21037

S/148/61/000/002/004/011
A161/A133

1.1310

AUTHORS: Tarnovskiy, I. Ya., Ganago, O. A. Vaysburd, R. A.

TITLE: Calculating the forces in drop and forging

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, no. 2 1961, 51 - 61

TEXT: The rated pressing stress of presses has to be selected for the expected maximum pressure required, i.e., finish forging when the surplus metal of the blank is forced out into the flash. The high number of existing theoretical and empirical formulae show that the problem is both important and difficult to solve. Usually the zone of plastic deformation at the flash space is determined experimentally and the data are used for calculations. The authors consider this practice wrong since the results are correct for the definite experiment conditions only, and use a different approach. The article presents a mathematical analysis in which the spreading of the plastic deformation zone at the flash space is determined theoretically for the minimum (instead of the maximum) full deformation energy. This principle itself had been treated in three previous works [Ref. 8: I. Ya. Tarnovskiy, A. A. Pozdeyev, V. B. Lyashkov. Deformatsiya metalla pro pro-

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katke (Metal deformation in rolling), Metallurgizdat, 1956; Ref. 9: I. Ya. Tarnovskiy, O. A. Ganago, R. A. Vaysburd. "Nauchnyye doklady vysshey shkoly. Metallurgiya, 1959, no. 1; Ref. 10: I. Ya. Tarnovskiy, A. A. Pozdeyev. "Nauchn. dokl. v. shk. Metallurgiya", 1958, no. 1]. Numerous experiments had been conducted with coordinate networks traced in different portions of specimens and deformations studied with tool microscope, and the same means were used later for verifying the theoretical conclusions. A formula describing the real spread of the plastic deformation into the die cavity has been derived (see Figure 1, a):

$$h_{п} = h_{з} + a_1 h_{з} \left(1 - \frac{x^2}{B_{п}^2}\right), \quad (1)$$

where h - current ordinate (or height) of expanding seat of plastic deformation; a_1 - indeterminate (variable) parameter. The formula (1) determines only the shape of the boundary between the rigid (1) and the plastic (2) zone in the forgings, but the volume of the plastic deformation zone depends on the variable parameter (a_1). This parameter is determined by the following analysis. An electronic computer had been used for more accurate calculations. The Simpson rule and the Siebel formula (the latter for the determination of specific contact friction) are employed in the derivation of the final two simple formulas (12) and (13) for the

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case of flat and of axially symmetric forgings:

$$\frac{p}{1.15\sigma_s} = 1 + 0.25\frac{B}{H_3}, \quad (12)$$

where B = 2b is the width of the forging with the flash bridge; $H_3 = 2h_3$ - the flash thickness:

$$\frac{p}{\sigma_s} = 1 + 0.17\frac{D}{H_3}, \quad (13)$$

where D is the forging diameter with the flash bridge. The formula (12) corresponds the formula obtained by Unksov [Ref. 12: Plasticheskaya deformatsiya pri kovke i shtampovke (Plastic Deformation in Forging and Stamping), Mashgiz, 1939] for the calculation of the stresses during upsetting between two parallel plates, and the formula is known as the Siebel formula derived for the case of upsetting of cylinders. This coincidence of the formulae leads to an important conclusion - that the value of the force required for finish forging depends not on the configuration of the forging in the vertical cross section, but on the shape and dimensions of the forging in the plane, the flash thickness, and the temperature and speed of

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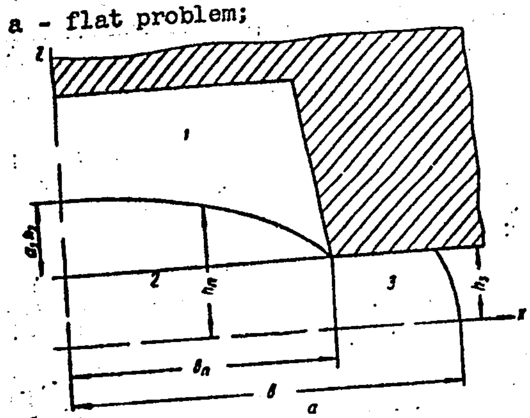
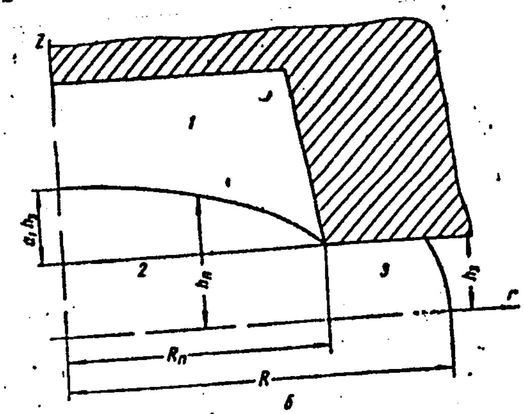
stamping. Experiments conducted with lead forgings gave results confirming this conclusion. There are 5 figures, 3 tables and 13 Soviet-bloc references.

Figure 1:

a - flat problem;



b - axially symmetric problem.



S/148/61/000/003/006/015
A161/A133

AUTHORS: Tarnovskiy, I. Ya., Pozdeyev, A. A., Meandrov, L. V., Khasin, G. A.

TITLE: The dependence of the deformation resistance on the ductile properties of steel in hot pressure working

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, no. 3, 1961, 82 - 90

TEXT: Tests have been carried out with the upsetting of 16 different steel grades at 900 - 1,200°C and three different deformation rates: 0.05; 7.5 and 150 sec^{-1}. The article presents details of the experiment techniques, the data obtained in the form of graphs, and derivations of formulae. The graphs present the real stress value variations with the deformation degree, as well as with deformation rate at different temperatures. The growth of deformation resistance (i.e., hardening) of some steel grades at 1,100 - 1,200°C, and a low deformation rate were found to be so insignificant that the yield limit or ultimate strength could be used as deformation resistance characteristic, but at high deformation rates the steel behaviour was different, and the conclusion was drawn that the effect of the deformation degree should by all means be taken into account for all the steel types studied. The increase in the deformation rate also considerably raised the deformation resistance. A formula was derived that expresses the behavior of the majority of the 16 steel grades with sufficient accuracy:

$$\sigma_{лп} = \sigma_0' + K\ln\left(1 + \frac{\xi_n}{\xi_0}\right) \quad (2)$$

where $\sigma_{лп}$ is the deformation resistance during linear stressed state and ξ_0 rate; σ' - the deformation resistance at zero deformation rate; ξ_0 - the deformation rate during static tests; ξ_n - any deformation rate; K - a coefficient that depends on the steel grade, temperature and deformation degree, in kg/mm². The coefficient presents in a physical sense the "tough resistance of metal to deformation". Its connection with the toughness factor is analysed; and a table is included giving the numerical values of K and σ' calculated for two of the studied steel grades (at different temperatures and deformation rates) - 18XHBA (18KhNVA) and X18H12M2T (Kh18N12M2T) steel. It is pointed out that the simplified ductility equation for flat employed usually in pressure working theory

$$\sigma_1 - \sigma_3 = 1.15\sigma_s \quad (5)$$

does not sufficiently express the real properties of steel at high temperatures. The new equation of tough-ductile state derived from experimental data is

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$$\sigma_1 - \sigma_3 = 1.15\sigma_s' + 4\mu'_{mean}|\xi_1| \quad (6)$$

where μ'_{mean} is the mean (for the entire body volume) value of the toughness coefficient at the given deformation moment, and σ_s' - the extrapolated yield limit that accounts at any given moment for the degree of the preceding deformation of the body. Equations are derived also for the case of any stressed state. The numerical values of the K coefficient render it easy to find the toughness coefficient for heated steel also under different deformation conditions. There are 7 figures and 4 Soviet-bloc references.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (The Ural Polytechnic Institute)

SUBMITTED: July 20, 1959

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; POZDNEV, A.A.; MEANDROV, L.V.

