the longitudinal beams C and D, Figs. 1, 2, 7, and 8, and by the transverse spreader-plates E, of Λ shape in cross-section, as shown in Figs. 1, 2, and 5.

Upon the upper ends of the posts B B is secured the longitudinal bar or anvil F, which forms a support for the free end of the pigs, Figs. 2 and 8, while upon the upper ends of the posts A A is a longitudinal bar or anvil G, Figs. 1, 2, 7, and 8, which is provided with a rib to fit into the neck on the pigs, substantially as in my prior patent.

H, Figs. 1, 2, 7, and 8, indicates a grating extending longitudinally of the table and arranged in an inclined position below the supporting-bars F and G, the upper inner end of the said grating being preferably supported upon or by the longitudinal beam C, as shown in Figs. 1, 3, 7, and 8.

I indicates a traveling frame, housing, or support, which may be considerably varied in form without in any manner departing from my invention, several modifications in the construction being shown in the drawings. This housing I is supported at the front by wheels J J, arranged in pairs, to run upon the tracks K K, as in Figs. 1, 2, 4, and 7, and is also preferably supported at the rear by one or more wheels L running upon a track M secured to the beam D.

Instead of using four wheels at the front, two wheels J′ may be arranged to run on a single track K′, as in Fig. 8; and instead of using the track M at the rear, the wheel or wheels L may be arranged to run upon the upper edge of the bar or support F, as indicated in the same figure, or any of these plans may be combined, as found desirable.

The supporting wheels and tracks, wherever they are located, may, if desired, be toothed, but as this is a common expedient illustration is not deemed necessary.

It is obvious that instead of supporting the

housing or frame upon the floor of the casthouse, it may be suspended from above, suitable girders and tracks K^2 for this purpose being indicated by dotted lines in Fig. 2.

The mechanism for imparting motion to the traveling housing is also a matter capable of considerable variation, and I do not wish to restrict myself to any special means. I have shown, merely for the pupose of illustration, twin engines N, Figs. 1 and 2, which, by means of a gear O, secured to one of the axles, an intermediate gear or idler P, mounted in the housing, and a spur-pinion secured to the engine-shaft, impart to the traveling housing the desired step-by-step motion.

The traveling housing I, (whatever be its form,) support, and propelling mechanism is provided with a sow-breaking hammer Q and a pig-breaking hammer R, the hammer Q being arranged to reciprocate in a vertical plane to one side of the table or support upon which the bed is placed, so as to break the overhanging sow from the pigs, while the hammer R reciprocates in a vertical plane midway between the ends of the pigs, so as break the pigs into two equal parts.

Hammer Q has a long narrow face, which is designed to strike the sow farther to one side of the longitudinal center of the latter than the other, so as to obtain an increased leverage and insure a clean break at the neck of the pig.

The movements of the hammer are controlled by means of a piston, (not shown,) whose rod *a* is secured to the hammer and works within a cylinder *b*, said cylinder being fitted with a valve *c*.

In order to prevent the piston within cylinder *b* from striking the end of the cylinder in case the cushioning devices should fail to act I provide the hammer with one or more, preferably two, rods *d*, which extend up through spring-boxes *e* secured to the top of the housing, said rods being provided with a transverse pin *f* or other suitable stop to engage a disk or washer *g* resting upon the top of a spring *h*, as shown in Fig. 3. When the hammer descends the stop *f* strikes upon the washer and puts the spring under compression, thereby limiting the descent of the hammer.

The hammer is prevented from overcoming the force of the spring and thereby allowing the piston to strike the end of the cylinder by means of the shoulder *i* formed on the box or cup *e*, Fig. 3, and serving to limit absolutely the distance the hammer and its piston may descend by reason of the engagement of the washer or disk *g* with said shoulder. The pig-hammer R will be provided with a similar mechanism for raising and lowering and for cushioning the blow.

Hammer Q operates in conjunction with an anvil or secondary table S, Figs. 1, 2, 4, 7, and 8, carried by the movable housing I, and serves not only to detach a section of the sow from the pigs, but also from the remaining portion of the sow. This anvil or secondary table S, which is preferably A-shaped, is arranged to extend transversely across the under side of the overhanging sow, Figs. 2 and 8, and is raised and lowered by means of steam or other fluid acting upon a piston mounted within a cylinder T in substantially the same manner as the hammers, the said anvil being arranged to one side of hammer Q, so that when the hammer descends the full effect of the blow is received upon that portion or section of the sow projecting beyond the anvil.

If desired the anvil S may be provided with a flat upper face, as indicated in dotted lines in Fig. 4, to insure a firm gripping of the sow.

In order to direct the pieces of the sow onto the grating H as they are broken off, the traveling housing is provided with an inclined shelf U, Fig. 4, which forms substantially a continuation of said grating, as shown in Figs. 2 and 8.

The pig-hammer R is similar to the sow-hammer, but its lower face instead of being flat is cambered, or inclines from the ends toward the center, as at *j*, Fig. 7, so as to insure the equal distribution of the strains and shocks. If there should happen to be a projection on one of the pigs, and a flat-faced hammer be employed, the hammer on striking this projection would have a tendency to tilt and thereby strain the frame, but by providing the hammer with a camber, as shown, its action is, to a certain extent, progressive, and as the initial blow is at the center tipping and straining are avoided.