Physical equations for the mechanics of a deformed solid in the press forging theory. Izv.vys.ucheb.zav.; chern.met. no.4:67-78 '61. (MIRA 14:4)

1. Ural'skiy politekhnicheskiy institut.
(Forging) (Deformations (Mechanics))

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

S/148/61/000/006/003/013
E193/E483

AUTHORS: Tarnovskiy, I.Ya., Levanov, A.N., Skornyakov, V.B. Marants, B.D.

TITLE: Investigation of contact friction forces during reduction (by forging)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Chernaya metallurgiya, 1961, No.6, pp.53-59

TEXT: When operations of the squeezing group are used to form a metal component, the working pressure required to effect the plastic deformation, the character of the metal flow and the distribution of stresses and strains depend upon the frictional forces in the area of contact between the tool and the metal being worked. Experimental determination of these forces has been the subject of many investigations in which, however, methods and equipment both complex and inaccurate have been used. In the present paper, its authors describe a simple equipment with the aid of which accurate data on the contact friction forces can be obtained, irrespective of whether static or dynamic loads are used to deform the metal. The equipment (Fig.1a) comprises a measuring block (2), split in the centre and held together by a rod (4) incorporating wire strain

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gauges. The measuring block is placed horizontally between the upper (3) and lower (1) plates of a sub-press assembly, so that two test pieces (shown in the diagram by cross-hatching), placed on either side of the measuring block, can be simultaneously deformed. The test pieces must be placed precisely in line and, in the case of cylindrical specimens, a jig (shown in Fig.1b) is used for this purpose. In both the upper and lower heads pins (6 and 7), sliding freely in their bushes, are inserted. One end of each pin is in contact with the test piece, the other presses against a measuring rod (5 and 8), also equipped with wire strain gauges. The position of the measuring block can be changed with the aid of an adjusting pin (9). When pressure is applied to the sub-press, assembled as shown in Fig.1a, the normal forces in the area of contact between the measuring block and the two test pieces balance each other. The sum of the two friction forces is transmitted onto the measuring rod (4). Consequently, the rod is under the action of a force which is twice the contact friction force, acting in a given part of the contact area whose magnitude depends upon the position of the test piece in relation to the plane of contact of two halves of the measuring block. The pressure exerted on the

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test pieces is transmitted by the pins (6 and 7) onto the measuring rods. Pressure and friction forces are recorded with the aid of an oscillograph. This method can be used for measuring the contact friction forces both during flat deformation and during compression of cylindrical specimens deformed at various rates of strain. By varying the distance S between the centres of the test pieces and the parting plane of the measuring block, the integrated contact friction force can be determined as a function of S and tangential stresses at any point of the contact area can be calculated. In the case of flat, rectangular test pieces, the calculation consists of differentiation of the experimentally determined relationship between the integrated friction force and S. The treatment becomes more complex for a cylindrical test piece, axially compressed. In this case, the relationship between the tangential stresses and the experimentally determined equivalent force F(s) acting on the segment determined by the distance S (Fig.2) is given by

$$F(s) = 2\int_{r_K}^{R}\int_{\varphi_o}^{\frac{\pi}{2}} \tau(r) r \sin\varphi \, dr \, d\varphi \qquad (1)$$

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where r and φ are the polar coordinates of points on the contact area, τ(r) is the sought function of the distribution of the tangential stresses along the radius of the contact area and r_K is the current value of the radius determining the boundary of a given segment along the cord. A method of solving this equation is given and applied to experiments in which the contact friction forces were measured during axial compression of cylindrical lead specimens of 36 mm diameter and 36, 12, 6 and 3 mm high. Thirty tests were carried out for each d_o/h_o ratio, where d_o and h_o denote the diameter and height of the specimens, respectively. The specimens were compressed to approximately 12% reduction in thickness at a strain rate of 6 mm/min. The surface finish of the measuring instrument was $\nabla 8$. The results are reproduced graphically. Those obtained for specimens with $d_o/h_o = 1$ are shown in Fig.4, where F (kg, left-hand scale, curve 1), τ (kg/mm2, right-hand scale, curve 2) and pressure p (kg/mm2, right-hand scale, curve 3) are plotted against S (mm). The results obtained for specimens with $d_o/h_o = 12$ are shown in the same manner in Fig.7. The results of the present

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investigation confirmed the earlier views (Ref.9: I.Ya.Tarnovskiy, A.A.Pozdeyev, O.A.Ganago. "Deformation and forces in pressure forming of metals", Mashgiz, 1959) on the relationship between the friction forces and the geometry of the deformed specimens and on the distribution of these forces in the contact area. They also confirmed the fact (Ref.10: A.I.Tselikov, Stal', 1958, No.5) that the contact friction forces increase as the d_o/h_o of the specimen increases. There are 7 figures and 10 Soviet references.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnical Institute)

SUBMITTED: May 4, 1960

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

S/148/61/000/006/005/013
E193/E480

AUTHORS: Smirnov, V.K. and Tarnovskiy, I.Ya.

TITLE: Forward slip in the transition zones in rolling of periodic profiles

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Chernaya metallurgiya, 1961, No.6, pp.95-104

TEXT: Most periodic profiles, produced by longitudinal rolling, constitute various combinations of flat and tapered sections. In rolling profiles of this type, there are moments when two or more parts of the rolls with different curvatures are in the deformation zone. In the present paper, an analysis is carried out of the conditions for the case when no more than two different portions of the rolls are simultaneously in the deformation region. All possible combinations of flat and tapered sections are shown in Fig.1, where the direction of rolling is from left to right. When a strip of this type is rolled, roll portions with diminishing and increasing radii can be simultaneously in the deformation zone; this corresponds to a transition from rolling with decreasing draft to rolling with increasing draft. When roll portions with increasing and constant radii are in the deformation zone, this

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corresponds to transition from rolling with increasing draft to rolling at a constant draft etc. The variants shown in Fig.1 are divided into two groups: one comprising the variants a, б, в and г; the other comprising variants д, е, ж and и. Rolling of tapered strip under conditions of diminishing draft can be regarded as a particular case of the first group; similarly, rolling of tapered strip with increasing draft is a particular case of the second group. (Variants г and и, less common than the remaining ones, are not considered in the present analysis.) The geometry of rolling according to variants a and д, relevant to the subject under consideration, are shown in Fig.2a and 2б respectively. It is with reference to this figure that general formulae are derived in the following paragraphs for the central angle of contact θ, and for the critical angle γ, the latter being determined from the equilibrium of the horizontal components of forces in the deformation region. The change of the critical angle γ with the rotation of the rolls is then considered and the relationship between γ and various rolling parameters is discussed. A formula for the momentary forward slip is then derived, the term "momentary" signifying the fact that the forward

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slip in the case under consideration continually varies. The validity of this formula was checked by experiments carried out on lead strip of the type shown on top of Fig.7. Test pieces of various sizes were rolled under various rolling conditions. Typical results for 2 sets of experimental conditions are shown in Fig.7 (bottom), where the forward slip S" is plotted against the distance (given in mm on the circumference of the rolls or in degrees of the angle δ) from the point of minimum roll radius. Although the validity of the analytically established relationships was qualitatively confirmed by the experiments, in many cases the experimental values of S" differed from the calculated values. This was attributed to the fact that the formula S" derived by the present authors, did not take into account the zone of sticking friction. There are 8 figures and 11 Soviet references.

ASSOCIATION: Ural'skiy politekhnicheskiy institut
(Ural Polytechnical Institute)

SUBMITTED: January 4, 1960

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

S/148/61/000/010/002/003
E193/E435

AUTHORS: Pozdeyev, A.A., Tarnovskiy, I.Ya., Zykov, Yu.S.

TITLE: Foundations of the theory of visco-plastic deformation of metal during rolling

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, no.10, 1961, 50-58

TEXT: Experimental evidence indicates that a hot-worked metal possesses both plastic and viscous properties and should therefore be considered as a complex visco-plastic medium. In contrast to the theory of small elastoplastic deformations in which the equations of state for a deformed metal establish the relationship between the stress and strain components, the corresponding equations for the theory of visco-plastic deformation describe the relationship between stress- and strain (deformation)-rate components. One advantage of using the latter theory as a tool for studying the mechanism of hot deformation is that it is concerned with increments of stress and strain rates. As a result the limiting condition of small degrees of deformation no longer applies and the theory can be applied to studying the variation of the stress-strain state at any moment of the deformation process.

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In the present paper, this theory is applied to the analysis of the mechanism of flat hot rolling. A slab of rectangular cross-section is considered whose dimensions are H_0 (thickness), L_0 (length) and B_0 (width). Its thickness is reduced during rolling by ΔH and its final dimensions are H_1, L_1 and B_1, the half-thickness and half-width being denoted by h and b with appropriate indices (0 or 1). The relationship between stress and strain rates is described by a set of equations for a visco-plastic medium (Ref.2: L.M.Kachanov. Mechanics of Plastic Media. Gostekhizdat, 1948)

$$\left.\begin{aligned} \sigma_x - \sigma &= 2\tau_s \frac{\xi_x}{H} + 2\mu'\xi_x; & \tau_{xy} &= \tau_s \frac{\eta_{xy}}{H} + \mu'\eta_{xy};\\ \sigma_y - \sigma &= 2\tau_s \frac{\xi_y}{H} + 2\mu'\xi_y; & \tau_{yz} &= \tau_s \frac{\eta_{yz}}{H} + \mu'\eta_{yz};\\ \sigma_z - \sigma &= 2\tau_s \frac{\xi_z}{H} + 2\mu'\xi_z; & \tau_{xz} &= \tau_s \frac{\eta_{xz}}{H} + \mu'\eta_{xz}. \end{aligned}\right\} \quad (1)$$

in which μ' (tensor coefficient) represents the coefficient of proportionality between the components of stress and the rate of deformation. Jordan's principle (Ref.3: L.S.Leybenzon. Course of Theory of Elasticity, Gostekhizdat, 1947) applied to an incompressible metal is expressed by

$$\iiint_V (\sigma_x \delta\xi_x + \sigma_y \delta\xi_y + \cdots + \tau_{xz} \delta\eta_{xz})\, dV = \iint_S (X_n \delta v_x + Y_n \delta v_y + Z_n \delta v_z)\, dS, \qquad (4)$$

where X_n, Y_n, Z_n - projections of external forces applied to the body under deformation, on the axis of the coordinates; δv_x, δv_y, δv_z - variations of velocity components of the displacements on the points of the body on which external forces are acting. The left hand side of Eq.(4) represents the variation of the work of internal forces, while the right hand side represents the variations of the work of external forces. Utilizing Eq.(1), applying calculus of variations and introducing a

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new system of coordinates to the right hand side of Jordan's equation it will become

$$\delta\left[\iiint_V \left(\tau_s H + \frac{\mu'}{2} H^2\right) dV + \psi\tau_s \iint_S \sqrt{v_y^2 + \left(v_B - \frac{v_x}{\cos\varphi_x}\right)^2}\, dS\right] = 0. \quad (16)$$

(16)

where H - the intensity of the velocity of deformation due to shear; v_B - roller velocity; φ_x - the angle characterizing the point considered ($0 < \varphi_x < \alpha$); α - contact angle; τ_s - yield point under shear; v_x, v_y, v_z - velocity components ($v_z = v_x \tan \varphi_x$). Jordan's equation presented in this form is applicable to the analysis of the process of rolling on plain rollers. If the work of shear lost on overcoming resistances τ_s is also included, it becomes:

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$$\delta\left[\iiint\limits_V\left(\tau_s H+\frac{\mu'}{2}H^2\right)dV+\sum_i\iint\limits_{S_i}\tau_s[v_i]\,dS+\right.$$
$$\left.+\psi\tau_s\iint\limits_S\sqrt{v_y^2+\left(v_в-\frac{v_x}{\cos\varphi_x}\right)^2}\,dS\right]=0, \qquad (17)$$

in which summation is extended over the surfaces of the discontinuities of the velocities and v_t represents the difference between the velocities on the surface of discontinuity. Eq.(16) or (17) should be combined with an equation expressing the law of energy conservation. The work done on direct rolling is:

$$N_{пр}=M_{пр}\omega=2R\omega\left[\iint\limits_{S_1}\psi\tau_s\,dS-\iint\limits_{S_2}\psi\tau_s\,dS\right], \qquad (18)$$

where $M_{пр}$ - roll torque (for two rollers); ω - angular velocity; R - roller radius. The work done on overcoming friction forces and internal resistances is

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$$N_{\text{д}} = \iiint_V (\tau_s H + \mu' H^2)\, dV + \psi\tau_s \iint_S \sqrt{v_y^2 + \left(v_s - \frac{v_x}{\cos\varphi_x}\right)^2}\, dS. \qquad (21)$$

Taking into account the work lost on the surfaces of discontinuities and the condition $N_{\text{пр}} = N_{\text{д}}$ leads to

$$N = v_s \left[\iint_{a0}^{\gamma b_x} \psi\tau_s\, dS - \iint_{\gamma 0}^{0 b_x} \psi\tau_s\, dS\right] - \iiint_V (\tau_s H + \mu' H^2)\, dV - $$
$$- \psi\tau_s \iint_S \sqrt{v_y^2 + \left(v_s - \frac{v_x}{\cos\varphi_x}\right)^2}\, dS - \sum_i \iint_{S_i} \tau_s [v_i]\, dS = 0. \qquad (26)$$

where γ - critical angle. Eq.(26) and (17) taken together define the problem for the calculus of variations. They contain three unknown quantities v_x, v_y, v_z and their derivatives which have to be determined in such a manner that, on one hand, the

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integral is to assume its maximum value and, on the other, the Eq.(26) be satisfied. Moreover, the functions v_x, v_y, v_z should satisfy incompressibility condition

$$\frac{\partial v_x}{\partial x} + \frac{\partial v_y}{\partial y} + \frac{\partial v_z}{\partial z} = 0. \qquad (29)$$