As the sow is preferably first detached the blow of hammer Q might tend to tip or tilt the bed, and to guard against this the housing is provided with a vertically-moving heavy holding block or buffer V, Figs. 2, 6, 7, and 8, mounted within a cylinder W, to which fluid is admitted, said block resting upon the bed slightly in rear of the necks formed on the pigs. The pigs are frequently cast with irregular or rounded lower faces, and, after the sow is detached from them, they would have a tendency to roll over if not held in position. To prevent this rolling I provide a series of independent dogs X, Figs. 2 and 6, which are preferably supported or carried by the block or buffer V, said dogs each having a stem *l* passing through an overhanging part of the block and a stop *m* at the upper end of the stem.

After the sow-section is broken off the block V is or may be raised slightly, but the dogs, whose stems pass freely through the block, rest with their own weight upon the several pigs and hold them in their proper positions, and this, too, regardless of variations in the respective pigs, the independence of the dogs permitting them to assume relatively different positions as circumstances may require.

The operation is as follows: The bed, com-

prising the sow and pigs, is raised from the casting-bed and placed upon the breaking-table, with the sow overhanging, as shown, the traveling house having been run beyond the end of the table, so as to allow the placing of the bed upon the table. The housing is now moved to bring the hammers over the table, and the block V is pressed down upon the bed and held thereon with considerable pressure. The anvil or secondary table S is now raised and held against the under side of the sow with pressure, the bed being thereby clamped and held in position. Hammer Q is now operated, and as it descends it detaches a section of the sow from the pigs and from the remainder of the sow, the lines of fracture being at the point where anvil S bears against the sow and at the neck joining the pigs and sow. There is more or less tendency of the housing to rise when the hammer descends, but this is overcome by means of the anvil or table S which bears against the under side of the sow. The detached sow-section falls down upon the inclined shelf or apron U, from which it passes to the grating H. The block V is now raised slightly, and the pigs (say four) are each separately held in proper position upon the table by means of the dogs X. The hammer R now descends and breaks each pig in two and the pieces fall onto the grating. The spreader-plates E, located in line with the posts A B, prevent the broken pigs from accumulating in front of the posts by deflecting said pieces laterally. The block V is now raised higher and by coming in contact with the stops *m* on the stems of the dogs X raise the latter. The anvil or secondary table S is lowered and the housing with appurtenances is moved lengthwise of the table a predetermined distance, and the operations just described are repeated.

I do not limit myself to the precise means for actuating the hammers, anvil, or secondary table, and the hold-down block and dogs, nor to the precise construction of the said dogs.

I am aware of Patent No. 498,805 to Martin and James, in which there is disclosed a stationary open frame carrying breaking mechanism and devices for feeding the bed lengthwise through said open frame, the pigs being first detached from the sow and broken, while sections of the sow are detached subsequently or during the breaking of the second set of pigs.

Having thus described my invention, what I claim is—

1. In apparatus for breaking pig iron, the combination with a table or support on which to place the bed; of means for coincidently detaching a section of the sow from the bed and from its pigs; and means for breaking the pigs from which the sow section was detached.

2. In apparatus for breaking pig iron, the combination with a table or support on which to place the bed; of a traveling frame or housing provided with means for coincidently detaching a section of the sow from the bed and from its pigs; and means for breaking the pigs from which the sow section was detached.

3. In apparatus for breaking pig iron, the combination with a table or support on which to place the bed; of a track or support extending in the same general direction as the table; breaking mechanism overhanging the table; and a traveling housing mounted upon the track or support and carrying the breaking mechanism.

4. In apparatus for breaking pig iron, the combination with a breaking table; of a traveling housing provided with a breaking mechanism, and a secondary table or anvil.

5. In apparatus for breaking pig-iron, the combination with a stationary table; of a traveling housing provided with breaking mechanism, and also with an anvil or secondary table, and with a hold-down block.

6. In apparatus for breaking pig-iron, the combination with a stationary table; of a traveling housing provided with a breaking mechanism and also with a shelf or apron.

7. In a breaking table, the combination with the posts A B, of the A-shaped spreader plates connecting the posts.

8. In combination with a breaking table; the hold-down block V; independent pig dogs X; and a breaking mechanism.

9. In combination with a breaking table; the hold-down block V; independent dogs X, free to slide upon the block and provided each with a stop; means for raising and lowering the block; and a breaking mechanism.

10. In apparatus for breaking pig iron, the combination with a stationary table; of a traveling housing provided with a breaking mechanism and also with a hold-down block to press the bed upon the table; and means, also mounted upon the traveling housing, for engaging the lower face of the bed, whereby the said bed is clamped on both faces.

11. In combination with a breaking table, and its grating; a traveling housing provided with breaking mechanism, and with an apron to form a continuation of the grating.

12. In combination with a breaking table; a traveling housing provided with breaking mechanism, and with a vertically-movable anvil or secondary table.

13. In combination with a breaking table; a traveling housing provided with two hammers,—the pig hammer being located over, and the sow-hammer outside of said table; and an anvil or secondary table carried by the housing beneath the sow-hammer.

14. In combination with a breaking table; a traveling housing provided with a sow-breaking hammer and also with an anvil or secondary table to support the sow; and a hold-down block to rest upon the bed close to the necks of the pigs.

15. In combination with a breaking table; a traveling housing provided with sow and

pig breaking hammers; means for holding the pigs while the sow is being detached; and separate dogs for holding the pigs while breaking the latter.

16. In combination with a breaking table; the pig-breaking hammer R having a camber on its lower face.

In witness whereof I hereunto set my hand in the presence of two witnesses.

JOHN S. KENNEDY.

Witnesses:
HORACE A. DODGE,
WALTER S. DODGE.