The solution can be obtained with the use of the calculus of variations (Ref.10: S.G.Mikhlin. Direct methods in mathematical physics. Gostekhteorizdat, 1950; Ref.11: L.V.Kantorovich, V.I.Krylov. Methods of approximation of higher analysis. Gostekhteorizdat, 1949). Thus, the velocity of the metal at any point of the volume of deformation region can be determined, whence all rolling parameters can be calculated. The power expended on deformation $N_{д}$ can be found from Eq.(21). If $N_{д}$ is known, the rolling torque $N_{пр}$ can be determined from Eq.(18), and the roll force can be calculated for a given roll radius. The velocities at the entry and exit points of the deformation region (v_0 and v_1) are calculated from the known value of v_x. Then, from the ratio of the initial-to-final cross-section area of

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this slab or from the values of v_1 and v_2, the elongation λ can be calculated from

$$\frac{F_o}{F_1} = \frac{v_1}{v_o} = \lambda$$

The lateral spread can be then calculated for a given draft, from the condition of constant volume of the deformed metal. The velocities v_x, v_y and v_z can be used also to construct trajectories of displacement of metal particles in the deformed region relative to the rolls, as has been described earlier (Ref.12: A.A.Pozdeyev, V.I.Tarnovskiy, Izv. VUZ. Chernaya metallurgiya, no.6, 1959). There are 12 references: 11 Soviet-bloc and 1 Russian translation of non-Soviet-bloc publication.

ASSOCIATION: Ural'skiy politekhnicheskiy institut
(Ural Politechnical Institute)

SUBMITTED: March 9, 1960

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TARNOVSKIY, I.Ya., prof., doktor tekhn. nauk

Variational methods in the theory of the working of metals by pressure. Sbor. nauch. trud. Ural. politekh. inst. no.122: 234-242 '61. (MIRA 17:12)

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TARNOVSKIY, I.Ya.

Classification of processes in metalworking by pressure.
Trudy Ural. politekh. inst. no.127:5-18 '61. (MIRA 16:8)

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S/137/62/000/006/080/163
A052/A101

AUTHORS: Tarnovskiy, I. Ya., Skorokhodov, A. N.

TITLE: Mechanics of metal deformation at rolling complex shapes

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 6, 1962, 3, abstract 6D10 ("Tr. Ural'skogo politekhn. in-ta", no. 127. 1961, 19 - 32)

TEXT: The modern conception of the stressed and strained state of metal at rolling complex shapes is described. In view of a great variety of complex shapes, a classification of shapes in groups is suggested. 1. By the form: a) with two planes of symmetry (H-beams and other), b) with one plane of symmetry (rails, T-beams and others), c)without planes of symmetry. 2. By conditions of lateral deformation: a) with a free expansion, b) with a restricted expansion, c) without expansion. The analysis of the mechanics of metal deformation shows that neither Brovo's nor Tafel's method can be accepted as a correct one. It should be recommended to use electronic machines for performing calculations, since the functions derived are very cumbersome.

N. Yudina

[Abstracter's note: Complete translation]

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TARNOVSKIY, I.Ya.; TRUBIN, V.N.

Using variational principles to investigate metal flow into die cavities during the upsetting of large steel ingots. Trudy Ural. politekh. inst. no.127:105-113 '61.

(MIRA 16:8)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

IL'YUSHIN, A.A.; POZDEYEV, A.A.; TARNOVSKIY, I.Ya.; TARNOVSKIY, V.I.

Applying the method of hydrodynamic approximations to variational problems of plastic flow. Inzh.zhur. 1 no.4:59-67 '61.
(MIRA 15:4)

(Plasticity)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; KOTEL'NIKOV, V.P.

Depth of the zone of plastic deformation in high strip rolling. Izv.vys.ucheb.zav.; chern.met. 4 no.5:109-119 '61. (MIRA 14:6)

1. Ural'skiy politekhnicheskiy institut.
(Rolling (Metalwork)) (Deformations (Mechanics))

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; LYU KHAY-KUAN' [Liu Hai-k'uan]; TRUBIN, V.N.

Mechanism of and conditions for the appearance of the "forging cross." Izv. vys. ucheb. zav.; chern. met. 4 no.7:112-120 '61. (MIRA 14:8)

1. Ural'skiy politekhnicheskiy institut
(Forging—Defects)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; SMIRNOV, V.K.; KHAYKIN, B.Ye.

Estimate of power parameters for periodic rolling with burrs. Izv. vys. ucheb. zav.; chern. met. 4 no.11:86-9, '61. (MIRA 14:12)

1. Ural'skiy politekhnicheskiy institut.
(Rolling mills)

TARNOVSKIY, I.Ya; SMIRNOV, V.K.; KOTSAR', S.L.

Kinematics of the nonstationary center of deformation in rolling.
Izv. vys. ucheb. zav.; chern. met. 4 no.11:97-109 '61. (MIRA 14:12)

1. Ural'skiy politekhnicheskiy institut.
(Rolling (Metalwork))
(Deformations (Mechanics))

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; POZDEYEV, A.A.; ZYKOV, Yu.S.

Variational method of investigating the widening of plastic toughness metal during the hot rolling process. Izv. vys. ucheb. zav.; chern. met. 4 no.12:61-70 '61. (MIRA 15:1)

1. Ural'skiy politekhnicheskiy institut.
(Rolling (Metalwork)) (Deformations (Mechanics))

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; ODINOKOV, Yu.I.; KUSTOBAYEV, G.G.; SYCHKOV, B.D.

Rolling 7 to 9-ton ingots by the semidouble method on the 1150 slabbing mill. Metallurg 6 no.11:20-22 N '61. (MIRA 14:11)

1. Ural'skiy politekhnicheskiy institut; Institut chernykh metallov i Magnitogorskiy metallurgicheskiy kombinat.
(Rolling(Metalwork))

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I. YA.

PHASE I BOOK EXPLOITATION SOV/6162

Trubin, V. N., Candidate of Technical Sciences, and I. Ya. Tarnovskiy, Doctor of Technical Sciences, eds.

Kovka krupnykh pokovok; rezul'taty issledovaniya tekhnologicheskikh rezhimov (Production of Heavy Forgings; Results of a Study of Technological Methods). Moscow, Mashgiz, 1962. 223 p. 3800 copies printed.

Reviewer: O. A. Ganago, Candidate of Technical Sciences; Tech. Ed.: N. A. Dugina; Executive Ed. of Ural-Siberian Department (Mashgiz): E. L. Kolosova, Engineer.

PURPOSE: This book is intended for engineering personnel of forging shops and engineering and design offices at heavy-machinery plants, as well as for those working in scientific-research and planning organizations. It may also be useful to students at higher educational establishments.

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APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

COVERAGE: The book reviews technological problems of forging large steel ingots. The effect of reduction and conditions of deformation on the quality of forgings is discussed on the basis of research work done at heavy-machinery plants of the USSR. The book offers practical suggestions on improving the quality of large forgings and reducing the amount of labor required to produce them. I. Ya. Chernikhova, V. I. Tarnovskiy, and V. P. Bakharev took part in preparing the copy for publication. There are 193 references, mostly Soviet.

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APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

AVAILABLE: Library of Congress

SUBJECT: Metals and Metallurgy

Card ~~4/5~~ 4/4

DV/wb/jk
2/25/63

YEGOROV, Vladimir Vasil'yevich; SOKOLOV, Oleg Viktorovich; TARKOVSKIY, Lev Fedorovich; ROGOV, A.B., red.; SHAMAROVA, T.A., red. izd-va; SUNGUROV, V.S., tekhn. red.

[Compiling and editing maps] Sostavlenie i redaktirovanie kart. Moskva, Geodezizdat, 1962. 238 p. (MIRA 15:10)
(Maps, Topographic) (Cartography)

TARNOVSKIY, Iosif Yakovlevich; SMIRNOV, Vitaliy Kuz'mich; KOTSAR', Sergey Leonidovich; PAL'MOV, Ye.V., prof., retsenzent; LEDNEV, M.P., kand.tekhn.nauk, retsenzent; KRYZHOVA, M.L., red.izd-va; TURKINA, Ye.D., tekhn. red.

[Longitudinal rolling of merchant shapes with a varying cross section] Prodol'naia prokatka profilei peremennogo secheniia. Sverdlovsk, Metallurgizdat, 1962. 366 p. (MIRA 15:7)
(Rolling (Metalwork))

S/182/62/000/001/002/004
D038/D113

AUTHORS: Trubin, V.N. and Tarnovskiy, I.Ya.

TITLE: Closing of internal defects in metal by upsetting

PERIODICAL: Kuznechno-shtampovochnoye proizvodstvo, no. 1, 1962, 6-11

TEXT: The author deals with research on the closing of internal defects in large forgings by upsetting, since the mechanism of this process has not been sufficiently investigated. Upsetting tests conducted on blanks consisting of compound lead templates provided with artificial defects had demonstrated that the closing of internal defects during the stress state similar to linear strain occurred only along the forging height, and the radial dimensions of defects had increased. It was impossible to close the internal defects in the shape of through holes during the linear strain. However, the closing of internal defects located along the height, and in radial directions was made possible by all-round compression. During uneven upsetting, the internal defects closed only in the central portion of the forging, i.e. in the zone of greatest deformation. The shape of

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APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

Closing of internal ....

S/182/62/000/001/002/004
D038/D113

upsetting plates and the presence of an aperture in the lower upsetting plate affect the closing of internal defects. A description of upsetting on flat plates with and without oil and graphite lubricant, the mechanism of the closing of internal defects, and upsetting of a 34ХН1М (34KhN1M) steel blank are included. The work of A. Tomlinson and I. Stringer (Ref. 1: The Closing of Internal Cavities in Forgings by Upsetting, Journal of the Iron and Steel Institute, March 1958), and that of M.V. Rastegayev (Ref. 2, Vestnik mashinostroyeniya, no. 3, 1960) is mentioned in the article. There are 10 figures and 3 references: 2 Soviet-bloc and 1 non Soviet-bloc. The English-language reference is: A. Tomlinson, I. Stringer. The closing of Internal Cavities ih Forgings by Upsetting, Journal of the Iron and Steel Institute, March, 1958.

Card 2/2

S/149/62/000/005/008/008
A006/A101

AUTHORS: Pozdeyev, A. A., Tarnovskiy, I. Ya., Vaysburd, R. A., Orlov, S. N.

TITLE: On the calculation of force in pressing aluminum alloy rods

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Tsvetnaya metallurgiya, no. 5, 1962, 145 - 155

TEXT: In order to develop methods of determining the force in pressure working of metals, the authors attempted the derivation of a formula to calculate the force in rod pressing, using direct methods of variation calculus. Force and pressure are calculated with the use of a rough, approximate metal flow diagram (Fig 1) where the container is divided into 3 sections, the velocity field is kinematically possible, and value "a" is the depth of deformation spread. The following simplified formula for the necessary force in pressing rods is derived:

$$\frac{p_c}{2\tau_s} = 1.1 + 1.15 \lg\lambda + 2\sqrt{\frac{0.4\lambda + 0.6}{\sqrt{\lambda}} - 1} + 2.8\frac{L}{D}; \quad (6)$$

λ is the extrusion. The calculated data were experimentally checked and their

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S/149/62/000/005/008/008
A006/A101

On the calculation of force in...

satisfactory agreement makes it possible to recommend the relation obtained for the determination of the pressing force for aluminum alloys. Calculations with the use of formula (6) are simple and do not yield indefinite results as e.g. Gubkin's formulae. Graphs are plotted to facilitate calculation (Figure 7). There are 2 tables and 7 figures.

ASSOCIATIONS: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute) Kafedra obrabotki metallov davleniyem (Department of Pressure Working of Metals)

SUBMITTED: April 9, 1962

S/149/62/000/005/008/008
A006/A101

On the calculation of force in...

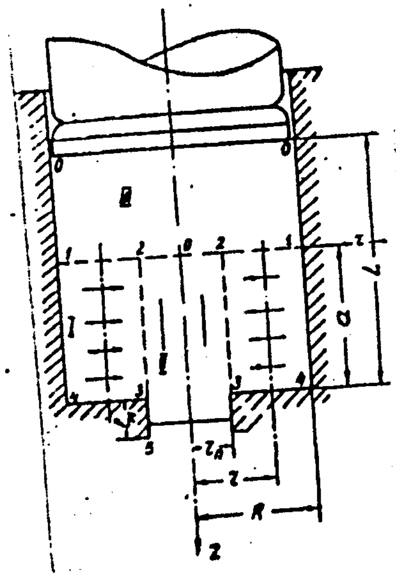

Figure 1. Kinematic diagram of metal flow and shear volumes in pressing rods from a round container

Legend: r_n is the rod radius; R is the container radius; L is the length of the pressed ingot; l_m is the length of the operational zone of the die; a is the depth of deformation seat spread (variable parameter)

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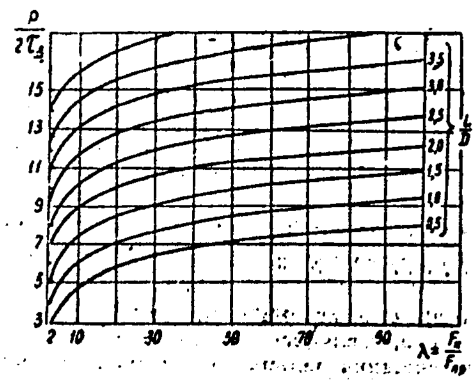
Figure 7. Graph of function $\frac{p}{2\tau_s} = f\left(\lambda; \frac{L}{D}\right)$ for K = 1.4
(K is $\frac{\tau'_s}{\tau_s}$; τ_s is friction stress; τ'_s is the shear yield point)



APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; MAKAYEV, S.V.; GANAGO, O.A.; STAROSELETSKIY, M.I.; SHELEKHOV, V.A.

Investigating the possibility of manufacturing railroad rails by drop forging in dies (without subsequent rolling). Kuz.-shtam.proizv. 4 no.12:1-3 D '62. (MIRA 16:1)
(Forging) (Car wheels)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; SMIRNOV, V.K.; KOTSAR', S.L.

Increase in width during the rolling of strips of variable thickness. Izv. vys. ucheg. zav.; chern met. 5 no.1:101-111 '62. (MIRA 15:2)

1. Ural'skiy politekhnicheskiy institut.
(Rolling(Metalwork))

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; SKOROKHODOV, A.N.

Analysis of deformations in the rolling of cross-like shapes by means of variational methods. Izv.vys.ucheb.zav.; chern.met. 5 no.6:61-70 '62. (MIRA 15:7)

1. Ural'skiy politekhnicheskiy institut.
(Rolling (Metalwork)) (Deformations (Mechanics))

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; SKOROKHODOV, A.N.

Rolling of H-beams with free widening. Izv. vys. ucheb. zav.; chern. met. 5 no.8:62-68 '62. (MIRA 15:9)

1. Ural'skiy politekhnicheskiy institut.
(Rolling (Metalwork)) (Beams and girders)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

ZYKOV, Yu.S.; TARNOVSKIY, I.Ya.; POZDEYEV, A.A.

Investigating by the variation method the widening of the metal during hot rolling in plain grooves. Izv. vys. ucheb. zav.; chern. met. 5 no.10:77-87 '62. (MIRA 15:11)

1. Ural'skiy politekhnicheskiy institut.
(Rolling (Metalwork))

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKI, I.I. [Tarnovskiy, I.I.]; KOTELNIKOV, V.P. [Kotel'nikov, V.P.]

Depth of the zone of plastic deformation at the lamination of high bars. Analele metalurgie 16 no.2:163-175 Ap-Je '62.

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya., prof., doktor tekhn. nauk; POZDEYEV, A.A., kand. tekhn. nauk; KOLMOGOROV, V.L., kand. tekhn. nauk

Calculating frictional forces in variational problems of metalworking by pressure. Stal' 22 no.6:538-539 Je '62. (MIRA 16:7)

(Metalwork) (Internal friction)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; ANTONOV, S.P.; ODINOKOV, Yu.I.; KUSTOBAYEV, G.G.; SYCHKOV, B.D.

Ingot rolling in the 1150 slabbing mill. Stal' 22 no.8:720-727 Ag '62. (MIRA 15:7)

1. Ural'skiy politekhnicheskiy institut, Ural'skiy institut chernykh metallov i Magnitogorskiy metallurgicheskiy kombinat.
(Rolling (Metalwork))

TARNOVSKIY, I.Ya.; ILYUKOVICH, B.M.; SKOROKHODOV, A.N.

Calculating deformations in the forming and edging grooves during the rolling of T-sections. Stal' 22 no.10:925-928 O'62. (MIRA 15:10)

1. Ural'skiy politekhnicheskiy institut i Chusovoskoy metallurgicheskiy zavod.
(Rolling (Metalwork)) (Deformations (Mechanics))

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

BAAKASHVILI, V.S.; TARNOVSKIY, I.Ya.; KHASIN, G.A.

Plasticity of heat-resistant and stainless steels and alloys at high temperatures. Soob. AN Gruz. SSR 28 no.2:211-216 F '62. (MIRA 15:3)

1. AN GruzSSR, Institut metallurgii, Tbilisi. Predstavleno akademikom F.N.Tavadze.

(Metals--Heat treatment) (Plasticity)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

LEVANOV, A. N.; TARNOVSKIY, I. Ya.

Gauge for measuring contact stresses in sagging. Zav. lab. 28 no.12:1531-1532 '62. (MIRA 16:1)

1. Ural'skiy politekhnicheskiy institut.

(Gauges)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, K.K.

Experience in the manufacture of starch products from corn.
Sakh.prom. 36 no.5:63-67 My '62. (MIRA 15:5)

1. Kazatskiy patochnyy kombinat.
(Corn starch)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; POZDEYEV, A.A.; KOLMOGOROV, V.L.; VAYSBURD, R.A.; GUN, G.Ya.; KOTEL'NIKOV, V.P.; TARNOVSKIY, V.I.; SKOROKHODOV, A.N.

[Variational principles of mechanics in the theory of metalworking by pressure] Variatsionnye printsipy mekhaniki v teorii obrabotki metallov davleniem. Moskva, Metallurgizdat, 1963. 52 p. (MIRA 17:5)

TARNOVSKIY, I.Ya., prof., red.

[Engineering methods for designing technological processes for the pressworking of metals] Inzhenernye metody rascheta tekhnologicheskikh protsessov obrabotki metallov davleniem. Moskva, Metallurgizdat, 1963. 430 p. (MIRA 17:5)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya., prof., red.; GOLUBCHIK, R.M., red.izd-va; DOBUZHINSKAYA, L.V., tekhn. red.

[Engineering methods of calculating technological processes in metalworking by pressure] Inzhenernye metody rascheta tekhnologicheskikh protsessov obrabotki metallov davleniem. Moskva, Metallurgizdat, 1963. 430 p. (MIRA 17:3)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, Iosif Yakovlevich; PAL'MOV, Yevgeniy Vasil'yevich; TYAGUNOV, Vladimir Arkad'yevich; MAKAYEV, Sergey Vladimirovich; KOTEL'NIKOV, Veniamin Petrovich; ANDREYUK, Leonid Vasil'yevich. Prinimal uchastiye KOTSAR', S.L.; LYASHKOV, V.B., red.; SKOROBOGACHEVA, A.P., red.izd-va; DOBUZHINSKAYA, L.V., tekhn. red.

[Rolling on a blooming mill] Prokatka na bliuminge. Moskva, Metallurgizdat, 1963. 388 p. (MIRA 16:10)
(Rolling (Metalwork))

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, Iosif Yakovlevich; POZDEYEV, Aleksandr Aleksandrovich; GANAGO, Oleg Aleksandrovich; KOLMOGOROV, Vadim Leonidovich; TRUBIN, Valeriy Nikolayevich; VAYSBURD, Rual'd Arkad'yevich; TARNOVSKIY, Valeriy Iosifovich; GOROBINCHENKO, V.M., red. izd-va; BEKKER, O.G., tekhn. red.

[Theory of working metals by pressure; variational methods of calculating forces and deformations] Teoriia obrabotki metallov davleniem; variatsionnye metody rascheta usilii i deformatsii. [By] I.IA.Tarnovskii i dr. Moskva, Metallurgizdat, 1963. 672 p. (MIRA 17:1)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I. Ya., doktor tekhn.nauk; ODINOKOV, Yu.I., inzh.; CHICHIGIN, V.A., inzh.

Rolling forces of the 1150 slab mill. Izv.vys.ucheb.zav.;mashinostr.no. 1:145-156 '63. (MIRA 16:5)

1. Ural'skiy politekhnicheskiy institut.
(Rolling (Metalwork))

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

ACCESSION NR: AR4018334 S/0137/64/000/001/I077/I077

SOURCE: RZh. Metallurgiya, Abs. 1I484

AUTHOR: Tarnovskiy, I. Ya.; Lyashkov, V. B.; Baskashvili, V. S.; Khasin, G. A.

TITLE: Plasticity and resistance to deformation of alloyed types of steel and alloys at high temperatures

CITED SOURCE: Tr. Ural'skogo n.-i. in-ta chern. met., v. 2, 1963, 146-152

TOPIC TAGS: alloyed steels, steel alloy, high-temperature steel testing, deformation resistance

TRANSLATION: Mechanical properties were determined during the stretching of 12 types of alloyed steel (structual, tool, and stainless) at 800-1,250 degrees. The tests took place on a 5-ton-capacity hydraulic press with a constant speed of engagement movement of 0.33 meters/sec. Heating and testing of samples took place in a tubular oven with carborundum rods. The true resistance to deformation S_b of the steel of all tested types was lowered by 6-10 times as the temperature of heating increased, and leveled off at 1,250 degrees, reaching approximately 2 kg/mm^2; for EI435 alloy and 3Kh2V8 type steel only, under these conditions, the value of S_b

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APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

ACCESSION NR: AR4018334

remained at 4 kg/mm^2. The highest δ_b at 800-1,000 degrees was characterized by alloy EI 435 and type EI478 austenitic steel. At the same time, in the above temperature range, more intensive lowering of the value of δ_b takes place in alloys and austenitic steels. For these materials, a continuous increase in plastic characteristics (φ and ψ) occurs with an increase in the test temperature. Pre-eutectoid types 12Kh2N4A and 5KhNT steels, in which the value of ψ changes within the range of 92-100 degrees, possess high plastic properties in the temperature range studied. With respect to 45G2, 30KhGSNA, EI 478, EKh3, and 5KhNT steels, there is a steady increase in plasticity at a temperature of about 1,000 degrees. In the remainder steels studied, a "breakdown" of plasticity is observed in the 900-1,000 degree range.

SUB CODE: MM ENCL: 00

Card 2/2

S/182/63/000/002/003/007
A004/A126

AUTHORS: Vaysburd, R. A., Tarnovskiy, I. Ya., Teterin, G. P.

TITLE: On the use of high-speed computers in developing die-forging technology

PERIODICAL: Kuznechno-shtampovochnoye proizvodstvo, no. 2, 1963, 10 - 13

TEXT: The authors are of the opinion that for solving the problems connected with the design particulars of a given component, e. g. dimensions, material, surface finish etc., high-speed computers can be used. Besides increasing the productivity, they would eliminate any subjective solution of technological problems. Since the most simple and widespread group of forgings are axially symmetric ones, i.e., forgings of the body-of-revolution type, this type of forgings would be the first whose technology could be developed by means of high-speed computers. The authors give a detailed description of a universal program which is being developed at present by a team of scientists of the Section "Metal Working" of the Ural'skiy politekhnicheskiy institut imeni S. M. Kirova (Ural Polytechnic Institute im. S. M. Kirov), and the Laboratory of Forg-

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APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

ings of NIPIGORMASh in cooperation with technologists of Uralmashzavod. They enumerate the data to be programmed, the technological details to be determined, present formulae for determining the subprograms of calculating the forging volume, fixing the overlap and determining the forging draft. The results of the investigations carried out prove the practicability of using successfully high-speed electronic computers for working out the technological processes of die forging. There are 5 figures.

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; LYASHKOV, V.B.; GANAGO, O.A.

Review of V.G. Shal'nev's book "Expanding methods of metal-working by pressure. Kuz.-shtam. proizv. 5 no.9:47-48 S '63. (MIRA 16:11)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; LEVANOV, A.N.

Dependence of contact friction forces during upsetting on the mechanical properties of the metal and the shape of the deformation center. Kuz.-shtam. proizv. 5 no.11:1-6 N '63. (MIRA 17:1)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

KOTEL'NIKOV, V.P.; TARNOVSKIY, I.Ya.; PUCHKOV, S.G.

Nomograms for the calculation of increases in width and forces in forge drawing. Kuz.-shtam. proizv. 5 no.12:6-10 D '63. (MIRA 17:1)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; SKOROKHODOV, A.N.

Deformation, forces, and the consumption of energy in rolling T-sections in edging passes. Izv.vys.ucheb.zav.; chern.met. 6 no.1:67-77 '63. (MIRA 16:2)

1. Ural'skiy politekhnicheskiy institut.
(Rolling mills)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

[illegible]

... heat resistant alloys and steel ... [illegible]

... zavedeniy. ... metallurgiya ... [illegible]

The object of the present investigation was to deter- ... degree of deformation temperature ... [illegible]

... forging machine ... [illegible]

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

Kh15N60 and EI 481 is plotted against ε, the various curves were [illegible] for specimens deformed at a strain rate of 7.5 sec^{-1} [illegible] - 1000 °C.

[illegible]

$M_2 = M_1 e$ [illegible]

where M_1 and M_2 are the mechanical properties of a metal at [illegible] respectively, and [illegible] is the temperature [illegible]

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; ILYUKOVICH, B.M.; SKOROKHODOV, A.N.

Deformations and stresses during strip rolling with cruciform grooves. Izv. vys. ucheb. zav.; chern. met. 6 no.4:68-75 '63. (MIRA 16:5)

1. Ural'skiy politekhnicheskiy institut.
(Rolling (Metalwork)) (Deformations (Mechanics))

TARNOVSKIY, I.Ya.; SKOROKHODOV, A.N.; ILYUKOVICH, B.M.

Deformation in sheet passes during the rolling of T-sections. Izv. vys. ucheb. zav.; chern. met. 6 no.5:118-122 '63. (MIRA 16:7)

1. Ural'skiy politekhnicheskiy institut.
(Rolling (Metalwork)) (Deformations (Mechanics))

LEVANOV, A.N.; TARNOVSKIY, I.Ya.

Methods of experimental investigation of contact stresses during plastic deformation. Izv. vys. ucheb. zav.; chern. met. 6 no.6: 73 '63. (MIRA 16:8)

1. Ural'skiy politekhnicheskiy institut.
(Deformations (Mechanics)) (Friction)

APPROVED FOR RELEASE: Thursday, September 26, 2002 CIA-RDP86-00513R001755020004-7"

TARNOVSKIY, I.Ya.; LEVANOV, A.N.

Studying the epures of contact friction forces and normal pressures in upsetting. Izv. v/s. ucheb. zav.; chern. met. 6 no.6:121-129 '63. (MIRA 16:8)

1. Ural'skiy politekhnicheskiy institut.
(Forging) (Friction)

TARNOVSKIY, I.Ya.; POZDEYEV, A.A.; ODINOKOV, Yu.I.; POPOV, V.M.

Investigating the flow rate area of a metal during rolling on large cogging mills. Izv. vys. ucheb. zav.; chern. met. 6 no.7:96-105 '63. (MIRA 16:9)

1. Ural'skiy politekhnicheskiy institut.
(Rolling (Metalwork)) (Deformations (Mechanics))

TARNOVSKIY, I.Ya.; POZDEYEV, A.A.; ODINOKOV, Yu.I.; POPOV, V.M.;
CHICHIGIN, V.A.

Increase in metal width and the corresponding speeds of horizontal and vertical rolls on universal blooming mills. Izv. vys. ucheb. zav.; chern. met. 6 no.9:103-109 '63. (MIRA 16:11)

1. Ural'skiy politekhnicheskiy institut.

TARNOVSKIY, I.Ya.; SKOROKHODOV, A.N.; ILYUKOVICH, B.M.

Shape changes during metal rolling in open beam passes.
Izv. vys. ucheb. zav.; chern. met. 6 no.12:82-89 '63. (MIRA 17:1)

1. Ural'skiy politekhnicheskiy institut.

TARNOVSKIY, I.Ya.; ODINOKOV, Yu.I.; CHICHIGIN, V.A.; SYCHKOV, B.D.

Torque distribution between the rolls of a rolling mill. Stal' 23 no.12: 1099-1102 D '63. (MIRA 17:2)

TARNOVSKIY, L.Ya., prof., red.; GOLUBCHIK, R.M., red.izd-va;
DOBUZHINSKAYA, L.V., tekhn. red.

[Engineering methods of calculating the technological processes of metalworking by pressure] Inzhenernye metody rascheta tekhnologicheskikh protsessov obrabotki metallov davleniem. Moskva, Metallurgizdat, 1964. 430 p. (MIRA 17:3)

ACCESSION NR: AP4029540 S/0149/64/000/002/0160/0163

AUTHOR: Poksevatkin, M. I.; Tarnovskiy, I. Ya; Levanov, A. N.

TITLE: Experimental investigation of contact stresses in the sagging of technically pure metals

SOURCE: IVUZ. Tsvetnaya metallurgiya, no. 2, 1964, 160-163

TOPIC TAGS: contact stress, pure metal, plastic deformation, friction, Armco iron, copper, zinc, copper

ABSTRACT: In this paper the authors investigate the ratio $\tau_{mean}:\tau_s$ and the index of the friction forces $\varphi = \tau_{mean}:p_{mean}$ (τ_{mean}, p_{mean} are the specific forces of friction in a normal pressure averaged on the contact surface; τ_s is the consistency limit in shear) which most completely characterize the forces of external friction during plastic deformation in the cold sagging of copper, zinc, and Armco iron. The dependences of friction and pressure and the various metals are presented in graphs. The experimental data show: 1) the forces of friction essentially depend on the focus form of the deformation at a given state of the working surface, 2) the ratios between the friction forces and normal pressure depend on the temperature-velocity condition of deformation, mechanical properties of the metal or alloy and especially

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on the change of these properties during deformation, 3) mechanical properties of the metal or alloy on the contact surface can differ considerably from those in the basic volume of the body which is connected with the hardening process and temperature changes. Orig. art. has: 2 figures and 1 table.

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnical Institute)

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ACCESSION NR: AP4042507 S/0182/64/000/007/0009/0012

AUTHOR: Tarnovskiy, I. Ya.; Baakashvili, V. S.; Khasin, G. A.

TITLE: Mechanical properties of martensitic and austenitic-ferritic steels

SOURCE: Kuznechno-shtampovochnoye proizvodstvo, no. 7, 1964, 9-12

TOPIC TAGS: martensitic steel, austenitic ferritic steel, heat resistant steel, stainless steel, high speed steel, steel mechanical property, steel heating method

ABSTRACT: A study is made of the deformation resistance of heat-resistant stainless steels at various temperatures and deformation rates following various types of heat treatment. Cylindrical specimens (diameter-to-length ratio, 0.8) of EI-347sh (sh — electroslag melted), EI-992, EI-961 (AISI-422), 5Kh4SV4MF, and R-18 (AISI-TI) martensitic steels and EI474 (AISI-414), 08Kh20N10G6, 08Kh19N9S2F2, and OKh21N6M2T austenitic-ferritic steels were upset at 900, 1000, 1100, or 1200C, with deformations of 15, 25, or 40% and deformation speeds

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of 0.05, 7.5, or 150 sec^{-1}. Test specimens were either heated to the test temperature, held for 10 min, and then upset, or heated to a higher temperature (1200C), held for 10 min, furnace cooled to the test temperature and held there for 10 min, and then upset. The high-speed R-18 and EI-347 sh steels and the high-carbon EI-992 martensitic steel had high deformation resistance at all deformation speeds. The deformation resistance of the martensitic steels increased at a higher rate and was higher in magnitude when heated by the second method. For the EI347 sh steel upset 30% at 900C, the difference in the absolute magnitude was about 10% and 5% at deformation speeds of 0.05 sec^{-1} and 7.5 sec^{-1}, respectively. The difference decreases with increasing test temperature. Similar behavior was observed in the EI-992 steel. In contrast, the increase in the deformation resistance of the austenitic-ferritic steels heated by any method is practically the same. The higher deformation resistance of martensitic steels heated by the second method is explained by the presence of W, V, Mo, and Cr carbides, which at 1200C partially dissolve and strengthen the γ-solid solution. Orig. art. has: 4 figures and 1 table.

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TARNOVSKIY, I.Ya.; VAYSBURD, R.A.; YEREMEYEV, G.A.; GANAGO, O.A.

Forces in open die forging. Izv. vys. ucheb. zav.; chern. met. 7 no.1:113-122 '64. (MIRA 17:2)

1. Ural'skiy politekhnicheskiy institut.

KOTSAR', S.L.; TARNOVSKIY, I.Ya.

Stressed and deformed state during the upsetting of a thick strip with one external zone. Izv. vys. ucheb. zav.; chern. met. 7 no.3:95-101 '64. (MIRA 17:4)

1. Ural'skiy politekhnicheskiy institut.

POKSEVATKIN, M. I.; TARNOVSKIY, I. Ya.; LEVANOV, A. N.

New methods of measuring contact stresses during rolling. Izv. vys.ucheb.zav.; chern.met.7 no. 4:93-96 '64.

Determining contact stresses during metalworking by pressure in connection with the mechanical properties of metals. Ibid.:97-102.
(MIRA 17:5)

1. Ural'skiy politekhnicheskiy institut.

KOTSAR', S. L.; TARNOVSKIY, I. Ya.

Stressed and deformed state and the equation of the movement of a strip being gripped by the rolls. Izv. vys. ucheb. zav.; chern. met. 7 no. 5:75-80 '64. (MIRA 17:5)

1. Ural'skiy politekhnicheskiy institut.

POKSEVATKIN, M. I.; TARNOVSKIY, I. Ya.; LEVANOV, A. N.; KHASIN, G. A.

Contact stresses during the hot upsetting of carbon and alloyed steels. Izv. vys. ucheb. zav.; chern. met. 7 no.6:103-108 '64. (MIRA 17:7)

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TARNOVSKIY, I.Ya.; RIMM. E.R.

Increase in width and power consumption during rolling with smooth rolls, using tension. Izv. vys. ucheb. zav.; chern. met. 7 no.7:96-103 '64 (MIRA 17:8)

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TARNOVSKIY, I. Ya.; KOTSAR', S.L.

Dynamics of the gripping of a strip by the rollers. Izv. vys. ucheb. zav.; chern. met. 7 no.7:132-138 '64 (MIRA 17:8)

1. Ural'skiy politekhnicheskiy institut.

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TARNOVSKIY, I.Ya.; POZDEYEV, A.A.; TARNOVSKIY, V.I.

Calculating metal pressure on the rolls during sheet rolling. Izv. vys. ucheb. zav.; chern. met. 7 no.8:84-92 '64.

(MIRA 17:9)

1. Ural'skiy politekhnicheskiy institut.

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KOLMOGOROV, V.L.; TARNOVSKIY, I.Ya.; YERIKLINTSEV, V.V.

New method of stress calculations in the pressure working of metals. Izv. vys. ucheb. zav.; chern. met. 7 no.9:74-80 '64. (MIRA 17:6)

1. Ural'skiy nauchno-issledovatel'skiy institut chernykh metallov i Ural'skiy politekhnicheskiy institut.

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KOLMOGOROV, V.L.; TARNOVSKIY, I.Ya.; YERIKLINTSEV, V.V.

Stressed state during the upsetting of a thick strip. Report no.1. Izv. vys. ucheb. zav.; chern. met. 7 no.9:95-101 '64. (MIRA 17:6)

1. Ural'skiy nauchno-issledovatel'skiy institut chernykh metallov i Ural'skiy politekhnicheskiy institut.

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TARNOVSKIY, I.Ya.; KOLMOGOROV, V.L.; RIMM, E.R.

Stressed state during the swaging of a strip with stiff ends (plane problem). Izv. vys. ucheb. zav.; chern. met. 7 no.10: 86-91 '64. (MIRA 17:11)

1. Ural'skiy politekhnicheskiy institut.